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Franchise Value

**A MODERN APPROACH
TO SECURITY ANALYSIS**

Martin L. Leibowitz

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—Alfred Rappaport, Leonard Spacek Professor Emeritus,
Northwestern University

“In a career filled with earned accolades, Marty’s longtime work on franchise value has somehow remained an underappreciated part of his vast contribution to investment theory and practice. Hopefully, these newly collected papers will remedy this situation.”

—Clifford S. Asness, Ph.D., Managing Principal,
AQR Capital Management

Franchise Value

*A Modern Approach
to Security Analysis*

MARTIN L. LEIBOWITZ



WILEY

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To all my associates and coauthors, as well as to all the portfolio managers, analysts, traders, and even competitors in the financial community who were so generous in sharing their thoughts, their concerns, and their enthusiasm with the author over such a wonderful span of years

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An Introduction to the Franchise Value Approach

ORIGINS

Our work on the *franchise value (FV) approach* to price/earnings ratios and equity valuation sprang from work that my associate Stanley Kogelman and I undertook in the late 1980s at Salomon Brothers. We had been asked to develop a valuation model to advance our understanding of a foreign equity market (one that should perhaps best remain unnamed). One of the key questions was how much an investor should be willing to pay for the market's exceptional rate of growth. Since it was well known that not all forms of earnings growth contribute to a firm's value, Stan and I tried to probe more deeply into the value-additive component of growth, which we chose to characterize by the term "franchise value" (FV).

At the outset, we decided to base our analyses on the price/earnings (P/E) ratio. Among market practitioners, the P/E ratio is a key valuation measure, even though it has received inadequate and often dismissive treatment in the academic literature. In attempting to connect the P/E ratio to the FV component of growth, we stumbled upon a reformulation of the standard Dividend Discount Model (DDM) that had a number of very desirable characteristics—simplicity, intuitiveness, and in many ways, broader generality. This FV framework also proved to be extremely provocative, opening the door to a series of analytical papers that explored different facets of the problem of corporate valuation. This volume is a compilation of those papers.

WARNING: THE LIMITATIONS OF ANY MODEL

Before we describe the franchise value approach and its implications, we should first provide some general background and "warning labels"—

caveats that apply quite generally to conclusions drawn from any financial model.

By its very nature, a model is an abstraction of a more complex reality. Consequently, any real-life investment decision should always incorporate a more comprehensive set of judgments and considerations than can be provided by any given model. The studies in this volume are intended only to illuminate certain facets of the valuation problem, and hence these findings should not be interpreted, by themselves, as the basis for any investment decision or action.

This warning about the potential abuse of modeled studies applies with special focus to stocks because of their extremely complex nature. In addition, many of the variables incorporated into the following studies represent convenient hypothetical constructs. For example, in the following discussions, the term “current earnings” refers not to the accounting earnings in any one period, but rather to the hypothetical annuity comprised of the net cash flow that could be distributed in perpetuity from the current book of business. Similarly, the return on a new investment is also represented as a PV-equivalent annuity consisting of the distributable cash flow per dollar invested.

By its very nature, our FV approach has certain built-in biases that should be well-recognized in advance. In equities, much of what can be modeled acts to *delimit* a firm’s value. Models capture those prospects that are visible and can be foreseen. However, to the extent that productive growth and future profits are visible, they should theoretically already be incorporated into the stock price. Hence, one should not be surprised when model-based forecasts show limited further growth in the company’s value (even when there may be considerable growth in the firm’s earnings). Indeed, with all visible future earnings embedded in the model estimate, we should expect to more typically see the firm’s value and P/E ratio decline as the prospective earnings are consumed.

To be sure, one hears of superoptimistic projections being touted on the basis of some model or another. However, under close examination, as one peels back the underlying assumptions embedded in these models, one typically finds that continuous profitable growth is taken as a given, without any grounding in the more fundamental sources of return and the ultimate equilibrium that competitive forces should drive them toward. Indeed, some of the claims for astronomical P/E ratios are addressed—and questioned—by a number of the chapters in this volume.

It may be in the nature of human organizations and systems that problems and limitations loom visibly in front of us, whereas our ways of dealing with them—and their unforeseen opportunities—are lost in the fog of future possibilities and lie beyond the clear horizon of our foresight. Good models deal with that which can be reasonably foreseen and

estimated, an inherently limiting condition when the really positive news arrives unannounced. This may be another reason why economics is called the “dismal science.”

The good news here is that every experienced equity analyst knows that models—no matter how sound—can carry you only so far. At some point, one has to rely on a form of faith that an attractive company has the right stuff that will enable it to grow beyond the visible franchise (that should be already in its pricing) and to develop and capitalize on opportunities that are as yet unforeseen.

We have referred to this positive faith as a *hyperfranchise*, and believe that it is some combination of the presence, resources, confidence, and dynamism that enables a firm not only to be great, but to stay great in the face of a rapidly changing world.

If everything foreseeable by the market is already embedded in the price, how can any security ever provide the analyst’s holy grail—a return that exceeds the risk-adjusted discount rate? Putting aside any discrepancy between what the analyst believes to be his or her better foresight, the answer must depend on rather amorphous considerations such as:

1. The successful realization of projects with initially uncertain outcomes. (Essentially, this effect can be viewed as a shrinkage in the risk premiums for some facets of the firm’s business.)
2. The emergence of positive surprising new opportunities (or unforeseeable problems) that could not be formally incorporated into any model.

For a given firm, these factors are not likely to be just random occurrences. Firms that have a positive hyperfranchise will have the innate ability to bring productive projects to fruition, to make good things happen, and to uncover and effectively exploit new opportunities. In the final analysis, the ability to assess a firm’s hyperfranchise potential may be the most critical talent that an analyst can possess. Unfortunately, or perhaps fortunately, the uncovering of such hyperfranchises falls outside any good modeling, and into the realm of art—and faith.

Thus, analysts find themselves trying to deal with visible islands of *probable* franchises and (antifranchises) surrounded by a murky sea of only *possible* hyperfranchises (and anti-hyperfranchises—surely there are bad surprises as well!). Given this situation, what is the role for the model—even the best model? Simply put, by incorporating all the factors that can be estimated in the best possible way, the analyst comes to know the knowable. In an efficient, competitive market, the pricing of any security is the net result of the analyses and needs of many participants, with at least a goodly number of them being pretty well informed (especially

those having the weight of ample assets). Consequently, it always pays to take the market price seriously and treat it with the respect that it deserves. Those who dismiss the market price, without rendering it due consideration, proceed at their own risk. Thus, whenever a model generates an intrinsic value estimate that differs significantly from a security's market price, there are a series of questions that the analyst should ask himself or herself:

1. Is the model sufficiently comprehensive of all the visible factors that appear to affect the market price?
2. Do the analyst's estimates of the factor values differ significantly from the consensus? If so, does the analyst have a reasonable basis and conviction that his or her estimates are better than the consensus estimate?
3. Are there special technical factors present in the market that could distort the market price from a generally agreed-upon intrinsic value? If so, is there a basis for believing that these special technical effects will abate at some point?
4. Finally, after addressing the above issues, to the extent that there remains unexplained variances between the analyst's view and the market price, are there elements of beyond-model hyperfranchise beliefs that can at least partially explain these gaps? And once again, does the analyst have sufficient conviction in the superiority of his or her views on these more ephemeral matters?

From the preceding, it should be clear that a good comprehensive model is an important first step in a reasoned evaluation, but it is only a first step. The modeled estimates of intrinsic value not only should be taken with the classic grains of salt, they should be embedded within a veritable "moat of salt." But a good model provides the invaluable service of enabling us to deal coherently and consistently with that which we believe we know. Moreover, without a model—either a good formal model or the highly intuitive mental models that great traders seem to have internalized—there is no way to begin to rationally distinguish a real opportunity from a coin toss.

DESCRIPTION OF THE FUNDAMENTAL CONCEPT

The franchise value approach was developed out of an effort to value a generic company. Our approach was built on the standard Dividend Discount Model (DDM) together with its enhancements through the work of Williams (1938), Gordon (1962), Miller-Modigliani (1961), and Estep

(1980). Our deconstruction of value began with segregation of the firm's *current* economic value from the added value generated by *future* growth. The key to this segmentation was to incorporate the *current* level of sustainable earnings into an expanded concept of book value that we termed the "tangible value" (TV). In essence, we treated all earnings from the current business as being immediately paid out as dividends.

We further extended this "full payout" notion to *all* future earnings as well, thereby eliminating reinvestment as a funding source. Without any reinvestment, the firm would have to look to an external market pool of capital for financing any incremental growth. We assumed that equity funding for new projects could be drawn from this pool at a risk-adjusted cost of capital (COC).

However, in order to both be viable and attract the needed capital, any new project would have to rise above the commodity level and hold the promise of earning some spread above the COC. This orientation toward external financing led to the idea of a *franchise spread*. To achieve a positive franchise spread, a project would by definition have to draw on the resources that were unique or at least special to the firm—patents, licenses, distribution networks, brand recognition, particularly efficient manufacturing capabilities, and so forth. In other words, to be additive to the firm's economic value, a project must have some special franchise-like quality—hence, the terms "franchise spread" and "franchise value."

Basically, this line of reasoning implies that a firm's growth derives from new projects having returns that provide a positive franchise spread above the COC. We made the further assumption that, in today's global financial markets, any project opportunity with such a positive franchise spread would be able to attract the required capital. Thus, the key to productive growth is the magnitude and returns associated with these franchise opportunities. It is these project opportunities that are the source of the value derived from growth. In general, these project opportunities will arise in an episodic fashion, and the return that they generate may also have erratic patterns over time. However, any pattern of future flows can be represented as an appropriately discounted present value. When thus expressed in terms of current dollars, the totality of the excess returns from these franchise opportunities corresponds to what we have called the firm's franchise value (FV).

The firm's intrinsic value is then just the sum of two components: (1) the tangible value, based on the firm's current earnings prior to any new capital investments, and (2) the franchise value, based on the totality of future capital projects that can provide returns in excess of the COC.

It turns out that a number of rather striking implications follow from this simple two-part decomposition of value. (Given the warnings

in the preceding section about the limitations of our model—or any model—the following observations should be carefully interpreted as partial insights that can illuminate only some of the facets of the overall valuation problem.)

A large number of these findings relate to the issue of growth itself. At the outset, it is evident that growth by itself is not a source of value. A firm can always grow its earnings by investing in projects that just return the COC. However, such projects do not create value. Value is created only when growth is derived from projects having a positive franchise spread.

Another set of rather striking results follow from the following observation: Even a plethora of franchise projects does not insure that the firm's P/E ratio will itself grow. All visible franchise opportunities should be already reflected in the firm's valuation. Therefore, any upward boost in the P/E ratio must come from some sort of surprise event—either the discovery of new franchise prospects or better-than-expected progress toward the realization of already-visible franchise opportunities.

Under conditions of equilibrium, the P/E ratio for a growth company should typically follow a *descending* orbit as its future prospects are brought to fruition and become embedded in the firm's earnings. This observation calls into question the all-too-common practice among equity and financial analysts of projecting a consensus growth in earnings to some horizon and then applying the current P/E ratio to estimate the future price. Since equilibrium conditions and consensus earnings growth should combine to make the P/E decline, often rather significantly, this stable P/E assumption can lead to a persistent overestimation of a stock's prospective return.

Another result, surprising to some analysts, is the sheer magnitude of the franchise opportunities and returns required to justify high P/E ratios. Even when quite ample prospective return and franchise spreads are assumed, a high P/E ratio requires a large set of investable opportunities, especially relative to the size of the current business.

The franchise value decomposition also provides insight into a puzzle that has long confounded discussions of the interest rate sensitivity of equities. From standard DDMs, one would expect equities to exhibit a super-sensitivity to changing interest rates. However, while equities do statistically exhibit some correlation with interest rates, it is quite low, very unstable, and even switches signs from one regime to another. In other words, the market experience has no resemblance to the extremely long “stretch durations” predicted by the DDM. The franchise value framework points one way toward resolving this paradox by noting that (1) a company's future earnings can respond to changing inflation, and (2) there can be significant difference in this inflation adjustment between the TV and

the FV components. The combination of these two effects can help explain the more moderate equity duration value seen in practice.

Another subject where there is often much confusion has to do with the effect of increasing leverage on the P/E ratio. This subject can be addressed from two different viewpoints, with radically different results. First, from the corporate finance position, many financial analysts are surprised to learn that increasing leverage of a given firm can lead to either increases or decreases in the firm's P/E ratio. The direction depends on the firm's hypothetical P/E prior to any leverage. However, the more salient point is that this P/E effect is very modest for common levels of corporate leverage. A second and very different answer obtains when considering the challenge of an equity market analyst looking at similar stocks having different degrees of leverage. In this case, the differential levels of leverage do affect the P/E ratio—with higher leverage always pushing down the theoretical P/E ratio, sometimes quite significantly! The difference from the preceding case is that here we have an already-levered stock and the analyst is trying to peer through the leverage to determine the firm's underlying return characteristics. In contrast, in the preceding corporate finance case, the firm and its return characteristics are known, and the only question is the impact of increasing or decreasing leverage.

The basic findings are summarized in a later section of this introduction, along with pointers to the chapters that provide the more detailed explanations.

During the development of the basic idea, I often found myself, together with my associate Stanley Kogelman, being asked to talk at various seminars and meetings about the franchise value methodology and its implications. Once described, most practitioners found the franchise value generally comfortable and pretty much consistent with their intuitions. However, there was one conversation where I mentioned the idea of an antifranchise to an individual who turned out to be in the process of organizing a major conference. I explained my conjecture that, just as the business world sought and valued franchise opportunities, there had also to be many instances where firms found themselves—for one reason or another—locked into activities that were net losers (i.e., antifranchises). In short order, I found myself committed to give a keynote talk on the antifranchise.

One doesn't have to look too hard around the modern business landscape to find examples of antifranchises that destroy firm value: projects with predictably overstated forecasts, companies consecrated to growth at any (capital) cost, imperialistic expansions, overly optimistic acquisition programs, determined support of pet projects, organizational reluctance to abandon failing projects in a timely manner, and so on.

However, these examples are both dry and rather depressing, especially for a keynote talk. To lighten things up a bit, I needed a keynote joke. But try as I might, I could not come up with anything humorous about the antifranchise concept.

At the time, I was the Director of Research at Salomon Brothers and the Chairman happened to be Warren Buffett. One day, we were having lunch together and the talk turned to my dilemma. Without hardly a moment's hesitation, Buffett not only grasped the idea of what I was calling an antifranchise, but he said that he had a joke that perfectly fit the keynote occasion.

The story was about a man who comes to the United States and becomes a successful businessman. One day, he receives a letter from a long-lost cousin in the old country informing him that an equally long-lost uncle had just passed away. The letter goes on to talk of the poverty back home and requests some help to give the uncle a decent burial. Our businessman quickly complies and sends the requested funds along with a brief note of consolation. A few weeks later, he receives a second letter explaining that the uncle didn't have a suit to his name, and could some additional funds be sent over to cover the cost of a burial suit? Once again, a bit more warily, our businessman complies with this request, thinking that this should surely be the end of the saga. However, after a few weeks, a third letter comes, again asking for more money to cover the expense of the suit. This time, our exasperated businessman, wondering why he should repeatedly pay for the same suit, dashes off an indignant response. Shortly thereafter, a reply comes back from the cousin. It turns out that the suit they had used to bury the uncle was *rented!*

Buffett finished the story and asked if that wasn't what I meant by an antifranchise. Of course, it was, and you can bet that I worked his tale into my presentation. But I still find myself amazed at how naturally and instantaneously he came up with this story that so perfectly "suited" the occasion.

SUMMARY OF KEY IMPLICATIONS

The findings from the following chapters fall into six main categories:

- I. Opportunity-Based Growth
- II. Growth Illusions
- III. Super-Growth and Spread-Driven Growth
- IV. Margin Erosion within a Competitive Environment
- V. Leverage and Interest Rate Effects
- VI. Generalizations to Other Financial Applications

I. OPPORTUNITY-BASED GROWTH (See Chapters 2, 3, 4, and 8)

1. A firm that has no prospects for productive investments can be viewed as a “fundamental no-growth firm.”
2. With this definition, a no-growth firm will have the same intrinsic value today whether it pays out all its earnings or reinvests part or all of them at just the market rate.
3. Through reinvestments that only earn the market rate of return, a no-growth firm may actually grow its earnings and assets, but this growth will not add to its current intrinsic value.
4. When the earnings are defined as the distributable level of free-cashflow that can be indefinitely sustained, then a no-growth firm will have an intrinsic value that is just the ratio of these “earnings” divided by the appropriate risk-adjusted discount rate.
5. The P/E ratio of a no-growth firm will then be the reciprocal of the appropriate market rate for equities.
6. The return on new franchise investments may be significantly greater than the return on the legacy investments that comprise the current book value and generate the current level of earnings. Many standard DDMs implicitly require these two returns to be the same, while the FV approach explicitly allows them to be different.
7. For future investments to be additive to intrinsic value, they must provide a “franchise spread” (i.e., a return that exceeds the market-based cost of financing). With efficient global capital markets, financing can always be found for viable corporate projects that offer the promise of a positive franchise spread. Thus, it is the franchise *opportunity* rather than the required *capital* that becomes the scarce resource. The constraint on corporate growth then becomes the size and magnitude of future franchise projects, rather than the availability of capital through reinvestment or external funding.
8. The magnitude of investment opportunities (at a given average franchise spread) can be transformed into present value (PV) terms to gauge the size of opportunities for future franchise investment.
9. The incremental intrinsic value from a future investment can also be cast into the form of a PV of franchise value per PV of dollars that can be invested in such opportunities.
10. It is the combination of the effective franchise spread and the PV size of the opportunities that determines the total FV and the extent to which the firm’s theoretical P/E exceeds the base P/E of a no-growth firm.
11. For reasonable franchise spreads, it turns out that to obtain a high P/E ratio, very high levels of future franchise investments are required, typically several multiples in PV terms of the current book value.

II. GROWTH ILLUSIONS (See Chapters 2, 3, 4, 6, and 8)

1. In many standard DDMs, growth is typically assumed to proceed in a smooth compounding pattern, with the firm's variables—earnings, sales, assets, price, and so on—all having a *common* fixed growth rate over time. With the use of PV and its deconstruction of the sources of growth, the FV approach is able to break free of these artificial (but intuitively appealing) constraints. With FV, each of the stock's characteristic variables can follow its own differentiated growth path, tracing out virtually any pattern over time, no matter how erratic.
2. In the absence of surprise discoveries of new franchise opportunities, the firm's earnings growth together with the increase in its P/E ratio will approximately add to the growth in the stock price.
3. In the general FV framework, as the firm consumes its franchise opportunities and realizes the associated earnings, its earnings will grow at a faster rate than its price, leading to a *decline* in the P/E ratio.
4. In theory, the FV/TV ratio determines the extent by which the P/E ratio exceeds the base P/E. As the firm's earnings grow through realization of franchise opportunities, value is essentially taken from the future-based FV and embedded in the "current" TV. With a finite set of franchise opportunities, this process naturally forces the P/E ratio to decline over time (assuming the absence of countervailing factors such as the surprise discovery of new franchise opportunities).
5. Analysts should be careful of the various forms of the growth illusion. A high earnings growth rate may reflect a period of rapid consumption of the available franchise opportunities, only to be followed by a sudden deceleration in productive earnings growth. In particular, the temptation to extrapolate earnings growth, especially high rates of earnings growth, well into the future should be carefully reviewed in light of this potential illusion.
6. Apart from new franchise discoveries, the stock's P/E ratio will be subject to a gravitational pull toward the base P/E ratio. Thus, with the passage of time, the P/E ratio will trace out a prescribed "P/E orbit" from the current level to a sequence of a "forward P/E" values defined by the equilibrium assumption.
7. Given these typically descending P/E orbits, there is a serious danger in the all-too-common P/E myopia where analysts project earnings over some horizon period, and then estimate the future price by applying the *current* P/E ratio (rather than the more appropriate forward P/E value).

III. SUPERGROWTH AND SPREAD-DRIVEN GROWTH (See Chapter 8)

1. Firms, especially in their early years, can actually experience a form of superheated growth from capitalizing on extraordinary one-time opportunities. These periods of extraordinary sales and earnings growth are often characterized by outsized returns on equity. By their very nature, these bursts of supergrowth tend to be rather limited both in scope and duration. Nonetheless they can play a crucial role as a catalyst in the birth of new ventures and new firms, and for their rapid ascent to the critical mass needed to create an ongoing business.
2. The shorter-term supergrowth phase can be distinguished from the longer-lasting and more stable franchise opportunities associated with achieving some reasonable (and usually modest) spread over the cost of capital. In contrast to the “supernova” growth phase, these subsequent periods of spread-driven opportunities are likely to have more persistence on an ongoing basis.
3. While both of these growth formats reflect franchise opportunities, superheated early growth tends to be opportunity-driven in the sense that the venture is typically based on a unique product or service. As such, it is temporarily free of intense competition, and may be able to generate a burst of profitability. This profitability leads to a super-high return on equity (ROE) that is relatively insensitive to the cost of capital. In contrast, the spread-driven franchise opportunity tends to be derived more from some edge within a basically competitive environment. In spread-driven situations, the firm’s funding decision is often governed by hurdle rate cutoffs that are themselves directly related to the COC. As such, this more spread-based ROE tends to rise or fall with the market COC.
4. Obviously, in a multifaceted firm, both opportunity-driven and spread-driven franchise situations can be simultaneously present. However, the more typical situation is that the opportunity-driven situation dominates a firm’s early years, and these initially hot franchises subsequently deteriorate into a longer-lasting spread-driven phase.
5. In probing into the underlying assumptions of standard DDMs with two- or three-phase structures, one often finds what is basically an opportunity-driven first phase that subsequently migrates into one or more spread-driven phases.
6. The final phase in these multiperiod models typically calls for the firm’s growth to stabilize or to meld into the growth rate of the equity market as a whole. Because the investor is assumed to receive few benefits in the early phase as the firm reinvests most of its earnings, the later phases can have a surprisingly large impact on the firm’s current value.

Accordingly, it is important to really probe the nature of both the explicit and the implicit assumptions that underpin these final phases. In some cases, when viewed from the prism of the FV approach, the standard assumption can seem highly optimistic in the context of a long-term competitive environment.

IV. MARGIN EROSION WITHIN A COMPETITIVE ENVIRONMENT (See Chapters 2, 3, 5, and 7)

1. Franchise opportunities have an intrinsically fragile character, and a firm cannot hope to enjoy the same “franchise run” for an indefinite period. At some point, the patents expire, competition is mobilized, barriers to entry become porous, cheaper imitations are developed, innovation leads to improved or even radically different product models, distribution channels are penetrated, cost advantages are homogenized, pricing power erodes, the market becomes commoditized, or fashion simply shifts. For any product or service, there is always the looming presence of potential competitors who would be willing to enter the market in order to garner just a modest excess return. Even before they actually enter the fray, the threat of their potential entry can act to dampen pricing power and profitability from an existing franchise. And, needless to say, the more a given franchise is profitable and larger in scope, the more intense the competitive pressures that will surely come to bear.
2. In a competitive environment, a franchise is always an aberration, albeit a form of aberration that perhaps paradoxically seems to continually bubble up and become the driver of the more dynamic sectors in our economy. But it is definitely an aberration in the sense that it extracts a premium price and provides an *excess* return in a world where many efficient market forces exist that are determined to attack any premium pricing and squeeze all returns back to market levels. Just as it is important to understand the role of franchise opportunity and franchise realization in fueling productive growth, so it is also important to delve more deeply into the seeds of “creative destruction” that are borne out of the very notion of a franchise.
3. One route to franchise erosion is related to the replacement cost measure of Tobin (1969). The successful exploitation of franchise opportunities, almost by definition, leads to a high level of profitability supported by a modest capital base. As such, it embeds a high ROE even once it has stabilized and provides no further growth. In most cases, competition should be able to replace, at some ratio Q of the original firm’s embedded allocated capital, the resources needed to

produce a comparable version of the franchise product. Either as a reality or just as a threat, this Q -ratio will then determine the maximum profitability that the firm can maintain on a going-forward basis. Even when the initial franchise run has quite a long duration, Q -type competition can cause margin deterioration and thus have a significant adverse impact on the ultimate value of the franchise. (In one example, we show how Q -type competition, even after a 20-year franchise run, can drive a P/E ratio down from 22 to below 13.)

4. As noted earlier, many standard multiphase DDMs have a high-growth phase followed by a series of more stabilized phases. The assumptions underlying those stabilized phases often appear quite innocuous. However, when more deeply probed, it can be seen that they often presume a continuance of the high level of ROE profitability implicitly generated by the early high-growth period. In an environment where Q -type competition lurks, this seemingly innocent assumption of continued profitability may actually be highly optimistic, resulting in significantly overstated P/E ratios.
5. This franchise erosion, whereby a “franchise run” eventually converts into a “franchise slide,” can spread beyond individual companies, to economic sectors, geographic regions, or even entire economies (Ross 1995).
6. In a global economy with highly efficient communication and transportation systems, costs will become ever-more homogenized in many product- as well as some service-based sectors. With cost equalization and with serious potential competitors that must be presumed to have access to the same global pool of capital, the ultimate differentiating feature of a franchise will then be a firm’s pricing power and the extent to which the associated excess return can be sustained in a competitive environment. This argument points to the sales price as being the driving source of franchise value. It also points to the inevitable pressure on franchise pricing from current or potential competitors who would be happy to just earn a modest margin over their COC.
7. Proceeding along this line of argument, one can identify a key variable that relates pricing power to the FV. The franchise margin is the percentage of dollar sales that exceeds the threshold required to just earn back the COC on a net basis. Simply put, a firm with a high franchise margin has a good franchise position in a given product area, while a firm with a zero or negative franchise margin does not. By the nature of this definition, the magnitude of the FV depends on the sales and sales growth combined with the level of the firm’s franchise margin.
8. This sales-driven approach allows for another prism to deconstruct the firm’s growth and explore how such growth interacts with the

generation of FV. A useful classification of growth regimes can then be developed:

- a. A period of ongoing sales maintained at the current level with a stable franchise margin
 - b. A subsequent period of sales maintained at the current unit level but with various degrees of margin erosion
 - c. Incremental sales growth of current products with varying levels of franchise margin
 - d. Incremental new sales growth based on new products or markets that may have a different franchise margin (possibly derived from proprietary pricing together with different capital costs)
9. In a media-dependent mass market, the critical franchise edge may depend on highly visible luminaries and/or endorsers. In knowledge-based enterprises, the critical element may be an exceptional pool of technical talent. In financial institutions or companies with high levels of acquisition activity, a key ingredient may be a small well-networked coterie. And senior management is likely to be well regarded in any successful company, regardless of their actual role in creating or shepherding that success. These employees, whether appropriately or not, may be viewed as a precious resource that constitute an integral “franchise labor” component of the firm’s profitability. As such, they can exert a claim to exceptional levels of compensation and possibly to a direct equity participation as well. Beyond a certain point, these claims can drive a material wedge into the franchise return that is fully available to the firm’s outside shareholders.
10. Even when direct equity is not made available to this franchise labor pool, there is an implicit equity-like grant in the form of higher compensation during periods of franchise realization and the associated high levels of profitability. Under such circumstances, the franchise labor pool may in effect constitute a class of “supershareholders” whose claims have precedence over those of the traditional shareholder.
11. Moreover, these supershareholder claims may be even more advantageous in having an implicit option-like character, quite independent of whether explicit option grants are included in the compensation package. This optionality arises since periods of high returns engender high bonus levels while dry periods still require sufficient compensation to maintain the loyalty and focus of these key employees.
12. This supershareholder priority is further elevated by the standard approach of reporting returns prior to capital costs—at both the com-

pany and the project levels. It then becomes human nature for franchise labor to press these claims against the much larger gross returns rather than the net-after-COC returns that really constitute the source of franchise value. In such situations, one may be better off being viewed as a senior franchise employee than as an outside shareholder. The franchise value framework actually provides a basis for analyzing the P/E impact of where and how these franchise labor claims are levied.

13. As the saying goes, failure is an orphan but success has many fathers (not all of whom may currently be in the family). The intrinsic ambiguity of any business activity often means that, during times of great success, the ranks of presumptively key employees may far exceed the more limited set of those who legitimately played a significant role in making it all happen. Moreover, the adverse P/E impact may be further aggravated by the natural inclination, during periods of high success, to be more indiscriminately inclusive in defining the “team” that should be kept intact at virtually any cost.

V. LEVERAGE AND INTEREST RATE EFFECTS **(See Chapters 4, 8, 9, and 10)**

1. For a given corporation with a fixed overall capitalization, a move to a higher debt-to-equity ratio will have two immediate effects. First, the earnings will be reduced by the amount of the debt service (after the appropriate tax impact), and second, the equity base will be reduced by the debt claim on the total book of assets. These effects lower both the numerator and the denominator of the P/E ratio, so that it is not immediately clear what the net impact would be, either in magnitude or direction. In fact, it turns out that, depending on the specific firm’s characteristics, increasing leverage can move the P/E ratio *either* higher or lower. However, for the level of leverage typically encountered in nonfinancial firms (i.e., up to 50 to 60% of total capitalization), the P/E effect is quite modest, regardless of direction.
2. It is important to distinguish this very moderate bidirectional effect of leveraging a given company from the problem of an investor trying to evaluate a group of stocks that are similar apart from having varying degrees of leverage. From this market vantage point, comparable earnings and book values lead to roughly similar ROEs. However, for a given ROE, higher debt ratios imply lower returns on assets (ROAs). And since it is the ROA that basically determines a firm’s enterprise value, it turns out that higher debt ratios can justify

only *lower* P/E ratios. Thus, in contrast to the virtually negligible effect within the corporate finance framework described above, from this market viewpoint, increased leverage can have quite a significant dampening effect on the theoretical P/E ratio.

3. The interest rate sensitivity of equities (the so-called “equity duration”) has long been a subject of much confusion. The DDMs treat a stock as a bond with a continually growing stream of dividend payouts. With so much of the cash flows back-ended into the future, such models display a very high sensitivity to any change in the discount rate. However, in practice, stocks have tended to display a much more moderate sensitivity to changing interest rates. This discrepancy leads to what is sometimes called the “duration paradox”: Why should the equity market evidence such a low (and relatively unstable) duration when standard models suggest they should have a very high sensitivity to discount rates? The FV framework suggests several ways to resolve this paradox.
4. The first approach to the duration paradox is based on the role of inflation. Suppose a firm could immediately raise prices in response to an inflationary increase in its costs and in its discount rates. Such a firm would act as a pure inflation conduit, and changes in inflation would have no net effect on its intrinsic value or its P/E ratio. To the extent that interest rate shifts are determined solely by changes in inflation, this hypothetical stock would have a zero duration! However, in reality, business typically responds to inflationary shifts in a much more complex way and usually with significant lags. There is also a major difference in how the different components of firm value are likely to respond to changes in inflation levels. Future projects have greater pricing flexibility and adaptability than existing activities with their more rigid embedded price structure. Thus, the FV should be more inflation resistant than the TV. Since the total firm value is made up of both the FV and the TV, the sensitivity to inflation-driven interest rate changes will depend on the relative size of these two components. High P/E growth stocks with high FV/TV ratio should be relatively insensitive to inflation effects, while one should see greater sensitivity in low P/E value stocks with their lower FV/TV ratios. Taken together, this FV-based analysis provides a reasonable explanation for the far more modest duration effects that are actually seen in practice as contrasted with the superhigh durations implied by some of the standard DDMs.
5. In a common form of the standard DDM, the P/E ratio has, as the denominator, the difference between the COC and the earnings growth rate. It is typically assumed that the growth rate is indepen-

- dent of the COC. Thus, as the COC decreases, from lower interest rate and/or from lower risk premiums, the COC moves closer to the growth rate, the denominator shrinks, resulting in sharply rising P/Es. Indeed, one periodically sees heroic forecasts of stellar P/Es (such as the Dow at 36,000), based on projections of a secular decline in the risk premium of equities. However, in the FV framework, the only growth that can affect a stock's price is that which is associated with a positive franchise spread. Any investment without such a positive spread may well grow the *future* book assets (and hence the future price), but it will not add to the firm's *current* value or price. It can therefore be argued that valuation models should only incorporate growth that reflects such positive-spread investment opportunities. With this approach, lower COCs will also reduce the rate of value-added growth. The theoretical P/E response to lower COCs will then be much more moderate than under the standard assumption of a fixed growth rate.
6. Indeed, without any need to assume an inflation flow-through effect, the equity duration in this spread-based growth model can be shown to just equal the P/E ratio itself! While not as low as the duration value derived from inflation flow-through (or seen empirically), these spread-based duration values can be up to 50 percent lower than the durations associated with the standard DDMs. One can further assume that the franchise spread itself is related to the magnitude of the COC. With this not-unreasonable assumption, the effective duration becomes even lower.
 7. This focus on growth associated with a positive franchise spread leads to a strikingly simpler two-parameter form of the basic three-parameter DDM. In the basic DDM, the three basic parameters are the "gross" growth rate, the dividend payout ratio, and the discount rate. With the reasonable assumption that a firm invests only with the expectation of a positive franchise spread, it turns out that the standard "gross" growth rate can be transformed in a "net growth rate" that reflects the economic value added in each period. The standard DDM can then be expressed in a more compact form that makes use of only the discount rate together with this net growth rate. This simple two-parameter format is far more illuminating of the ultimate sources of firm value.
 8. The fixed growth rate in the standard DDM also suggests that higher dividend payouts should lead to higher P/E ratios and higher ROEs. With a constant COC, these higher ROEs mean that the franchise spread should also be higher. However, such conclusions are rather hard for most analysts to accept. To the contrary, high dividend pay-

outs would generally be viewed as an indication of fewer opportunities for productive reinvestment. Most analysts would therefore expect to see these high payouts lead to *lower* P/E ratios, rather than the higher ones predicted by the standard DDMs. This unpalatable result can be corrected by embracing the concepts of a prescribed franchise spread and spread-based growth. A high payout ratio then implies, as it should, reduced opportunities for productive investment, and hence a *lower* P/E ratio. Thus, the concept of a fixed franchise spread and spread-based growth leads to a more reasonable relationship between the P/E and the payout behavior.

VI. GENERALIZATION TO OTHER FINANCIAL APPLICATIONS (See Chapter 11)

Chapter 11 represents an attempt to show that the same decomposition used in the franchise value can be generalized to model a number of financial situations. The subject of this chapter is a defined contribution (DC) retirement plan. The investor specifies his or her objective as achieving a retirement annuity that pays a prescribed percentage of his or her final salary. The objective is to find the current asset/salary ratio required to keep the plan on track, given values for salary growth, investment returns, and the savings rate. The asset/salary ratio has a certain similarity to a P/E ratio. However, the real analogy lies in the problem's structure of having (1) a *current pool* of earning assets (the current savings), (2) a source of *future growth* (in this case, the prospective salary growth), (3) a procedure that specifies the investment opportunities derived from this growth (the fraction of future salary that can be saved), and (4) an investment return that can be applied to these future investments. The retirement phase of the payout annuity roughly corresponds to two-phase equity models where the last phase represents a drawdown of the accumulated value. However, in the DC plan, it is the total PV needed to fulfill the retirement objective and the PV of future investments that are estimated first. The required level of current assets then serves as the balancing component. When this required level of current assets is expressed as ratio to the current salary, it turns out that the salary drops out of the formula. In other words, for individuals with the same assumptions regarding salary growth, investment return, savings fraction, and the time to retirement, the identical asset/salary ratio is required to keep them on track, regardless of what their current salary or current asset level may actually be.

FORMULATION OF THE BASIC MODEL

In this section, we will describe how the basic FV formula is developed by making extensive use of present value constructs and building on the foundation of the DDM.

We begin by defining the *tangible value (TV)* to be the economic book value associated with the earnings stream that can be derived from the current business *without* the addition of further capital. A valuable simplification is obtained by using a fixed annual payment E to create a figurative annuity that has the same present value (PV) as the literal earnings stream. If k is the appropriated risk-adjusted discount rate (usually taken as equivalent to the COC—the cost of equity capital), then

$$TV = \frac{E}{k}$$

Moreover, if B is the book value, then the earnings E can be expressed as a return on this book value,

$$E = rB$$

so that

$$TV = \frac{rB}{k}$$

With the value derived from all current business embedded in the TV, we can now turn to future prospects as the remaining source of firm value.

There appears to be an almost congenital human need to view all growth as a smooth, consistent, and readily extrapolatable process. This compulsion may be rooted in the understandable desire for order and predictability in confronting future developments that are intrinsically uncertain. However, this forced smoothing of growth prospects can lead to a number of fundamental errors.

In actuality, new projects deliver a sequence of returns over time, consisting of investment inflows in the early years followed by a subsequent pattern of positive returns. A simple fixed franchise spread is far too simplistic to capture such a complex return pattern over time. However, in most cases, the project's present value contribution can be prox-

ied by an appropriately chosen fixed return R per dollar invested that is received year after year in perpetuity. The project's net return pattern can thus be rendered equivalent (in PV terms) to a level annuity based on the dollar amount invested at a fixed spread ($R - k$) over the COC k . Piling these heroic assumptions one upon another, *all* of a firm's franchise projects can be compressed into an "average" annual spread per dollar of funding that reaches from the current time into perpetuity. (Actually, this hierarchy of assumptions is not that far afield from the common corporate practice of requiring new projects to provide some "hurdle rate" above the COC.)

With this perpetual spread model as a gauge of value-added return, the next step is to size the totality of the firm's franchise projects (i.e., to determine how many dollars could be invested at the given franchise spread). In the standard DDM, a growth rate is chosen, and the size and timing of future projects are implicitly set by the level of earnings available for reinvestment. We sought to move beyond this standard approach for several reasons, starting with our desire not to be constrained by the smooth-growth hypothesis. Another compelling rationale is the emergence of modern information systems and global capital markets. Carried to an (admittedly theoretical) extreme, an efficient financial market should be able to provide capital to any worthwhile project—any project that enjoys a positive franchise spread. Thus, in this hypothetical limit, it would be the *opportunities* for franchise investment that would be the scarce resource, rather than the *capital* required to fund them.

These growth opportunities might arise in some irregular fashion over the course of time. However, a project's size may be normalized by computing the PV of the total dollar amount that could be invested over time in each such opportunity. The sum of these PVs could then be viewed as equivalent to a single dollar amount that, if invested *today*, would act as a surrogate for all such future opportunities. This concept of the PV of all future growth prospects has the virtue of considerable generality. No longer are we restricted to smooth compounded growth at some fixed rate. Virtually any pattern of future opportunities—no matter how erratic—could be modeled through this PV equivalence.

The PV of all growth opportunities will generally sum to a massive dollar value. To make this term intuitive—and estimable—it seemed reasonable to represent it as some multiple G of the current book value (B), that is, PV of investable opportunities = $G \times B$.

At this point, we have a PV of future investable dollars in terms of an equivalent single investment *today*. At the same time, we found that a pattern of franchise returns over time could be represented by an annual fran-

chise spread of $(R - k)$ per dollar invested. Consequently, the product of this franchise spread and the PV of investable opportunities corresponds to an annual dollar return—above the COC—that could be earned in perpetuity from the full panoply of the firm’s positive growth prospects. Thus, the firm’s added value from its growth prospects, the FV, takes on the form of a perpetual stream of “net-net” profits with annual payments, $(R - k)(G \times B)$.

We now basically have the firm’s theoretical value expressed in terms of two level annuities—a current earnings stream E for the TV and a flow of net-net profits from new projects for the FV. But the PV of a level dollar annuity is perhaps the most basic equation in finance: One simply divides the annual payment by the discount rate k (i.e., the COC). For the TV, we have earlier found

$$\text{TV} = \frac{E}{k}$$

and now for the FV,

$$\text{FV} = \left(\frac{1}{k} \right) (R - k)(G \times B)$$

When the FV is added to the TV, we obtain a theoretical valuation P for the firm’s current business and all its foreseeable future value-additive projects,

$$\begin{aligned} P &= \text{TV} + \text{FV} \\ &= \frac{E}{k} + \left(\frac{1}{k} \right) (R - k)(G \times B) \end{aligned}$$

From the very beginning, our intent was to use this valuation result as the numerator in a P/E ratio, with the current economic earnings as the denominator. But recall that the firm’s earnings E can be represented as the product $(r \times B)$ of the book value B and the current return on equity r . At this point, we have the serendipitous result that dividing by the earnings leads to an even simpler formulation for the FV,

$$\begin{aligned}
 \frac{FV}{E} &= \frac{(G \times B)}{E} \left(\frac{R - k}{k} \right) \\
 &= \left(\frac{G \times B}{r \times B} \right) \left(\frac{R - k}{k} \right) \\
 &= \left(\frac{R - k}{rk} \right) G \\
 &= FF \times G
 \end{aligned}$$

where $FF = \frac{R - k}{rk}$, a compact expression that we came to call the “franchise factor.”

The FV model thus became very easily stated, especially in (P/E) terms,

$$\begin{aligned}
 P/E &= \frac{TV}{E} + \frac{FV}{E} \\
 &= \frac{1}{k} + FF \times G
 \end{aligned}$$

This development may look straightforward (and even perhaps rather obvious), but the actual route traveled was quite torturous, with many false starts and blind alleys. When Stan and I finally stumbled (quite the appropriate word) on this expression, it was definitely a *eureka* moment that neither of us are likely to forget. It was during a Sunday phone conversation, and we suddenly realized that with this definition of the franchise factor FF we had a very general and elegant expression for the theoretical P/E ratio.

Little did we realize the extent to which we had opened the door to myriad further questions about equity valuation. Some of those other issues were later addressed by Stan and/or myself, sometimes in conjunction with other colleagues.

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Sales-Driven Franchise Value

This chapter is based on a monograph published in 1997 by the Research Foundation of the Institute of Chartered Financial Analysts. It has been placed out of chronological sequence because it provides a very compact description of the initial earnings-based approach to franchise value. It then proceeds to a more comprehensive framework by extending the FV concept to a sales-based approach. This broader sales-based framework has significant advantages for comparative analysis, especially in cross-border comparisons. The following chapter, Chapter 3, published in 1997 in the Financial Analysts Journal, serves as a comparison piece focusing on a more graphic characterization of various combinations of sales growth and margin compression.

In a series of earlier papers, published together in 1994, Leibowitz and Kogelman developed a *franchise value* (FV) approach for estimating the intrinsic value of a firm's equity. Although derived from the standard formulations of the dividend discount model (Williams 1938; Miller and Modigliani 1961; Gordon 1962), the FV approach has the powerful advantage of being a more general (as well as more intuitive) formulation. This greater generality is helpful in adopting the FV model to today's global capital markets, where capital availability is often *not* the scarce resource (Bernstein 1956; Solnik 1996). Moreover, the FV model's focus on the price/earnings ratio (P/E) allows exploration of many facets of this key market variable—a variable that is widely used in practice but all too little studied from an analytical viewpoint. Even though the original FV devel-

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opment was based on the traditional earnings construct, it is an easy transformation to express the FV model in terms of net operating income, free cash flow, or other measures of economic value (Stewart 1991; Copeland, Koller, and Murrin 1994; Peterson and Peterson 1996). Because the earlier papers and much of current practice still follows the traditional earnings mode of analysis, this terminology will be retained here for purposes of consistency.

In this chapter, the purpose is to migrate from the return-on-investments FV model that formed the basis for the earlier work to a formulation that is based on the opportunity to generate sales—that is, a *sales-driven franchise value*. Although sales and investments are two sides of the same coin, it is a fairly major mental shift to view the opportunity for generating productive sales as the precursor and the ultimate motivation for investment (Rappaport 1986). This sales-driven context is especially productive in valuing multinational corporations. These firms have the size and reach to site production facilities anywhere in the world, resulting in a strong trend toward convergence in production efficiency. Increasingly, such megafirms are distinguished not by their production costs but by their distinctive approaches to specific markets. In other words, they create shareholder value through their sales-driven franchise.

The sales-driven FV model “looks through” the earnings to the more fundamental considerations of sales generated and net margins obtained. A key feature of the investment-driven FV approach is that it distinguishes between the current business and its future opportunities. In the sales-driven context, the net margin on the current level of sales is differentiated from the margin on new sales growth. This differentiation leads directly to the introduction of a simple, but powerful, concept—the franchise margin—to incorporate the capital costs required to generate these new sales.

The franchise margin has a number of important intuitive interpretations. First of all, it can be viewed as the present value added per dollar of annual sales. A second interpretation is that the franchise margin represents the excess profit that the company is able to extract from a given dollar of sales above and beyond that available to any well-financed, well-organized competitor who would be content to simply cover the cost of capital. This second interpretation can be especially relevant for a global market, where competitors with these characteristics are looming in the wings and would be able to field their products should any opportunity present itself. Moreover, in markets where cost-of-production efficiencies do not create any persistent benefits, the majority of the franchise margin will be derived from the company’s ability to extract a better price per unit of sales. In such circumstances, the franchise margin becomes a good proxy for the *pricing power* of the firm’s product in a given market. In this sense, the franchise margin truly represents the special value of a brand, a patent,

a unique image, a protected distribution system, or some form of intellectual property that enables a company to extract an excess profit in a particular market (Treyner 1994; Smith and Parr 1994; Romer 1994).

One of the virtues of the sales-driven approach is that it shines a much brighter light on the fragility of a product franchise. In today's competitive environment, few products can count on long "franchise runs" with fully sustained profitability. At some point, the tariff barrier erodes, the patent expires, the distribution channel is penetrated, the competition is mobilized, or the fashions simply shift. Over time, virtually all products become vulnerable to commodity pricing by competitors who would be quite happy to earn only a marginal excess return. Even without direct visible competition, a firm may have to lower its pricing (and hence its margin) to blunt the implicit threat from phantom competitors (Statman 1984; Reilly 1997; Fisher 1996).

One way or another, the franchise runs out. When this occurs, sales may still continue to grow, but the margins earned must surely fall. Taken to the extreme, this margin compression will ultimately drive the franchise margin toward zero. And without a franchise margin, subsequent sales growth fails to add net present value and hence can have no further impact on the firm's valuation or its P/E. This effect can be surprisingly large—even for a highly robust franchise that lasts for many years. For instance, one example in this chapter shows how the prospective termination of a valuable franchise 20 years hence can pull a firm's current P/E from a lofty 22 down to less than 13. History has shown that franchise erosion of one form or another can spread beyond individual firms, sometimes with devastating effect on entire economic regions and their financial markets (Brown, Goetzmann, and Ross 1995). These fundamental issues of franchise limitations are much more clearly visible in a sales context than in the standard investment-based formulations with their emphasis on return on equity (ROE) estimation.

Another point of departure from Leibowitz and Kogelman is the focus on the price/sales ratio (P/S) as a particularly useful yardstick. As might be expected, the sales-driven orientation leads naturally to a greater role for the more "accounting neutral" P/S (Damodaran 1994; Fisher 1984; Barbee 1996). Moreover, P/S can sometimes supply better insights than P/E because of its more explicit treatment of any franchises embedded in the current business. Such franchises can have important implications for valuation and risk assessment, and they can also lead to a variety of paradoxical results. In a later section, an example is presented where an *improvement* in the current margin can *lower* a firm's P/E but at the same time *raise* its P/S. Thus, for a broad range of corporate situations, a variety of analytical and intuitional advantages favor the sales-driven approach relative to standard valuation methods and relative to the original

investment-driven FV model. Figure 2.1 provides a summarized listing of these advantages.

With the sales-driven FV model, a firm’s value depends on its ability (1) to sustain the pricing power required to achieve positive franchise margins on a significant portion of its sales and (2) to access new markets that can support a high level of sales growth. Thus, the sales-driven model emphasizes a corporation’s ability to maintain an existing franchise, to create a new market for itself, or to successfully invade an established market. This competitive advantage in unearthing and attacking sizable markets distinguishes the highly valued firm that should trade at a high price/sales ratio (or a high

FIGURE 2.1 Summary of Features of Sales-Driven Franchise Model

Retains Benefits of Investment-Driven FV Model
Better Fit for Multinational Companies Facing Global Equilibrium of Production Costs
Sales/Margin Parameters More Intuitive and More Directly Estimable than ROEs
Places Market Opportunities as Central Driver of Investment and Value Creation
Relates New Market Opportunities to Existing Sales Level
Underscores Role of Pricing Power
Segregates Product Margins from Magnitude of Product Market
Clearly Distinguishes between Sales Growth and Value Creation
Relates Sales Turnover and Capital Costs to Franchise Opportunity
Explicitly Accommodates Competitive Pressures on Future Margins
Clarifies the End Game Scenarios Associated with the Termination of a “Franchise Run”
Accommodates Phenomenon of Super-ROEs from Rapid Leveraging of Prior Investments into New Product Markets

price/earnings ratio). In a world with ample capital, with great fungibility of that capital, and with financial markets that can bring capital quickly to bear wherever excess returns are available, it is no longer the capital, the retention of earnings, or the financial strength per se that is the key ingredient of success. These are not the scarce resources in this new regime. The scarce resource is that special edge that enables a firm to extract franchise pricing for a product that is broadly demanded.

One word of caution is appropriate at the outset. In the application of any equity valuation model, the analyst comes to a crossroads where a fundamental decision must be made. Even a properly estimated valuation model can quantify only the current business activity and the more *visible* prospects for the future. In theory, all such visible and/or probable opportunities can be incorporated in the valuation process. But any such analytical approach will fall short of capturing the full value represented by a dynamic, growing multinational corporation. Many facets of a vibrant organization—the proven ability to aggressively take advantage of previously unforeseen (and unforeseeable) opportunities, a determination to jettison or restructure deteriorating lines of business, a corporate culture that fosters productive innovation, and so forth—are difficult to fit into the confines of any precise model. At some point, the analyst must draw the line and define certain franchise opportunities as estimable and visible and relegate the remaining “hyperfranchise” possibilities to the realm of speculation and/or faith. To paraphrase Bernstein (1996), analyzing a firm’s future is akin to assessing the value of a continually unfinished game in which the rules themselves drift on a tide of uncertainty. The purpose of this observation is to caution the analyst that the results of any equity valuation model should be viewed only as a first step in a truly comprehensive assessment of firm value. At the very most, the modeled result should be taken as delineating the region beyond which the analyst must rely on imagination and intuition.

FINDINGS FROM THE FRANCHISE-VALUE APPROACH

Before turning to the development of the sales-driven formulation, recounting the basic findings from Leibowitz and Kogelman will be helpful. The FV approach provides a flexible approach to understanding how corporate and economic events affect the different components of firm value. Building on this foundation, we were able to develop new avenues of analysis for several important investment issues: reinvestment policy, capital structure, taxes, accounting practices, inflation, and equity duration.

These analyses led to the following observations, some rather surprising, about the determinants of the price/earnings ratio:

- A no-growth firm will have a low base P/E that is simply the reciprocal of the equity capitalization rate appropriate to the firm's risk class.
- The return from new investments should be differentiated from the current ROE—that is, new investments may have a different (and generally higher) ROE than the existing book of business. This differentiation is crucial because most firms have wide flexibility in their choice of new projects and can thus achieve future returns well in excess of their current ROEs.
- High P/Es result only when growth comes from new projects that provide sustainable above-market returns. Growth per se is not viewed as evidence of highly profitable investments. Only franchise growth contributes to shareholder value.
- In contrast to the standard models that assume a smooth and constant rate of growth, in the FV model, earnings growth can follow any pattern over time—no matter how erratic. The dynamic character of the modern business scene is grossly inconsistent with the notion of smooth growth. In particular, the path of franchise growth—the only kind that counts—is continually beset by competitive forces and hence is virtually never smooth.
- In the FV approach, productive new opportunities are assumed to be the scarce resource, rather than the available financing levels derived from retained earnings. Indeed, the level of retained earnings may have little to do with the excess profit potential of new investments. If good projects are not available, earnings retention cannot create them.
- The P/E impact of new investments depends on the size of those investments relative to current book equity. Consequently, enormous dollar investments may be necessary to significantly affect the P/E of large companies.
- One particularly surprising finding is the effect of leverage. It turns out that increased leverage does *not* have a well-defined directional effect on the P/E. Higher leverage can drive the P/E up in some cases, or down in other situations. The key determinant of the P/E's directional sensitivity is the firm's preleverage P/E.
- High P/Es have an intrinsically fragile character. When franchise investment opportunities are limited in scope and timing, the P/E will decline toward the base P/E. To maintain a high P/E, a firm must continue to uncover new and previously unforeseen investment opportunities of ever-greater magnitude.
- Although it is commonly believed that price growth always matches earnings growth, this equality holds only under very special conditions.

In general, as the firm “consumes” its franchise opportunities, the resulting P/E decline creates a gap between price growth and earnings growth. (The magnitude of this gap can be approximated by the rate of P/E decline.) Thus, one can have situations in which earnings continue to grow at a brisk pace but the price growth lags far behind—or even declines.

- The ability to pass along changing levels of inflation, even partially, can dramatically enhance a firm’s P/E. A firm’s future investments are likely to be far more adaptive to unexpected inflation than are its existing businesses. Consequently, when the value of a firm’s equity is derived primarily from prospective businesses, its interest rate sensitivity (equity duration) is likely to be low. Thus, the FV approach helps explain why equities have much lower observed durations than the high levels suggested by the standard dividend discount model (DDM).

For the detailed analyses that led to the preceding results, the reader is referred to Leibowitz and Kogelman.

THE DIVIDEND DISCOUNT MODEL

In order to proceed with the main subject of this paper, it is necessary to first review the basic terminology and formulation of the standard DDM and the original investment-driven FV model. The standard DDM assumes that a firm’s value is derived from a stream of dividends that grow—forever, in the simplest version—at a compound annual rate, g . Thus, for a discount rate, k , and a starting dividend, D (received one year hence), the firm’s intrinsic value, P , can be written as

$$\begin{aligned}
 P &= \sum_{t=1}^{\infty} \frac{D(1+g)^{t-1}}{(1+k)^t} \\
 &= \frac{D}{k-g}
 \end{aligned}$$

To relate this result to the current earnings, E , a retention ratio, b , is prescribed, so that $(1 - b)$ becomes the payout ratio, and the preceding equation then becomes

$$P = \frac{(1-b)E}{k-g}$$

and

$$P/E = \frac{1-b}{k-g}$$

When the further assumption is made that b remains fixed, then earnings and dividends must both grow at the same rate, g . Finally, with a constant ROE of r , this earnings growth is fueled by the earnings retention in each period:

$$\Delta E = r(b \times E)$$

or

$$\begin{aligned} g &= \frac{\Delta E}{E} \\ &= rb \end{aligned}$$

Example 2.1 illustrates how the basic DDM leads to a P/E of 13.89 for a firm that (1) has an ROE, r , equal to 18 percent on all current *and* future investments and (2) retains 44 percent of its earnings to finance its 8 percent annual growth rate. In this example, and throughout the chapter, the discount rate, k , is set at 12 percent. At first impression, this P/E of 13.89 appears rather low for such a high ROE. In point of fact, it is the high required retention rate of 44 percent that suppresses the P/E. To obtain a higher P/E, suppose that exactly the same growth rate of 8 percent could be sustained with a lower earnings retention—say 30 percent. Example 2.2 shows that this assumption does indeed result in a somewhat higher P/E of 17.59, but it also implies a disproportionately greater ROE value of r equal to 27 percent. This example may appear somewhat counterintuitive because higher ROEs are typically associated with higher retention rates and hence higher growth rates. By keeping the growth fixed at 8 percent, however, one makes the tacit assumption that a definite limit exists to the opportunities for high ROE reinvestment.

These results derive from the intrinsic nature of the DDM. The simplicity of the basic DDM rests on the assumption of constant annual growth that is “self-financed” by a constant fraction of earnings retention. In turn, this assumption implies that a single ROE applies to both the existing book of business and to future investments. In moving to the investment-driven FV model, both of these conditions can be relaxed.

EXAMPLE 2.1 Infinite Dividend Growth

Specifications	Standard DDM	Calculation
Infinite growth at compound rate $g = 8\%$, discounted by capital cost $k = 12\%$. Retention, b , is implicitly related to growth, g , and ROE $r = 18\%$, so that	$P/E = \frac{1-b}{k-g}$	$P/E = \frac{1-0.4444}{0.12-0.08} = 13.89$
	where	
	b = retention fraction on earnings	
	$(1-b)$ = fixed dividend payout	
	k = cost of capital (discount rate)	
	g = annual growth rate for dividends	
$b = \frac{g}{r}$ $= \frac{0.08}{0.18}$ $= 44.44\%$		
Dividends are determined after retaining the fraction $b = 44.44\%$ of earnings to finance growth.		

EXAMPLE 2.2 Same Dividend Growth as Example 2.1 but at a Higher ROE

Specifications	Standard DDM	Calculation
With ROE, r , set higher at 27%, the exact same $g = 8\%$ growth can be achieved simultaneously with lower retention,	$P/E = \frac{1-b}{k-g}$	$P/E = \frac{1-0.2963}{0.12-0.08} = 17.59$
$b = \frac{g}{r}$ $= \frac{0.08}{0.27}$ $= 29.63\%$		
and hence with higher dividends and higher P/E.		

THE BASIC FRANCHISE-VALUE MODEL

In its simplest form, the franchise-value model decomposes the intrinsic value, P , into two present value terms: (1) a tangible value (TV) derived from existing investments and (2) a FV associated with new investments, so that

$$P = TV + FV$$

If E is the normalized earnings flow (i.e., the “perpetual equivalent”) from the current book of business, and k is the discount rate, then

$$TV = \frac{E}{k}$$

These earnings can be further factored into a product of the current (normalized) ROE, r , and the book value per share, B :

$$E = rB$$

The second term, the franchise value, reflects the present value of all excess returns on future investments, with “excess” meaning the return above and beyond the cost of the required added capital. In other words, the FV term is simply the sum of the net present values of future projects. Under a wide range of conditions, this term can also be resolved into two factors. The first factor is the magnitude of new investments in present value terms, and the second factor reflects the average productivity of these new investments. To obtain the most basic representation, suppose each new investment dollar produces a stream of new earnings, R . To find the excess return, the annual cost, k , of each capital dollar must be deducted. Thus, the net stream of excess earnings available for today’s shareholder (after compensating the provider of the new capital) will be

$$R - k$$

and this stream will have a present value of

$$\frac{R - k}{k}$$

The FV term thus becomes the product of the present value generated per new dollar invested multiplied by the present value (PV) of all such new investments:

$$FV = \left(\frac{R - k}{k} \right) PV_{\text{New investments}}$$

With this present value formulation, one can move away from the simple growth models of the DDM and allow the investment process to follow virtually any pattern over time. A related point of departure is that the FV model allows for external and/or internal financing—that is, there is no requirement for self-financing limited by earnings retention.

To provide a more intuitive footing, a growth factor, G , can be defined that scales the new investments to the current book value:

$$G \equiv \frac{PV_{\text{New investments}}}{B}$$

so that

$$FV = \left(\frac{R - k}{k} \right) GB$$

Therefore, the basic version of the FV model can now be written as

$$\begin{aligned} P &= TV + FV \\ &= \frac{E}{k} + \left(\frac{R - k}{k} \right) GB \end{aligned}$$

or

$$P = \frac{rB}{k} + \left(\frac{R - k}{k} \right) GB$$

where r and R represent returns on equity for the current and the new businesses, respectively.

In P/E terms, after division of the price by $E = rB$, the FV model becomes

$$P/E = \frac{1}{k} + \left(\frac{R - k}{rk} \right) G$$

In Leibowitz and Kogelman, we found it convenient to define a franchise factor (FF):

$$\text{FF} \equiv \left(\frac{R - k}{rk} \right)$$

so that the P/E result took on the extraordinarily simple form

$$\text{P/E} = \frac{1}{k} + (\text{FF} \times G)$$

Thus, a firm's P/E is composed of a basic term—the reciprocal of the discount rate, which applies to all companies in the same risk class—and a second term that depends solely on the firm's ability to generate *productive* future growth.

As a simple example of the FV model, first consider the firm in Example 2.2 that turned out to have a P/E of 17.59 under the DDM. For the FV model in that case,

$$\begin{aligned} R &= r \\ &= 27\% \end{aligned}$$

so that the franchise factor becomes

$$\begin{aligned} \text{FF} &= \frac{0.27 - 0.12}{(0.27)(0.12)} \\ &= 4.63 \end{aligned}$$

Moreover, for a set of investment opportunities that grow at an 8 percent rate, the growth factor, G , can be shown to correspond to

$$\begin{aligned} G &= \frac{g}{k - g} \\ &= \frac{0.08}{0.12 - 0.08} \\ &= 2.00 \end{aligned}$$

(This value, $G = 2$, also corresponds to an infinite variety of other future investment patterns that share the same present value when discounted at 12 percent. For example, a $G = 2$ also results from a 17.72 percent growth rate maintained for 10 years.) As shown in Example 2.3, when the FV model is applied to these values, we obtain the same P/E, 17.59, that was given by the DDM in Example 2.2. It is comforting to see that the FV

model and the DDM always coincide when the firm specifications are the same.

In Example 2.4, the FV model’s flexibility is used to specify two distinct ROEs—18 percent on the current book and 27 percent on prospective investments. Given that Example 2.4 has a lower ROE on its current in-

EXAMPLE 2.3 The Franchise-Value Model: Treating the DDM as a Special Case

Specifications	Investment-Driven FV Model	Calculation
<p>The FV model segregates the P/E contribution into two terms: (1) the contribution from the current business,</p> $\frac{1}{k} = \frac{1}{0.12}$ $= 8.33$ <p>and (2) the add-on from the franchise value associated with prospective new investments.</p> <p>This second FV term (FF × G) is itself of two composed factors that can be usefully separated: (1) a franchise factor (FF) depicting the P/E contribution from excess ROE on each dollar of new investments and (2) a growth factor, G, that relates the present value of new investment opportunities to the current book value.</p>	$P/E = \frac{1}{k} + (FF \times G)$ $FF = \frac{R - k}{rk}$ <p>where</p> <p>r = ROE on current book</p> <p>R = ROE on new investments</p> <p>G = present value of all prospective new investments with the ROE value of R depicted as a ratio to the current book value</p> <p>For this example, both ROEs are set to coincide with Example 2,</p> $r = R$ $= 27\%$ <p>For the special case of infinite growth at a rate g,</p> $G = \frac{g}{k - g}$	$FF = \frac{0.27 - 0.12}{(0.27)(0.12)}$ $= 4.63$ $G = \frac{0.08}{0.12 - 0.08}$ $= 2.00$ <p>(Note that this implies that the PV magnitude of growth opportunities is “immediately equivalent” to twice the current book value.)</p> $P/E = \frac{1}{0.12} + (4.63 \times 2.00)$ $= 8.33 + 9.26$ $= 17.59$ <p>Thus, when the FV model is applied to the preceding numerical example, the resulting P/E coincides with that given by the DDM.</p>

EXAMPLE 2.4 Higher P/E from Differentiating between ROEs on New versus Old Investments

Specifications	Investment-Driven FV Model	Calculations
One advantage of the FV model is that the two ROEs are naturally segregated. In this example, ROE on new business is kept at $R = 27\%$, but the ROE on the current business is lowered to $r = 18\%$. This reduction in r actually leads to a higher P/E. This result follows from the P/E contribution $1/k$ of the current business being independent of r .	$P/E = \frac{1}{k} + (FF \times G)$ $FF = \frac{R - k}{rk}$	<p>Same as Example 2.3 in all respects except r is reduced from 27% to 18%.</p> $FF = \frac{0.27 - 0.12}{(0.18)(0.12)}$ $= 6.944$ $G = 2.00$ $P/E = \frac{1}{0.12} + (6.944 \times 2.00)$ $= 8.33 + 13.89$ $= 22.22$

vestment, it may, at first, seem somewhat paradoxical that the resulting P/E, 22.22, is significantly higher than in the two preceding examples where both ROEs equaled 27 percent. In point of fact, as discussed earlier, the lower book ROE of r has no impact on the first term while it augments the P/E contribution of future investments because it falls in the denominator of the franchise factor,

$$FF = \frac{R - k}{rk}$$

In general, a lower ROE in the current business, all else being equal, will always augment the overall P/E.

THE SALES-DRIVEN FRANCHISE MODEL

A franchise opportunity may be derived from a well-defined ROE obtained through regulatory fiat or through the purchase of financial market

investments. In such cases, the estimate of ROE is the critical variable, and the investment-driven FV model would be the most appropriate approach. In many other situations, however, the impetus for new strategic initiatives arises from the prospect of an exceptional sales opportunity. If these opportunities truly add economic value, then the capital investment involved in their pursuit should naturally lead to a correspondingly high ROE. But because the sales potential itself is the fundamental source of these corporate initiatives, using a sales-driven framework is generally more natural for estimating their impact on the firm's profitability, growth, and economic value.

In moving to a FV model based on sales, earnings are viewed as being the result of a given level of sales activity and a net margin that relates each dollar of sales to a dollar of earnings. For the current book of business, the annual sales, S , now becomes analogous to the normalized earnings stream, E . With a net margin of m ,

$$E = mS$$

and the tangible value of the current business can be directly written as

$$\begin{aligned} \text{TV} &= \frac{E}{k} \\ &= \frac{mS}{k} \end{aligned}$$

To provide an intuition regarding the magnitude of the net margin, m , Figure 2.2 plots the average net margin for the 30 stocks in the Dow Jones Industrial Average (DJIA) during the 1992–96 period.

The franchise-value term can be transformed in a similar fashion. Suppose the firm's future products and market developments are expected to lead to a certain volume of new sales in the future—above and beyond the current annual level, S . For simplicity, all of these new sales can be characterized as being equivalent (in present value terms) to an incremental annual rate, S' . Then, S'/k will correspond to the present value of all new sales. If each dollar of new sales earns a net margin, m' , then $m'S'$ will be the equivalent annual earnings associated with this new sales activity. But even in this sales-driven context, one must recognize that incremental sales require incremental investments in the form of capital expenditures and increased working capital. The need to pay for the additional capital detracts from the value of the new sales for today's shareholders. Assuming that a certain fraction, c' , of each dollar of new sales must be set aside to cover the cost of this capital requirement, then the annual net excess earnings to today's shareholders becomes

$$m'S' - c'S'$$

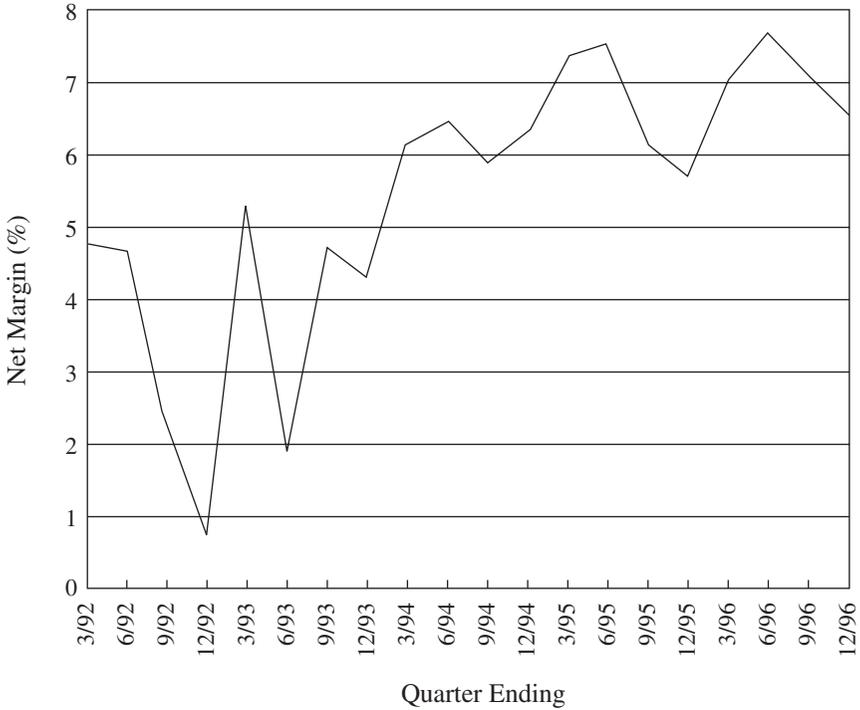


FIGURE 2.2 Average Net Margin of the 30 Stocks in the Dow Jones Industrial Average, 1992–96

Note: Average net margin is calculated as the ratio of net income (before extraordinary items) to sales.

The capitalized value of this excess earnings stream corresponds to the franchise-value term in this sales-driven context:

$$\begin{aligned} \text{FV} &= \frac{m'S' - c'S'}{k} \\ &= \frac{S'}{k}(m' - c') \end{aligned}$$

The total sales-driven firm value then becomes

$$\begin{aligned} P &= \text{TV} + \text{FV} \\ &= \frac{mS}{k} + \frac{S'}{k}(m' - c') \\ &= S \left[\frac{m}{k} + \frac{S'(m' - c')}{Sk} \right] \end{aligned}$$

If a sales growth factor, G' , is now defined to be the ratio of incremental new sales, S' , to the current sales, S ,

$$G' \equiv \frac{S'}{S} \\ = \frac{PV_{\text{New sales}}}{PV_{\text{Current sales}}}$$

then

$$P = S \left[\frac{m}{k} + \frac{(m' - c')}{k} G' \right]$$

THE FRANCHISE MARGIN

The capital cost, c' , per dollar of sales is related to the commonly used ratios of sales turnover and asset turnover. For the purposes of this chapter, the term “sales turnover” refers to the total capital base that supports each category of annual sales. From this vantage point, the total capital base would include—in addition to inventory investment—all other elements of embedded or incremental capital. Thus, for the current annual level of sales, S , the turnover, T , would be defined as

$$T \equiv \frac{S}{B}$$

where B is the book value of the (unlevered) firm. Similarly, for the new sales, S' , the relevant capital base would incorporate expenditures for product development, added inventory, new working capital, new production and distribution facilities, the marketing launch, and so forth. The turnover, T' , measure for these new sales would then become

$$T' \equiv \frac{S'}{\text{Incremental capital base}}$$

Because capital expenditures are assumed to bear an annual charge of k ,

$$k(\text{Incremental capital base})$$

is the *annual* cost of providing the capital required to support the *annual* sales, S' . The capital cost, c' , per dollar of new sales would therefore become

$$c' = \frac{k(\text{Incremental capital base})}{S'}$$

or

$$c' = \frac{k}{T'}$$

A similar relationship holds for the capital costs associated with the current level of sales.

Figure 2.3 displays a five-year history of the average sales/book value ratio, T , for the companies included in the DJIA. This graph is surprising because of the stability of these quarterly values around the average turnover value of 3.34. This remarkable stability is somewhat of an artifice in that it obscures significant company-to-company variation. For most of the firms in the DJIA, however, the company-specific turnover ratios appear to be fairly stable through time.

Returning to the theoretical model, Figure 2.4 plots the relationship of c' to the turnover, T' :

$$c' = \frac{k}{T'}$$

Clearly, as the turnover, T' , goes up, the cost of capital, c' , goes down. For a net margin, m' equal to 9 percent, a sufficiently high turnover (above T' equals 1.33 in the figure) is needed for the cost of capital to fall below the profit margin and lead to a true net excess profit. For a given turnover level, the extent by which the profit margin exceeds the unit cost of capital can be termed the “franchise margin,” $(fm)'$:

$$\begin{aligned} (fm)' &\equiv m' - c' \\ &= m' - \frac{k}{T'} \end{aligned}$$

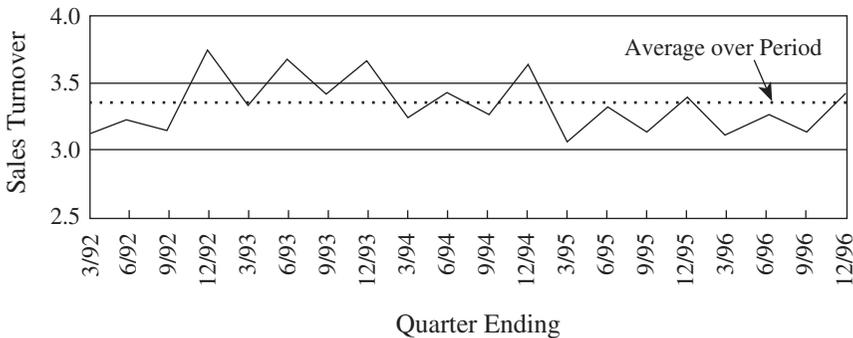


FIGURE 2.3 Average Sales Turnover of the 30 Stocks in the Dow Jones Industrial Average, 1992–96

Note: Average sales turnover is calculated as the ratio of annualized sales to initial book value (based on index composition as of April 1, 1997).

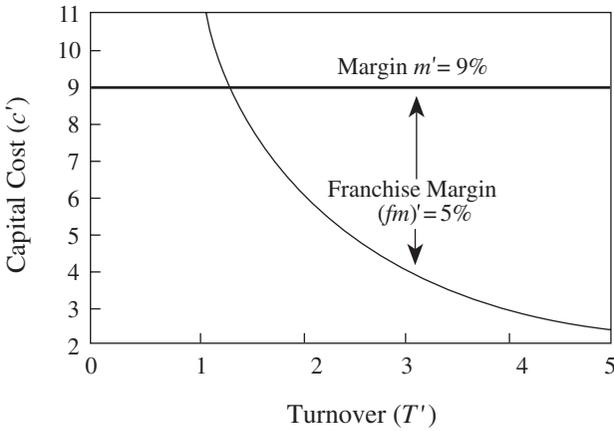


FIGURE 2.4 The Franchise Margin: Annual Capital Cost as a Percentage of Sales, c' , versus Sales Turnover Rate, T'

The basic valuation equation can now be written using this franchise margin as the coefficient for the net present value contribution of future sales:

$$P = S \left[\frac{m}{k} + \frac{(fm)'}{k} G' \right]$$

or

$$P/S = \frac{m}{k} + \frac{(fm)'}{k} G'$$

Similarly, the franchise margin allows the P/E to be expressed quite simply:

$$\begin{aligned} P/E &= \frac{P}{mS} \\ &= \frac{1}{k} + \frac{(fm)'}{mk} G' \end{aligned}$$

As an illustration of the sales-driven FV model, Example 2.5 addresses a firm whose characteristics are identical to the company in Example 2.4. With sales turnover ratios of T equals T' , which equal 3, and with margins of m equal to 6 percent for the current book and m' equal to 9 percent for

the new sales, one can see that the corresponding ROEs are the same as in Example 2.4:

$$\begin{aligned} r &= mT \\ &= 6\% \times 3 \\ &= 18\% \end{aligned}$$

$$\begin{aligned} R &= m'T' \\ &= 9\% \times 3 \\ &= 27\% \end{aligned}$$

In Example 2.5, sales grow at the same 8 percent rate that was used in the preceding examples for the growth of new investment opportunities. With this identical mapping of values, it is no surprise that the sales-driven FV in Example 2.5 produces the same P/E of 22.22 as the investment-driven FV model used in Example 2.4.

THE FRANCHISE MARGIN FOR THE CURRENT BUSINESS

The concept of a franchise margin can also be extended to the firm's current business. The implicit annual capital cost of the current book equity, B , is

$$kB$$

With current sales, S , and margin, m , the net value annually added by the current business is

$$\begin{aligned} mS - kB &= S \left[m - k \left(\frac{B}{S} \right) \right] \\ &= S \left[m - \frac{k}{(S/B)} \right] \\ &= S \left[m - \frac{k}{T} \right] \end{aligned}$$

where T is the turnover of total *current* sales to the book equity. If a franchise margin, fm , is defined for the current business,

$$fm \equiv m - \frac{k}{T}$$

EXAMPLE 2.5 Sales-Driven FV Model Coincides with Investment-Driven FV Model for Basic Situations

Specifications	Sales-Driven FV Model	Calculations
With the focus on sales and new sales opportunities, the two factors determining the franchise value now become: (1) G' , a sales growth factor that relates the PV of future sales to current sales, and (2)	$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'$	Same specifications as Example 2.4 but with the following implied values assigned to sales parameters:
$\frac{(fm)'}{mk}$	<p>The franchise margin,</p> $(fm)' = m' - \frac{k}{T'}$	
the P/E contribution per unit of new sales growth.	represents the excess profit on future sales beyond that needed to cover the cost of capital,	$m = 6\%$ $m' = 9\%$ $T = 3$ $T' = 3$
This second factor consists of	which becomes evident by viewing $1/T'$ as the dollars of new capital required to generate each dollar of new annual sales. Hence, k/T' becomes the annual capital cost to produce \$1 of annual sales, and so	Note that the above values imply that
$m =$ net margin on existing sales		$r = mT$ $= 18\%$;
$m' =$ net margin on new sales, and		$R = m'T'$ $= 27\%$
$(fm)' =$ the franchise margin		$(fm)' = 0.09 - \frac{0.12}{3}$
$= m' - \frac{k}{T'}$		$= 0.05$ $G' = 2.00$
where		
$T' =$ turnover ratio of new sales dollars to capital required to generate the new sales level	$(fm)' = m' - \frac{k}{T'}$	$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'$
To relate this model to the preceding example, note that, in general,	represents the net excess profit per dollar of new sales. Because	$= \frac{1}{0.12} + \left[\frac{0.05}{(0.06)(0.12)} \times 2.00 \right]$
$r = mT$		$= 8.33 + (6.944 \times 2.00)$
where	$(fm)' = 0$	$= 8.33 + 13.89$
$T =$ turnover ratio for existing book of business,	reflects the minimum margin for a rational competitor, $(fm)'$ is a gauge of a firm's pricing power.	$= 22.22$
$R = m'T'$		(Same result as Example 2.4.)
and		
$G' = \frac{T'}{T} G$		
But in this special case		
$T = T'$		
$G = G'$		
$= 2.00$		

then the capitalized net present value of the current business becomes

$$\frac{mS - kB}{k} = S \frac{fm}{k}$$

The firm's tangible value is the value of the current business—that is, the book capital already in place together with the *net* present value of earnings from the book investments. Thus,

$$TV = B + S \frac{fm}{k}$$

With these definitions, the firm's value can be expressed in a more symmetric form:

$$\begin{aligned} P &= TV + FV \\ &= B + \frac{S}{k} [fm + (fm)'G'] \end{aligned}$$

In this form, it becomes clear that the firm can exceed its book value only by attaining franchise margins on its current and/or its future sales.

The above expression for the tangible value is clearly too simple to address many of the dynamic changes that affect the existing business of real firms. Although many of these considerations could be handled through the appropriate “normalization” of earnings, sales, and margins, it is probably worthwhile to cite two explicit revisions that are often needed in assessing modern companies: (1) the impact of margin improvement, or deterioration, and (2) the need for continuing capital expenditures in order to maintain even the current level of sales.

First, in recent years, many firms have been able to maintain significant growth of earnings in the face of a very modest growth in sales. This result has been achieved by marked improvements in the net margin, often effected through major restructurings. For such situations in which further margin improvement or compression is believed to be imminent, an adjustment term may be required to capture the impact of the projected changes.

The second issue relates to the capital expenditures required to maintain the current level of sales. This issue obviously becomes entangled with the definition of net margin. Theoretically, to the extent that net margin actually reflects the earnings contributions, depreciation would already have been deducted. If a capital expenditure equal to this depreciation were able to fully maintain the current sales level, then no adjustment would be necessary. But in general, a greater or lesser capital expenditure is called for, and explicitly bringing this issue to the fore by

adding another term to the tangible value component is often worthwhile. Such adjustments may be particularly appropriate in those durable-product sectors that require heavy capital expenditures to develop the new product models necessary to maintain even the current level of revenue. In such cases, large capital reserves may be present as part of the commitment to undertake such mandatory product development. These capital reserves should be recognized as having been essentially committed to internal needs and hence not available for ultimate distribution to shareholders. By the same token, appropriate added value should be recognized for situations in which the depreciation runs far in excess of the capital required to maintain the annual sales at the normalized level. With the appropriate interpretations of terms, the franchise-value model should be able to accommodate all of these situations.

Up to this point, the assumption has been that all sales from the current book of business can be represented by a single number and that all future growth can be related in some consistent fashion to this current sales level. But breaking down current and future sales in terms of identifiable product lines and geographical areas of opportunity is far more productive and insightful. In particular, one cannot begin to truly understand the character of a multinational company without examining its sales by geographical region. A product that may have reached maturity and has no further franchise margin in one area (often the home country) may have significant franchise margin and be a great source of value in other regions of the world. Such a product-line model represents a simple extension of the basic model.

PRICE RATIOS

The preceding development focused primarily on the direct estimation of a firm's intrinsic value. In practice, however, many (if not most) analytical procedures are conducted on the basis of one or more comparative ratios. The field of financial analysis uses ratios of all types—from price/earnings to innumerable accounting measures. This almost compulsive drive for “rationizing” is motivated by several objectives. First is the understandable desire to achieve some relative comparability by normalizing for the huge differences in firm size. A second objective is to create some consistent gauge of value.

In the analyses of firm valuation, one often encounters ratios of price/earnings, price/cash flow, price/book, and sometimes price/sales. In market practice, the price/earnings ratio is clearly the dominant yardstick—and by a wide margin, although cash flow is finding increased use. But both earnings and cash flow are less than totally satisfactory because

of their instability and the difficulty in developing broadly accepted “normalized” estimates (Treyner 1972; Fairfield 1994). Because many historical artifices affect book value, the price/book ratio also raises many questions as a basis for comparing firms. A firm’s sales have a reasonable claim to being a good denominator in that sales are based on a fairly concrete flow that is affected relatively little by different accounting conventions. It is, therefore, worth pondering why the price/sales ratio is so rarely used and the more volatile price/earnings ratio is ubiquitous.

The answer may lie with the second objective for forming these ratios: a gauge of value. After all, if earnings (or cash flow by some appropriate definition) is the ultimate source of equity value, then the analyst will want to know how much is being paid for a dollar of earnings. A related argument can be seen from the following basic relationships:

$$P/E = \left(\frac{1}{r} \right) (P/B)$$

$$P/E = \left(\frac{1}{m} \right) (P/S)$$

In other words, price/book and price/sales are less complete measures because additional variables—the ROE and the net margin, respectively—are needed to reach the “ultimate” price/earnings ratio.

Another, and more subtle, argument may be that the P/E level conveys information about a stock’s risk level. This line of reasoning would suggest that a stock with a low P/E has a price that is supportable by the very concrete measure of current earnings. To the extent that the P/E rises above this level, it must be based on the more intangible (and hence more risky) prospect of future earnings growth. The FV approach, with its separation of “current” TV from future FV, accommodates the spirit of this interpretation.

When attempting to estimate a firm’s value, the ultimate ratio is always the market price, \hat{P} , to the estimated intrinsic value, P . And any ratio that supports this goal is equally good. For example, if the analyst prefers to frame the intrinsic value calculation in terms of price/book, then the ultimate measure of market overvaluation will simply be

$$\hat{P}/P = \frac{(\hat{P}/B)}{(P/B)}$$

Thus, in this context, the numeraire that should be used is the one that is most convenient to use, and this choice may obviously differ from analyst to analyst and from firm to firm. In this spirit of analytical convenience, the

price/sales ratio may be deserving of wider acceptance. The virtue of sales as a relatively stable and “accounting-clean” measure has already been cited. Another argument derives from the thrust of this chapter. To the extent that assessing the firm’s future franchise value is a critical element in the analysis, these projections may be more reliably developed in terms of future sales opportunities and the associated pricing power (i.e., franchise margins). In such cases, the price/sales ratio given by

$$\begin{aligned} P/S &= \frac{1}{S} \left\{ B + \frac{S}{k} [fm + (fm)'G'] \right\} \\ &= \frac{1}{T} + \frac{fm}{k} + \frac{(fm)'}{k} G' \end{aligned}$$

is a clear and compelling statement of the sources of value.

Figure 2.5 illustrates the P/S for the current Dow Jones companies during the 1992–96 period. The horizontal line in the graph represents the reciprocal, $1/\bar{T}$, of the average turnover during this period ($\bar{T} = 3.34$). The P/S value beyond this line provides a crude measure of the contribution from the two franchise margin terms in the preceding equation.

For situations in which other price ratios are desired, these can readily be formulated within the sales-driven context. For example, the price/book ratio becomes

$$P/B = 1 + T \frac{fm}{k} + T \frac{(fm)'}{k} G'$$

The P/E ratio can also be expressed in terms of the two franchise margins:

$$\begin{aligned} P/E &= \frac{1}{mT} + \frac{fm}{mk} + \frac{(fm)'}{mk} G' \\ &= \frac{1}{r} + \frac{fm}{mk} + \frac{(fm)'}{mk} G' \end{aligned}$$

But because the franchise margin on the current book does not play a necessary role in the P/E, it is generally simpler to use the equivalent form

$$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'$$

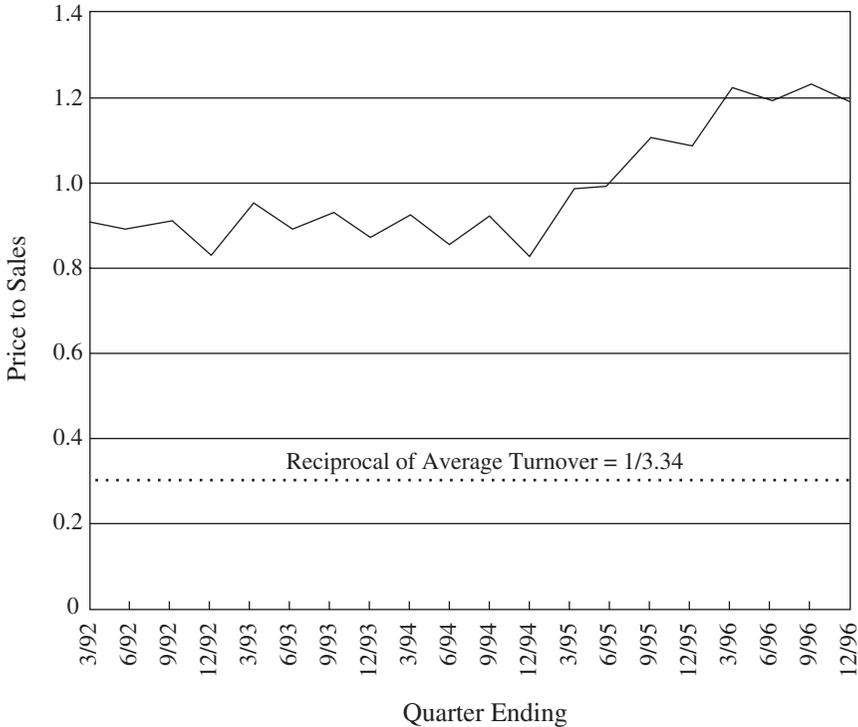


FIGURE 2.5 Average Price/Sales of the 30 Stocks in the Dow Jones Industrial Average, 1992–96

Note: Average price/sales is calculated as the ratio of price at end of quarter to annualized sales.

Although all these ratios are theoretically equivalent in terms of the final valuation result, each ratio does provide a somewhat different slant on the analytical process. To illustrate these differences, consider the firm depicted in Example 2.6. This company differs from Example 2.5 solely in having a higher current margin ($m = 9$ percent versus $m = 6$ percent for Example 2.5).

In comparing the two illustrations, the first surprise is that the margin improvement in Example 2.6 leads to a significantly *lower* P/E (17.59 versus 22.22 for Example 2.5). The second surprise is that this lower P/E is associated with a higher P/S (1.58 versus 1.33 for Example 2.5, as calculated in Example 2.6).

EXAMPLE 2.6 Margin Improvement Can Simultaneously Lead to Lower P/E but Higher P/S

Specifications	Sales-Driven FV Model	Calculations
<p>The P/E tends to obscure the role of any franchise embedded in the current business. This effect can lead to the paradoxical result that <i>higher</i> current margins (and hence <i>higher</i> current ROEs) can lead to <i>lower</i> P/Es. This effect was evident in Examples 2.3 and 2.4. In Example 2.4, $r = 18\%$ and gave a P/E of 22.22, but $r = 27\%$ in Example 2.3 and led to a lower P/E of 17.59. The price/sales ratio behaves more “reasonably”—that is, the P/S increases with improvements in the current margin and in the ROE associated with the current business.</p>	<p>The P/E reflects higher current margin only in the denominator of the future sales term:</p> $P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'$ <p>But the P/S provides recognition of a franchise margin in existing sales,</p> $P/S = \frac{1}{T} + \frac{fm}{k} + \frac{(fm)'}{k} G'$	<p>In Example 2.5, P/E = 22.22, and $m = 6\%$, so that</p> $P/S = m(P/E) = 0.06 \times 22.22 = 1.33$ <p>Now, if we change the current margin, m, to 9%, so that</p> $m = m' = 9\%$ $fm = (fm)' = 0.05$ <p>P/E is <i>lowered</i>,</p> $P/E = 8.33 \cdot \left[\frac{0.05}{(0.09)(0.12)} \times 2.00 \right] = 8.33 + (4.63 \times 2.00) = 17.59$ <p>but P/S is <i>raised</i></p> $P/S = m(P/E) = 0.09(17.59) = 1.58$ <p>The basis for this effect is apparent from the full P/S formula:</p> $P/S = \frac{1}{3} + \frac{0.05}{0.12} + \left(\frac{0.05}{0.12} \times 2.00 \right) = 0.333 + 0.417 + (0.417 \times 2.00) = 1.58$ <p>Note that because</p> $r = mT = 0.09 \times 3 = 27\%$ <p>this example is now also coincident with Example 2.3.</p>

The story behind this seeming paradox can be gleaned by observing that in the P/S formulation,

$$P/S = \frac{1}{T} + \frac{fm}{k} + \frac{(fm)'}{k} G'$$

the tangible value component reflects the franchise value provided by the current business. A larger current margin positively affects the P/S through its role in the fm term. In contrast, with P/E,

$$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'$$

the P/E contribution from the tangible value, $1/k$, is always the same, regardless of whether or not the current business generates a franchise return. Moreover, a higher current margin, m , will actually depress the franchise-value term because of its presence in the denominator. Thus, a higher margin, m , will always lead to a higher P/S but to a lower or equal P/E.

This problem with the price/earnings ratio's treatment of the current franchise margin is most dramatically exhibited in firms that have no *future* franchise value. All such firms will have a P/E equal to 8.33, but their P/B and P/S will appropriately vary with the magnitude of the current franchise. When *all* franchises are eliminated—both current and future—then all three ratios will fall to their respective base values:

$$\begin{aligned} P/E &= \frac{1}{k} \\ &= 1.33 \\ P/B &= 1 \\ P/S &= 0.33 \end{aligned}$$

Because *all* franchises, including current franchises, are theoretically vulnerable to competition, this greater discriminating ability of P/B and P/S should definitely make them worthy of wider consideration.

OPTION VALUES AND THE HYPERFRANCHISE

From a theoretical point of view, the franchise-value calculation should incorporate all prospects and probabilities for sales at a franchise margin. Theoretically, in an ideally transparent market, the analyst would be able

to peer into the future to uncover all forthcoming additions to the firm's present value.

As was shown in Leibowitz and Kogelman, however, when the valuation model is based on a finite set of franchise-value opportunities, the firm will ultimately chew through these opportunities in the course of time. Eventually, it will exhaust these prospects, and its P/E will decline to the base value of current earnings over the discount rate (or in our sales-driven model, to a P/S that is just equal to the reciprocal of the turnover rate). In order to achieve an elevated P/E or even to maintain it at levels above the base ratio, management must access additional "franchise surprises" that were not previously embedded in the market forecasts. Of course, these surprises could take the form of actualizations of the happier outcome of prospects that had previously been only discounted probabilities (as when a new drug is actually approved for clinical use by the Food and Drug Administration). But a more general construct is to recognize that firms with access to sizable markets on a franchise basis are likely to have an organization, a management culture, and a level of corporate energy that can lead to future franchise opportunities that are currently unimaginable. This "hyperfranchise value" can surpass any anticipation of specific market opportunities that may be on the horizon. It represents a positive wild card in the valuation of a great corporation. By the same token, the cult of ever-growing market share and management ego trips can lead to destruction of value and may thus represent a negative form of hyperfranchise.

The hyperfranchise is clearly an elusive concept and generally quite difficult to measure. Nevertheless, it can be a major component of firm value. Many very practical business leaders focus on enhancing their firm's position to take advantage of potential future opportunities that are currently indefinable. To be sure, they do not call it "the pursuit of hyperfranchise"—"vision" is a more likely term. In some respects, it is like a game of chess in which a player may strive to achieve a positional advantage. And just as a chess player may sacrifice some tactical advantage to attain the better position, so may a visionary manager invest capital or even exchange visible franchise value in order to enhance the firm's hyperfranchise. Indeed, although foregoing maximum profitability to gain market share can be based on a variety of short- and long-term considerations, the pursuit of hyperfranchise may well be one such motivation. Any hyperfranchise will, of course, be dependent on the nature of the market economy at that time. When more opportunities open up globally, when trade barriers fall, when the best firms can freely confront their peers on a fair playing field, then a hyperfranchise will have a much higher value. In periods of economic contraction, trade frictions, and increased regulation, one can see how the hyperfranchise value may not count for nearly as much, even in the very best of firms.

Another source of value is derived from the optional characteristics of the franchise opportunities themselves. If we could truly trace out, on an expectational basis, all the franchise markets potentially available to a given firm, then we might be tempted to take that expected value as the gauge of the firm's franchise value. But if uncertainty exists in the circumstances surrounding these markets, or the magnitude of their potential, we must recognize that a corporation has the freedom to choose to enter the good markets when they appear good and to abandon what had been good markets once they turn sour. A company can time the entry into new markets so as to achieve the maximum impact for its shareholders. All of these options that are available to corporate management enhance the franchise value above and beyond its expected value. Clearly, this option value will be greater in a world that is uncertain, highly variable, and dynamic—one that is reminiscent of the environment we face today.

One particular option that is available to all growing firms deserves special mention: the option to time investments relative to fluctuations in the cost of capital. The cost of capital may vary widely over time, even on a real basis. Now, suppose we view the corporation as having an inventory of franchise opportunities, each with an implied ROE, which may itself have some degree of sensitivity to the market cost of capital. At a given point in time, the firm would consider pursuing only those new opportunities whose implied ROEs exceeded the cost of capital. As the cost of capital declines, more potential projects would become available for productive pursuit (and vice versa when the real cost of capital rises). This observation has major implications for how the changing cost of capital affects firm value. Thus, a firm's total franchise value could be increased not simply by the lower discount rate associated with lower capital cost but also by the broader range of franchise opportunities that would then become productively available. The option to take advantage of such fluctuations in the cost of capital is an important addition to the franchise value of a firm. This "franchise inventory" view leads to the strong implication that firms might have an even higher duration relative to real interest rates than suggested by earlier studies (Leibowitz et al. 1989).

SALES GROWTH MODELS

The estimate of future growth is clearly a central component of a firm's valuation. At the same time, the process of growth estimation is well known to be particularly error prone. What is not broadly appreciated, however, is that many of these problems derive from implicit assumptions that are buried deep within the common formulations of growth. As we

shall see, the sales-driven approach helps to clarify many of these problems and to facilitate the selection of the most appropriate growth models.

For the simplest class of growth models, the starting assumption is that growth proceeds smoothly, at a constant rate per annum, and that this smooth growth continues indefinitely. With this infinite horizon, we encounter the condition that a finite solution is achieved only when the growth rate, g , falls below the discount rate, k . Table 2.1 illustrates the sales pattern associated with 8 percent infinite growth. For this very special case, the growth factor takes on a familiar form:

$$G' = \frac{g}{k - g}$$

TABLE 2.1 Infinite Sales Growth

Years	Current Sales		New Sales		Equivalent New Sales*	
	Annual Level	Cumulative Present Value	Annual Level	Cumulative Present Value	Annual Level	Cumulative Present Value
1	1	0.89	0.08	0.06	2	1.79
2	1	1.69	0.17	0.18	2	3.38
3	1	2.40	0.26	0.35	2	4.80
4	1	3.04	0.36	0.55	2	6.07
5	1	3.60	0.47	0.79	2	7.20
10	1	5.65	1.16	2.31	2	11.30
15	1	6.81	2.17	4.05	2	13.62
20	1	7.47	3.66	5.79	2	14.94
25	1	7.84	5.85	7.39	2	15.69
30	1	8.06	9.06	8.82	2	16.11
35	1	8.17	12.69	9.82	2	16.35
40	1	8.24	19.11	10.92	2	16.49
Infinite horizon		8.33		16.67		16.67

Growth rate = 8%.
Growth horizon = infinite years.

$$\begin{aligned} \text{Growth factor} &= \frac{PV_{\text{New sales}}}{PV_{\text{Current sales}}} \\ &= \frac{16.67}{8.33} \\ &= 2.00 \end{aligned}$$

*Equivalent new sales = constant annual new sales that has same present value = 16.67 as actual new sales pattern.

This formula makes it clear how a growth rate of 8 percent, discounted at 12 percent, leads to $G' = 2$.

As mentioned earlier, the sales growth factor is really quite general and can relate any form or pattern of growth to the current level of sales, including various situations in which the growth terminates after some prescribed span of time. The most common and simplest form of growth termination is depicted in Table 2.2. In this table, a base level of *current sales* is continued in perpetuity, but the growth of *new sales* terminates after a 20-year time period, as shown in the column labeled “Annual Level, Effective” (for reasons that will soon become apparent). The resulting sales growth factor is

$$G' (20) = 1.03$$

TABLE 2.2 Terminating Growth with Sustained Margins

Years	Current Sales		New Sales			Equivalent New Sales	
	Annual Level	Cumulative Present Value	Annual Level		Cumulative Present Value	Annual Level	Cumulative Present Value
			Actual	Effective			
1	1	0.89	0.08	0.08	0.06	1.03	0.91
2	1	1.69	0.17	0.17	0.18	1.03	1.74
3	1	2.40	0.26	0.26	0.35	1.03	2.47
4	1	3.04	0.36	0.36	0.55	1.03	3.13
5	1	3.60	0.47	0.47	0.79	1.03	3.71
10	1	5.65	1.16	1.16	2.31	1.03	5.82
15	1	6.81	2.17	2.17	4.05	1.03	7.02
20	1	7.47	3.66	3.66	5.79	1.03	7.69
25	1	7.84	5.85	3.66	7.01	1.03	8.07
30	1	8.06	9.06	3.66	7.70	1.03	8.30
35	1	8.17	12.69	3.66	8.10	1.03	8.42
40	1	8.24	19.11	3.66	8.32	1.03	8.49
Infinite horizon		8.33			8.58		8.58

Discount rate = 12%.

Growth rate = 8%.

Growth horizon = 20 years.

$$\begin{aligned}
 \text{Growth factor} &= \frac{PV_{\text{New sales}}}{PV_{\text{Current sales}}} \\
 &= \frac{8.58}{8.33} \\
 &= 1.03
 \end{aligned}$$

which is about half the factor of 2 for perpetual growth. In some ways, this decline of almost 50 percent is surprisingly large, especially after a full 20 years of constant growth *and* the perpetual continuance of the high sales level attained at the end of the 20-year growth period. In Example 2.7, this 20-year growth period is applied to a firm having the same specifications as in Example 2.5, with the result that the P/E declines from 22.22 to 15.48.

More generally, given sales growth that continues for N years and then stabilizes, the resulting sales growth factor, as derived in Appendix 2A, becomes

$$G'(N) = \left(\frac{g}{k-g} \right) \left[1 - \left(\frac{1+g}{1+k} \right)^N \right]$$

Table 2.3 provides a tabulation of $G'(N)$ values for various growth rates and growth periods.

It is worth noting that this simple termination model enables us to deal with growth rates that could be far in excess of the discount rate and still get finite growth factors and finite firm values. It is also worth noting

EXAMPLE 2.7 Finite Period of Sales Growth: 20 Years at 8 Percent

Specifications	Sales-Driven FV Model	Calculations
One common assumption is that uniform growth continues for a specified period but then reverts to a lower pace associated with the general market. Both DDM and FV models accommodate such “multiphase” growth patterns. The tacit assumption, however, is that prior productive investments are unaffected by the step-down in growth.	$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'(N)$ $G'(N) = \left(\frac{g}{k-g} \right) \left[1 - \left(\frac{1+g}{1+k} \right)^N \right]$ <p>N = number of years of growth $G'(N)$ is tabulated in Table 2.3 for various values of g and N.</p>	<p>Same values as Example 2.5 except for lower G':</p> <p>$G'(20) = 1.03$ From Table 2.2:</p> $P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'(20)$ $= \frac{1}{0.12} + (6.94 \times 1.03)$ $= 8.33 + 7.15$ $= 15.48$ <p>(Significantly lower P/E than in Example 2.5 with its infinite growth at 8%).</p>

TABLE 2.3 Sales Growth Factors

Years of Growth	Growth Rate						
	6 Percent	8 Percent	10 Percent	12 Percent	14 Percent	16 Percent	18 Percent
1	0.05	0.07	0.09	0.11	0.13	0.14	0.16
2	0.10	0.14	0.18	0.21	0.25	0.29	0.33
3	0.15	0.21	0.26	0.32	0.38	0.44	0.51
4	0.20	0.27	0.35	0.43	0.51	0.60	0.70
5	0.24	0.33	0.43	0.54	0.65	0.77	0.89
10	0.42	0.61	0.82	1.07	1.36	1.68	2.06
15	0.56	0.84	1.18	1.61	2.13	2.77	3.56
20	0.67	1.03	1.51	2.14	2.97	4.07	5.52
25	0.75	1.19	1.81	2.68	3.90	5.62	8.06
30	0.81	1.32	2.09	3.21	4.90	7.46	11.36
Infinite horizon	1.00	2.00	5.00	—	—	—	—

that the growth factor, G' , remains the fundamental variable. It does not matter what the growth rate is or over how many years it persists, as long as it leads to the same growth factor, G' . Any growth pattern that leads to a given growth factor, G' , will have the same effect on the firm's value. In fact, one can go beyond a smooth annual growth rate to any irregular pattern of development. Any such pattern, no matter how bizarre, can be represented by an appropriate growth factor.

FRANCHISE TERMINATION MODELS

Although the basic growth model presented earlier has the virtue of simplicity, there is a certain logical inconsistency in the idea that a franchise advantage can be maintained indefinitely. Just as nature abhors a vacuum, so the world of economics abhors a perpetual franchise. Competition in one form or another will eventually erode even the very best franchise.

A key problem arises from the common confusion of terminology in the phrase "sales growth." This term is often used to depict the growth in the annual *level* of sales as opposed to the *total dollar value* of sales accumulated through time. In estimating the total value of the firm, however, the latter meaning is clearly the relevant one—the total dollars of sales in present value terms that the firm achieves at margins in excess of the cost of new capital. Thus, in characterizing how a franchise winds down, the

key analytical issue is how to model the changes in the franchise margins associated with the various components of sales. One approach for dealing with “franchise termination” is to assume that any further sales growth beyond the termination point carries no franchise margin whatsoever. Such sales will have no present value impact and can thus be disregarded in the analysis of firm valuation. Although sales growth may continue indefinitely, the analysis can then proceed as if all sales growth came to an absolute halt at the termination point.

Even with this general formulation of “growth only to the termination point,” different ways still remain for the franchise termination to affect the annual sales level reached at the termination point. The selection of the most appropriate of these “franchise termination models” can have a major impact on any estimate of a firm’s value. The following discussion presents three different termination models, each with increasing stringency in terms of the franchise margins retained beyond the termination horizon. As a mathematical convenience, all three termination models are analyzed by keeping the franchise margins, fm and $(fm)'$, fixed but reducing the prospective sales flows to which they apply. In effect, this leads to reduced estimates for productive future sales. In turn, these reduced sales flows are characterized by lower sales growth factors.

The first termination model treats all on-going sales—at the annual levels reached at the termination point—as retaining their respective franchise margins. For obvious reasons, this model is referred to as the “sustained margin” case. In this case, the productive sales flows exactly correspond to those that would result from growth coming to a halt at the termination point, with the then-achieved annual sales level being continued indefinitely. This “sustained margin” model coincides with the basic terminating growth situations displayed in Table 2.2. In this case, regardless of how the “actual” sales may continue to grow, the “effective annual sales”—that which carries a positive franchise margin—levels out at the 20-year franchise termination point. Thus, the reduced growth factors presented in Table 2.3 can be applied to any sustained margin situations having the indicated termination points and pretermination growth rates.

This basic approach of growth termination at some specified time horizon is widely seen throughout the investment literature. In fact, the investment-driven analog of this growth horizon model forms the basis for virtually all commonly used valuation formulas—including many of the popular multiphase DDMs. In investment terminology, the assumption here is that all investments made prior to the termination point continue to earn the same ROE on an annual basis—past the termination point and on to perpetuity.

A second, and vastly different, “end game” treatment arises more naturally from the sales-driven context. Suppose that franchise termination means that from the termination point forward, the margins collapse down to a commodity pricing level on *all* new sales growth (i.e., on all sales above the original level associated with the current book of business). This assumption is radically different in that it curtails all increments of value from any such “new-sales” beyond the termination point. In this “collapsing new margin” interpretation, the residual value for today’s shareholders of future new sales beyond the termination point is zero! Intuitional clarity would seem to argue for this cruder, but simpler, model of a total cessation of value enhancement. After all, when a market ceases to provide franchise pricing, the margin collapse should logically apply to all such future sales. Just because a given level of new sales was reached prior to the termination point, it does not follow that this sales level should be spared from the margin collapse. As might be expected, a firm’s estimated value may be radically reduced when an analyst shifts from a “sustained franchise” to a “collapsing new margin” viewpoint.

Example 2.8 addresses this issue by assuming that, after 20 years, all sales *above the original level* are subject to the margin squeeze. As noted earlier, the sales-driven FV calculation can proceed by keeping the franchise margins fixed but reducing the sales growth factor to account for only the productive sales flow under this franchise termination model. Within this framework, the termination condition is equivalent to having the total annual sales (i.e., the original sales plus the new sales) rise to 4.66 times the original level by the 20th year, and then suddenly drop back to 1.00 times the original level and remain there in perpetuity. Based on the analysis developed in Appendix 2B, Table 2.4 schematically depicts the pattern of productive sales (i.e., those with a positive franchise margin) generated by this “collapsing new margin” model. This reduced flow of sales naturally leads to a further decline in the sales growth factor to 0.69. The P/E also undergoes a significant drop to 13.12, dramatically illustrating the vulnerability of investment-driven models that tend to overlook these more powerful margin squeezes.

Table 2.5 provides a tabulation of growth factors for these first two termination models across a range of growth rates and termination horizons. As discussed earlier, the 8 percent growth terminating at 20 years can be seen to lead to growth factors of 1.03 with a sustained margin and to 0.69 with collapsing new margins. Note that these values represent only 52 percent and 35 percent, respectively, of the full growth factor of 2.00 that would result from perpetual growth at 8 percent. These are surprisingly significant reductions after a full 20 years of growth. From the third row of Table 2.5, it can be seen that with faster

EXAMPLE 2.8 Collapsing Margin on Newly Developed Sales after 20-Year Growth Period

Specifications	Sales-Driven FV Model	Calculations
<p>Same growth pattern as in preceding examples, but after the 20th year, competitive pressures are assumed to drive the franchise margin to zero: $(fm)' = 0$</p> <p>For convenience, this competitive-margin effect is captured through a reduced sales growth factor. In fact, actual sales growth may continue beyond the 20th year, but with $(fm)' = 0$, there is no further contribution to firm value or to the P/E.</p>	<p>$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'(N)$</p> <p>The collapsing margin situation is shown in Table 2.4 to result in a growth factor of $G'(20) = 0.69$. By focusing on the ability to sustain a franchise margin, the sales-driven FV model underscores the limits to a product franchise in today's competitive global market. This point is often overlooked in the standard multiphase models because it is all too easy to implicitly assume that all previous investments continue to earn the same high initial ROE forever.</p>	<p>Same values as Example 2.7 except for even lower G'</p> <p>$G'(20) = 0.69$</p> <p>$P/E = \frac{1}{k} + \frac{(fm)'}{mk} G'(20)$ $= 8.33 + (6.94 \times 0.69)$ $= 8.33 + 4.79$ $= 13.12$</p> <p>(Significantly lower than the P/E of 15.48 achieved in Example 2.7.)</p>

growth (10 percent) and a shorter termination horizon of 10 years, margin compression forces even more dramatic reductions—to 16 percent and 7 percent—relative to the perpetual growth factor of 5.00. These results underscore the need to confront the critical issue of franchise termination in every analysis of firm value.

The third, and most stringent, termination model assumes that all franchise margins collapse. In other words, this “total margin collapse” model presumes that if competition is so fierce as to drive the franchise margin on *new* sales down to zero, then it is also likely to destroy any franchise margin on *current* sales. (An exception to this argument might be multinational environments with differential barriers to competition.)

TABLE 2.4 Terminating Growth with Collapsing New Margins

Years	Current Sales		New Sales			Equivalent New Sales	
	Annual Level	Cumulative Present Value	Annual Level		Cumulative Present Value	Annual Level	Cumulative Present Value
			Actual	Effective			
1	1	0.89	0.08	0.08	0.06	0.69	0.62
2	1	1.69	0.17	0.17	0.18	0.69	1.17
3	1	2.40	0.26	0.26	0.35	0.69	1.66
4	1	3.04	0.36	0.36	0.55	0.69	2.10
5	1	3.60	0.47	0.47	0.79	0.69	2.49
10	1	5.65	1.16	1.16	2.31	0.69	3.90
15	1	6.81	2.17	2.17	4.05	0.69	4.70
20	1	7.47	3.66	3.66	5.79	0.69	5.15
25	1	7.84	5.85	0	5.79	0.69	5.41
30	1	8.06	9.06	0	5.79	0.69	5.56
35	1	8.17	12.69	0	5.79	0.69	5.64
40	1	8.24	19.11	0	5.79	0.69	5.69
Infinite horizon		8.33			5.79		5.79

Discount rate = 12%.

Growth rate = 8%.

Growth horizon = 20 years.

$$\begin{aligned}
 \text{Growth factor} &= \frac{PV_{\text{New sales}}}{PV_{\text{Current sales}}} \\
 &= \frac{5.79}{8.33} \\
 &= 0.69
 \end{aligned}$$

Example 2.9 demonstrates this ultimate level of competition in which the margin compression extends to all sales, including those derived from the firm’s original book of business. The pattern of effective sales is shown in Table 2.6, with the detailed analysis provided in Appendix 2C. As might be expected, this curtailment of value lowers the first term in the FV model, leading to, in this case, a slightly lower P/E of 12.90 percent. This modest reduction is a direct result of the choice of a 20-year initial period; shorter horizons would result in a more serious decrement.

The preceding discussion of termination models is certainly not intended to be an exhaustive characterization of how franchises can wind down. Indeed, just as the creation and development of a franchise is a highly complex and dynamic process, so a franchise’s expiration may take

TABLE 2.5 Sales Growth Factors for Various Termination Models

Growth Rate	Growth Factor for Perpetual Growth with Sustained Margin	Number of Years Growth before Termination	Sustained Margin		Collapsing New Margin		
			Terminated Growth with Sustained Margin	As Percentage of Perpetual Growth with Sustained Margin	Terminated Growth with Collapsing New Margin	As Percentage of Terminated Growth with Sustained Margin	As Percentage of Perpetual Growth with Sustained Margin
6%	1.00	10	0.42	42%	0.20	48%	20%
8	2.00	10	0.61	32	0.28	45	14
10	5.00	10	0.82	16	0.37	45	7
12	∞	10	1.07	—	0.47	44	—
14	∞	10	1.36	—	0.58	43	—
16	∞	10	1.68	—	0.70	42	—
18	∞	10	2.06	—	0.84	41	—
6	1.00	20	0.67	67	0.46	67	46
8	2.00	20	1.03	52	0.69	67	35
10	5.00	20	1.51	30	0.98	65	20
12	∞	20	2.14	—	1.34	63	—
14	∞	20	2.97	—	1.79	60	—
16	∞	20	4.07	—	2.36	58	—
18	∞	20	5.52	—	3.08	56	—
6	1.00	30	0.81	81	0.67	83	67
8	2.00	30	1.38	69	1.06	77	53
10	5.00	30	2.09	42	1.60	77	32
12	∞	30	3.21	—	2.35	73	—
14	∞	30	4.90	—	3.42	70	—
16	∞	30	7.46	—	4.93	66	—
18	∞	30	11.36	—	7.11	63	—

EXAMPLE 2.9 Collapsing Margin on Total Sales after 20-Year Growth Period

Specifications	Sales-Driven FV Model	Calculations
<p>Same situation as in Example 2.8 but with the added stringency that after 20 years, margins collapse to “commodity levels” on total sales—both existing sales and new sales; that is,</p> $fm = (fm)' = 0$ <p>The effect of this “total margin collapse” is quite modest after 20 years, but it can have a much larger impact for shorter-growth periods.</p>	<p>From Appendix 2.C,</p> $P/E = \frac{1}{mT} + \left(\frac{fm}{m}\right)\frac{1}{k} \left[1 - \left(\frac{1}{1+k}\right)^{N+1} \right] + \frac{(fm)'}{mk} G'(N)$	<p>Because</p> $\left[1 - \left(\frac{1}{1+k}\right)^{N+1} \right] = \left[1 - \left(\frac{1}{1.12}\right)^{21} \right] = 0.91$ <p>we have</p> $P/E = \frac{1}{mT} + \left(\frac{fm}{m}\right)\frac{1}{k}(0.91) + \frac{(fm)'}{mk} G'(20)$ $= \frac{1}{0.06 \times 3} + \left(\frac{0.02}{0.06}\right)\left(\frac{1}{0.12}\right) [(0.91) + 6.94 \times 0.69]$ $= 5.56 + 2.53 + 4.79 = 12.90$

on far more forms than can be readily categorized. Rather, the purpose in exploring the implications of these three simple termination models is to illustrate the following key points:

- Virtually any limit to a firm’s franchise (even after as long a run as 20 years) can have an extraordinary impact on firm value.
- Seemingly subtle differences in the assumed nature of the franchise limit can also lead to major valuation swings.
- The sales-driven model, by its very nature, brings to the surface these fundamental analytical issues that lie buried within the more standard investment-driven formulation.

MODELING SUPER-ROEs

In many situations, new business prospects arise that require only minimal capital investment. Typically, in these instances, the firm finds itself in a position to reap windfall sales, and profits, by leveraging off of its past investments in product development, manufacturing facilities, marketing

TABLE 2.6 Terminating Growth with Total Margin Collapse

Years	Current Sales			New Sales			Current New Sales		
	Annual Level		Cumulative Present Value	Annual Level		Cumulative Present Value	Annual Level		Cumulative Present Value
	Actual	Effective		Actual	Effective		Actual	Effective	
1	1	1	0.89	0.08	0.08	0.06	0.69	0.62	
2	1	1	1.69	0.17	0.17	0.18	0.69	1.17	
3	1	1	2.40	0.26	0.26	0.35	0.69	1.66	
4	1	1	3.04	0.36	0.36	0.55	0.69	2.10	
5	1	1	3.60	0.47	0.47	0.79	0.69	2.49	
10	1	1	5.65	1.16	1.16	2.31	0.69	3.90	
15	1	1	6.81	2.17	2.17	4.05	0.69	4.70	
20	1	1	7.47	3.66	3.66	5.79	0.69	5.15	
25	1	0	7.56	5.85	0	5.79	0.69	5.41	
30	1	0	7.56	9.06	0	5.79	0.69	5.56	
35	1	0	7.56	12.69	0	5.79	0.69	5.64	
40	1	0	7.56	19.11	0	5.79	0.69	5.69	
Infinite horizon			7.56 ^a			5.79		5.79	

^aFollowing the growth/receipt convention explained in Appendix 2C, the current sales receipts bearing the full initial 6% margin would extend through the end of the 21st year (i.e., after 20 years of sales growth), resulting in a cumulative present value = 7.56.

Discount rate = 12%

Growth rate = 8%

Growth horizon = 20 years.

EXAMPLE 2.10 Near-Infinite Turnovers and Super-ROEs from Leveraging Existing Investments

Specifications	Sales-Driven FV Model	Calculations
<p>With new international markets opening up, many firms achieve enormous sales improvements with minimal new investments. The investment-driven models go awry with ROEs approaching these super-high levels. The sales-driven FV model, however, can readily handle these surprisingly not uncommon situations by using G' to directly capture the PV opportunity for new sales and by letting</p> $(fm)' = m' - \frac{k}{T'} \rightarrow m'$ <p>as the incremental turnover</p> $T' \rightarrow \infty$ <p>Essentially, the profits on these new sales represent a windfall to firm value because there is virtually no associated capital cost.</p>	$P/E = \frac{1}{mT} + \left(\frac{fm}{m}\right) \frac{1}{k} \left[1 - \left(\frac{1}{1+k}\right)^{N+1}\right] + \frac{m'}{mk} G'(N)$	<p>Same as Example 2.9 except</p> $(fm)' = m' - \frac{k}{T} \rightarrow m'$ $\frac{(fm)'}{mk} = \frac{m'}{mk}$ $= \frac{0.09}{(0.06)(0.12)}$ $= 12.50$ $P/E = 5.56 + 2.53 + \frac{m'}{mk} G'(20)$ $= 5.56 + 2.53 + (12.50 \times 0.69)$ $= 5.56 + 2.53 + 8.63$ $= 16.73$ <p>(Note significant escalation in P/E from Example 2.9.)</p>

campaigns, and/or distribution channels. The magnitude of the business opportunity can often be quite sizable, particularly in a global context where a firm with a strong brand-name product can penetrate major new markets with very modest capital expenditures. Because the required incremental investment is so small, and the reward can be so large, the ROEs on

these prospects can be enormous. For managers, the ROE is rarely the question; they just move forward. But for the investment analyst, the prospect of these windfall opportunities may present a significant addition to firm value. In investment-driven models, making a reasoned estimate of ROE that may at first appear to be ridiculously high becomes difficult. A far more palatable approach is to estimate the size of the prospective new market and the obtainable margin—that is, to pursue the sales-driven route to evaluation.

Example 2.10 considers the same 20-year growth situation as Example 2.9. But in this case, only a minimal capital investment is required to realize this sales growth. This example goes to the extreme limit where the turnover, T' , becomes virtually infinite, which drives the franchise margin, $(fm)'$, to coincide with the margin itself,

$$\begin{aligned}(fm)' &= m' \\ &= 0.09\end{aligned}$$

and leads to a significant escalation of the P/E to 16.73.

CONCLUSION

The sales-driven franchise value approach suggests a rather different way to view multinational firms. Suppose that one can envision the global economy in the future as being composed of a set of current product markets, new product markets, and even some hypothetical “hypermarkets” of the yet-to-be-imagined variety. One can then ask the question: “Which firms have the ability to access these markets in a fashion that will generate a positive franchise margin for a significant span of time?” The first set of candidates will be corporations with areas of regional dominance where the franchise is achieved by barriers to entry that can persist into the future (e.g., German life insurance companies may enjoy a particular competitive advantage for some time with respect to German nationals). In other cases, the brand name and associated imagery surrounding a particular product may carry its franchise far into the future. In all cases, one would be well advised to think of the inevitable pressures that must be brought to bear on positive franchise margins and to think about their likely duration in the face of global competition and new product innovation. Those firms that can lever their existing product line and corporate resources to deliver products that truly have pricing power (and the value added that justifies that pricing power) should be the long-term winners in this valuation game.

APPENDIX 2A: Derivation of the Constant-Growth Model

The concept of the sales growth factor implies that all future sales growth is equivalent (on a present value basis) to an instantaneous jump of S' to a new constant level of annual sales, where S' equals $G'S$ (Table 2.1). To explore the assumptions embedded in this growth model and its related forms, one must delve into the algebraic derivation of this result.

At the outset, the nature of the growth process must be precisely defined. The basic approach is to assume that a sales *rate* achieved at the beginning of the year leads to a sales *receipt* at the end of that same year. Thus, the original annual sales rate leads to receipts of S dollars at the end of the first year, S dollars at the end of the second year, and so forth. By the same principle, the sales growth at the rate g will be viewed as raising the level of annual sales to a *going-forward* rate of $(1 + g)S$ by the end of the first year. The incremental sales (gS) associated with this first year of sales growth will be received at the end of the second year, the third year, and so forth, producing a capitalized value two years hence of

$$\begin{aligned} & gS \left[1 + \left(\frac{1}{1+k} \right) + \left(\frac{1}{1+k} \right)^2 + \dots \right] \\ &= gS \left[\frac{1}{1 - \left(\frac{1}{1+k} \right)} \right] \\ &= \frac{gS(1+k)}{k} \end{aligned}$$

with a current present value of

$$\frac{1}{(1+k)^2} \frac{gS(1+k)}{k} = \frac{gS}{(1+k)k}$$

The above expression thus represents the present value contribution of the first year's growth in the sales rate. Similarly, by the end of the second year, the new "going forward" incremental sales rate will be

$$g(1 + g)S$$

which will produce a future income stream that, starting at the end of the third year, will have a *then*-present value of

$$\frac{g(1+g)S(1+k)}{k}$$

By discounting this third-year value back to the present, we obtain

$$\frac{1}{(1+k)^3} \left[\frac{g(1+g)S(1+k)}{k} \right] = \frac{1}{(1+k)^2} \left[\frac{g(1+g)S}{k} \right]$$

In general, the present value contribution of the sales growth generated by the end of the year t will be

$$\frac{gS}{k(1+k)} \left(\frac{1+g}{1+k} \right)^{t-1}$$

Suppose this growth process continues for N years and then, for some reason, comes to an abrupt halt, so that the annual sales rate remains fixed at the level reached at the end of year N . The annual sales would then follow the pattern depicted in Table 2.1. The preceding expression corresponds to the present value of new sales generated in year t . Consequently, the sum total of all such present values from the first year to year N will correspond to the present value of all incremental sales:

$$\begin{aligned} \frac{gS}{k(1+k)} \sum_{t=1}^N \left(\frac{1+g}{1+k} \right)^{t-1} &= \frac{gS}{k(1+k)} \left[\frac{1 - \left(\frac{1+g}{1+k} \right)^N}{1 - \left(\frac{1+g}{1+k} \right)} \right] \\ &= \left(\frac{gS}{k} \right) \frac{1}{k-g} \left[1 - \left(\frac{1+g}{1+k} \right)^N \right] \end{aligned}$$

By definition,

$$\begin{aligned}
 G' &\equiv \frac{PV_{\text{Incremental new sales}}}{PV_{\text{Current sales}}} \\
 &= \frac{PV_{\text{Incremental new sales}}}{S/k} \\
 &= \frac{\left(\frac{gS}{k}\right) \frac{1}{k-g} \left[1 - \left(\frac{1+g}{1+k}\right)^N\right]}{S/k} \\
 &= \left(\frac{g}{k-g}\right) \left[1 - \left(\frac{1+g}{1+k}\right)^N\right]
 \end{aligned}$$

The values of G' are tabulated in Table 2.3 for various growth rates, g , and time horizons, N .

For the important special case of perpetual growth, we must have k greater than g in order to obtain a finite growth factor:

$$G' = \frac{g}{k-g}$$

APPENDIX 2B: New Margin Collapse Models

As developed in Appendix 2A, the first year's sales growth creates a payment stream, gS , that, if continued to perpetuity, will have a present value contribution of

$$\frac{gS}{(1+k)^2} \left[1 + \left(\frac{1}{1+k}\right) + \left(\frac{1}{1+k}\right)^2 + \dots \right] = \frac{gS}{(1+k)k}$$

On the other hand, if the margin collapses after year N , with

$$m' \rightarrow \frac{k}{T'}$$

and

$$(fm)' \rightarrow 0$$

then all future sales beyond the year $(N + 1)$ will have absolutely no impact on the firm's valuation. Thus, from the valuation viewpoint, it is

equivalent to having the sales stream come to an abrupt halt. In essence, the payment tail after year $(N + 1)$ is being dropped, thereby changing the present value to

$$\begin{aligned}
 & \frac{gS}{(1+k)^2} \left[1 + \left(\frac{1}{1+k} \right) + \left(\frac{1}{1+k} \right)^2 + \dots + \frac{1}{(1+k)^{N-1}} \right] \\
 &= \frac{gS}{(1+k)^2} \left[1 - \frac{1}{(1+k)^N} \right] \left[1 + \left(\frac{1}{1+k} \right) + \left(\frac{1}{1+k} \right)^2 + \dots \right] \\
 &= \frac{gS}{(1+k)^2} \left[1 - \frac{1}{(1+k)^N} \right] \left[\frac{1}{1 - \left(\frac{1}{1+k} \right)} \right] \\
 &= \frac{gS}{(1+k)^2} \left[1 - \frac{1}{(1+k)^N} \right] \left[\frac{1+k}{k} \right] \\
 &= \frac{gS}{k(1+k)} \left[1 - \frac{1}{(1+k)^N} \right] \\
 &= \frac{gS}{k} \left[\frac{1}{(1+k)} - \frac{1}{(1+k)^{N+1}} \right]
 \end{aligned}$$

For example, when $N = 1$, the growth achieved in the first year leads to a single payment, gS , in the second year that contributes to a present value of

$$\frac{gS}{k(1+k)} \left[1 - \frac{1}{(1+k)} \right] = \frac{gS}{(1+k)^2}$$

By the same reasoning, the second year's growth produces a truncated stream with a present value of

$$\begin{aligned}
 & \frac{g(1+g)S}{(1+k)^3} \left[1 + \frac{1}{(1+k)} + \frac{1}{(1+k)^2} + \dots + \frac{1}{(1+k)^{N-2}} \right] \\
 &= \frac{g(1+g)S}{(1+k)^3} \left[1 - \frac{1}{(1+k)^{N-1}} \right] \left[1 + \frac{1}{(1+k)} + \frac{1}{(1+k)^2} + \dots \right] \\
 &= \frac{g(1+g)S}{(1+k)^3} \left[1 - \frac{1}{(1+k)^{N-1}} \right] \left[\frac{1+k}{k} \right] \\
 &= \frac{g(1+g)S}{k} \left[\frac{1}{(1+k)^2} - \frac{1}{(1+k)^{N+1}} \right]
 \end{aligned}$$

Proceeding in this fashion, the year t 's growth results in a present value contribution of

$$\begin{aligned} Z_t &= \frac{g(1+g)^{t-1}S}{k} \left[\frac{1}{(1+k)^t} - \frac{1}{(1+k)^{N+1}} \right] \\ &= \frac{gS}{k(1+k)} \left[\left(\frac{1+g}{1+k} \right)^{t-1} - \frac{(1+g)^{t-1}}{(1+k)^N} \right] \end{aligned}$$

And summing these contributions over the N years of growth, one obtains

$$\begin{aligned} \sum_{t=1}^N Z_t &= \frac{gS}{k(1+k)} \left[\sum_{t=1}^N \left(\frac{1+g}{1+k} \right)^{t-1} - \sum_{t=1}^N \frac{(1+g)^{t-1}}{(1+k)^N} \right] \\ &= \frac{gS}{k(1+k)} \left\{ \left[\frac{1 - \left(\frac{1+g}{1+k} \right)^N}{1 - \left(\frac{1+g}{1+k} \right)} \right] - \frac{1}{(1+k)^N} \left[\frac{1 - (1+g)^N}{1 - (1+g)} \right] \right\} \\ &= \frac{gS}{k} \left\{ \left[\frac{1 - \left(\frac{1+g}{1+k} \right)^N}{(k-g)} \right] - \frac{1}{(1+k)^{N+1}} \left[\frac{(1+g)^N - 1}{g} \right] \right\} \end{aligned}$$

Thus,

$$\begin{aligned} G' &= \frac{\sum_{t=1}^N Z_t}{S/k} \\ &= \left(\frac{g}{k-g} \right) \left[1 - \left(\frac{1+g}{1+k} \right)^N \right] - \left[\frac{(1+g)^N - 1}{(1+k)^{N+1}} \right] \end{aligned}$$

On inspection, one can see that this expression corresponds to the earlier year N growth factor, less the term

$$\frac{(1+g)^N - 1}{(1+k)^{N+1}}$$

Because the new sales growth would reach a level of

$$[(1 + g)^N - 1]$$

in N years, this latter term can be shown to correspond to the present value contribution of the tail of constant “new” sales beyond year N .

APPENDIX 2C: Total Margin Collapse

In the “total margin collapse,” the franchise margin on current business, fm , and future business, $(fm)'$, both drop to zero *after* year N .

For the “new sales” arising from the sales growth, this is tantamount to the termination of all further sales. But for the initial sales level, the original book value is presumed to provide all necessary capital. Hence, all such sales with a positive margin will contribute some present value. Concentrating at first only on the initial sales component of firm value, let S_0 be the initial sales and m_1 and m_2 represent the margin before and after year N of *growth*, which, by our convention, corresponds to the $(N + 1)$ year of sales receipts. We then have the present value

$$\begin{aligned} & m_1 S_0 \left[\frac{1}{1+k} + \frac{1}{(1+k)^2} + \dots + \frac{1}{(1+k)^{N+1}} \right] + m_2 S_0 \left[\frac{1}{(1+k)^{N+2}} + \frac{1}{(1+k)^{N+3}} + \dots \right] \\ &= \left[m_1 - \frac{k}{T} + \frac{k}{T} \right] S_0 \left[\frac{1}{1+k} + \dots + \frac{1}{(1+k)^{N+1}} \right] \\ & \quad + \left[m_2 - \frac{k}{T} + \frac{k}{T} \right] S_0 \left[\frac{1}{(1+k)^{N+2}} + \frac{1}{(1+k)^{N+3}} + \dots \right] \\ &= \frac{k}{T} S_0 \left[\frac{1}{1+k} + \frac{1}{(1+k)^2} + \dots \right] + \left[m_1 - \frac{k}{T} \right] \frac{S_0}{(1+k)} \left[1 + \frac{1}{(1+k)} + \dots + \frac{1}{(1+k)^N} \right] \\ & \quad + \left[m_2 - \frac{k}{T} \right] S_0 \left[\frac{1}{(1+k)^{N+2}} + \dots \right] \\ &= \frac{S_0}{T} + fm_1 \frac{S_0}{k} \left[1 - \left(\frac{1}{1+k} \right)^{N+1} \right] + fm_2 S_0 \left[\frac{1}{(1+k)^{N+2}} + \dots \right] \\ &= S_0 \left\{ \frac{1}{T} + \frac{fm_1}{k} \left[1 - \left(\frac{1}{1+k} \right)^{N+1} \right] \right\} \end{aligned}$$

where

$$fm_1 = m_1 - \frac{k}{T}$$

and by assumption,

$$\begin{aligned} fm_2 &= m_2 - \frac{k}{T} \\ &= 0 \end{aligned}$$

For the total firm value, we then obtain

$$P = S_0 \left\{ \frac{1}{T} + \frac{fm_1}{k} \left[1 - \left(\frac{1}{1+k} \right)^{N+1} \right] + \frac{(fm)'}{k} G' \right\}$$

where G' has the new margin collapse form derived in Appendix 2B.

To relate this expression to the illustration depicted in Table 2.6, the cumulative present value of 7.56 (shown under “Current Sales”) corresponds to the factor,

$$\frac{1}{k} \left[1 - \left(\frac{1}{1+k} \right)^{N+1} \right]$$

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Franchise Margins and the Sales-Driven Franchise Value

In a global environment, any one company's cost advantage from geographical locale, cheaper labor, or more-efficient production sites can always be replicated, in time, by a sufficiently strong competitor with access to today's free-flowing financial markets. Thus, the ultimate key to a superior margin will be price, not cost. High-value firms will be those that can develop and/or sustain a sales-driven franchise with premium pricing across a range of product markets. The incremental pricing margin beyond that available to a "new commodity competitor"—one who would be content to earn only the cost of capital—is the "franchise margin." A sales-driven valuation model translates this pricing power into an estimate of capitalized firm value.

The franchise value (FV) approach for estimating a firm's intrinsic value is based on the differential returns on equity (ROEs) from its current and future investments.¹ Although derived from the standard formulations of the dividend discount model (see Williams 1938; Miller and Modigliani 1961; Gordon 1962, and Damodaran 1994), the franchise value approach provides greater flexibility in modeling today's corporate environment, in which capital is often *not* the scarce resource (Bernstein 1956; Solnik 1991). This demonstrates how ROE-based formulation can be transformed to a *sales-driven* FV model. Its development here is based on the

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simplest case of a tax-free, unlevered firm with coincident economic and accounting variables.²

In many ways, sales and investments are two sides of the same coin, but to view the opportunity for generating productive sales as the precursor and the ultimate motivation for investment requires a fairly major mental shift (Rappaport 1986). This sales-driven context proves particularly productive in valuing multinational corporations. Those firms have the size and reach to site production facilities anywhere in the world, resulting in a strong trend toward convergence in production efficiency. Increasingly, such megafirms are distinguished not by their production costs but by their distinctive approaches to specific markets. In other words, they create shareholder value through their *sales-driven franchise*.

The sales-driven FV model looks beyond earnings to the more fundamental considerations of sales generated and net margins obtained. A key feature of the investment-driven FV approach is that it distinguishes between the current business and its future opportunities. In the sales-driven context, the net margin on the current level of sales is differentiated from the margin on new sales growth. This distinction leads directly to the introduction of a simple but powerful concept—the franchise margin—to incorporate the capital costs required to generate new sales.

Another virtue of the sales-driven approach is the much brighter light that it shines on the fragility of a product franchise. In today's competitive environment, few products can count on long "franchise runs" with fully sustained profitability. At some point, the tariff barrier erodes, the patents expire, the distribution channel is penetrated, the competition is mobilized, or fashions simply shift. Over time, virtually all products become vulnerable to commodity pricing by competitors who would be quite happy to earn only a marginal excess return. Even without direct, visible competition, a firm may have to lower its pricing (and hence its margin) to blunt the implicit threat from phantom competitors (Statman 1984; Reilly 1994).

One way or another, the franchise runs out. This effect can be surprisingly large—even for a highly robust franchise that lasts for many years. One example in this chapter shows how the prospective termination of a valuable franchise—even 20 years hence—can pull down a firm's current P/E from a lofty 22 to below 13. History has shown that franchise erosion in one form or another can spread beyond individual firms, sometimes with devastating effect on entire economic regions and their financial markets (Brown, Goetzmann, and Ross 1995). These fundamental issues of franchise limitations are more clearly visible in a sales context than in the standard investment-based formulations with their emphasis on ROE estimation.

One word of caution is appropriate at the outset. In the application of

any equity valuation model, the analyst comes to a crossroads at which a fundamental decision must be made. Even a properly estimated valuation model can only quantify the current business activity and the more *visible* prospects for the future. In theory, all such visible and/or probable opportunities can be incorporated in the valuation process. Any analytic approach, however, will fall short of capturing the full value represented by a dynamic, growing, multinational corporation. The many remaining facets of a vibrant organization are difficult (or impossible) to fit into the confines of any precise model. Such aspects of value include the proven ability to aggressively take advantage of previously unforeseen (and unforeseeable) opportunities, a determination to jettison or restructure deteriorating lines of business, and a corporate culture that fosters productive innovation. At some point, analysts must draw the line by defining certain franchise opportunities as estimable and visible and relegating the remaining hyperfranchise possibilities to the realms of speculation and/or faith. To paraphrase Peter Bernstein (1996), analyzing a firm's future is akin to assessing the value of a continually unfinished game in which the rules themselves drift upon a tide of uncertainty. The purpose of this observation is to caution analysts that the results of any equity valuation model should be viewed only as a first step in a truly comprehensive assessment of firm value. At the very most, the modeled result should be taken as delineating the region beyond which an analyst must rely on imagination and intuition.

THE SALES-DRIVEN FRANCHISE MODEL

In many situations, the impetus for new strategic initiatives arises from the prospect of an exceptional sales opportunity. If these opportunities truly add economic value, then the capital investment involved in their pursuit should naturally lead to a correspondingly high ROE. Because the sales potential itself is the fundamental source of these corporate initiatives, it is generally more natural to use a sales-driven framework to estimate their effect on the firm's profitability, growth, and economic value.

In moving to a FV model based on sales, earnings are viewed as the result of a given level of sales activity and a net margin that relates each dollar of sales to a dollar of earnings. Although the original FV development was based on the traditional earnings construct, it is an easy transformation to express the FV model in terms of net operating income, free cash flow, or other measures of economic value (see Stewart 1991; Copeland,

Koller, and Murrin 1994; and Peterson and Peterson 1996). Nevertheless, because the earlier studies and much of current practice still follow the traditional “earnings mode” of analysis, we will stay with our earlier terminology for purposes of consistency.

Beginning with the current book of business, the annualized sales, S , can be related to the normalized earnings stream, E , with a net margin of m , so that

$$E = mS$$

Thus, the tangible value, TV , of the *current* business can be directly written as

$$\begin{aligned} TV &= \frac{E}{k} \\ &= \frac{mS}{k} \end{aligned}$$

where k is the discount rate, or cost of capital.

To provide an intuition regarding the magnitude of m , Figure 3.1 plots the average net margin for companies included in the Dow Jones Industrial Average (DJIA) from 1992 to 1996. (The values plotted are simple, unweighted averages of the ratios of quarterly operating earnings to sales for the 30 stocks composing the DJIA as of April 1, 1997.)

The value derived from future investments—the franchise value (FV)—can be derived in a similar fashion. Suppose the firm’s future products and market developments are expected to lead to a certain volume of new sales. For simplicity, all of these new sales are considered equivalent (in present value terms) to an incremental annual rate S' . Then,

$$\frac{S'}{k}$$

will correspond to the present value of all new sales. If each dollar of new sales earns a net margin, m' , then $m'S'$ will be the equivalent annual earnings associated with this new sales activity. Incremental sales, however, require incremental investment in the form of capital expenditures and increased working capital. The need to pay for the additional capital detracts from the value of the new sales to today’s shareholders. If we assume that a certain fraction, c' , of each dollar of new sales must be set aside to

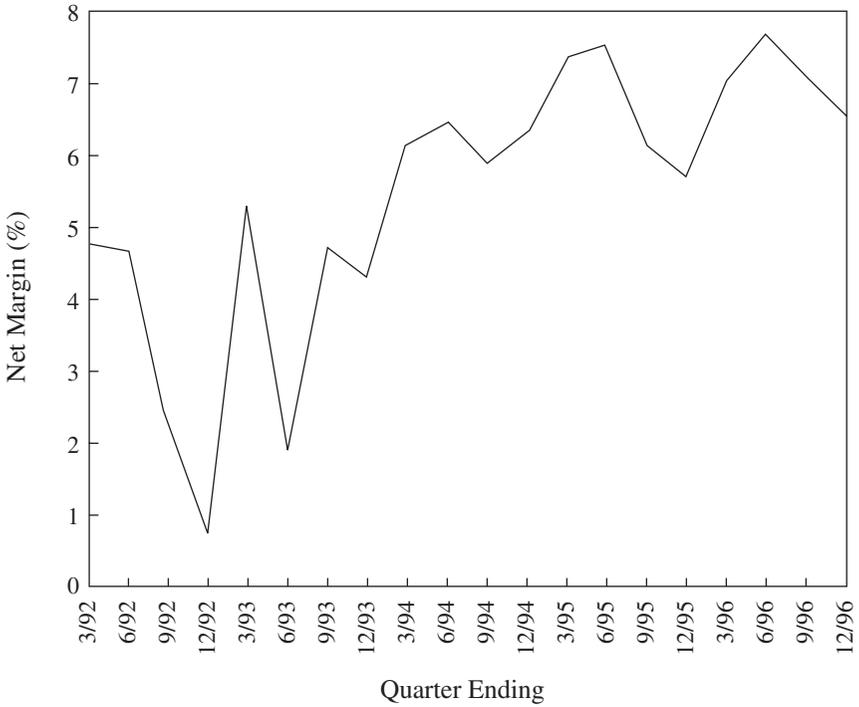


FIGURE 3.1 Average Net Margin of the 30 Stocks in the DJIA, 1992-96
Note: Average net margin is calculated as the ratio of net income (before extraordinary items) to sales.

cover the cost of this capital requirement, then the annual net excess earnings to today's shareholders becomes

$$m'S' - c'S'$$

The capitalized value of this excess earnings stream corresponds to the franchise value term in this sales-driven context,

$$\begin{aligned}
 FV &= \frac{m'S' - c'S'}{k} \\
 &= \frac{S'}{k}(m' - c')
 \end{aligned}$$

The total sales-driven firm value then becomes

$$\begin{aligned} P &= TV + FV \\ &= \frac{mS}{k} + \frac{S'}{k}(m' - c') \\ &= S \left[\frac{m}{k} + \frac{S'}{S} \frac{(m' - c')}{k} \right] \end{aligned}$$

We now define a sales growth factor, G' , to be the ratio of incremental new sales, S' , to current sales, S ; that is,

$$\begin{aligned} G' &\equiv \frac{S'}{S} \\ &= \frac{PV_{\text{New sales}}}{PV_{\text{Current sales}}} \end{aligned}$$

Then,

$$P = S \left[\frac{m}{k} + \frac{(m' - c')}{k} G' \right]$$

THE FRANCHISE MARGIN

The capital cost, c' , per dollar of sales is related to the commonly used ratios of sales turnover and asset turnover. For the purposes of this chapter, the term “sales turnover” refers to the total capital base that supports each category of annual sales. From this vantage point, the total capital base would include—in addition to inventory investment—all other elements of embedded or incremental capital. Thus, for the current annual level of sales, S , the turnover, T , would be defined as the ratio

$$T \equiv \frac{S}{B}$$

where B is the book value of the (unlevered) firm. Similarly, for the new sales, S' , the relevant capital base would incorporate expenditures for product development, added inventory, new working capital, new production

and distribution facilities, the marketing launch, and so forth. The turnover measure, T' , for these new sales would then become

$$T' \equiv \frac{S'}{\text{Incremental capital base}}$$

Because capital expenditures are assumed to bear an annual charge of k , k times the incremental capital base becomes the *annual* cost of providing the capital required to support the *annual* sales, S' . The capital cost, c' , per dollar of new sales would thus become

$$c' = \frac{k(\text{Incremental capital base})}{S'}$$

or

$$c' = \frac{k}{T'}$$

A similar relationship holds for the capital costs associated with the current level of sales.

Figure 3.2 displays a five-year history of the average sales-to-book-value ratio, T , for the companies composing the DJIA. The stability of these quarterly values around the average turnover value of 3.34 for the five-year period is surprising. This remarkable stability, however, is somewhat of an artifice in that it obscures significant company-to-company variation. Nevertheless, the company-specific turnover ratios for most of the firms in the index still appear to be fairly stable through time.

Figure 3.3 plots the relationship of c' (where $c' = k/T'$) to the turnover,

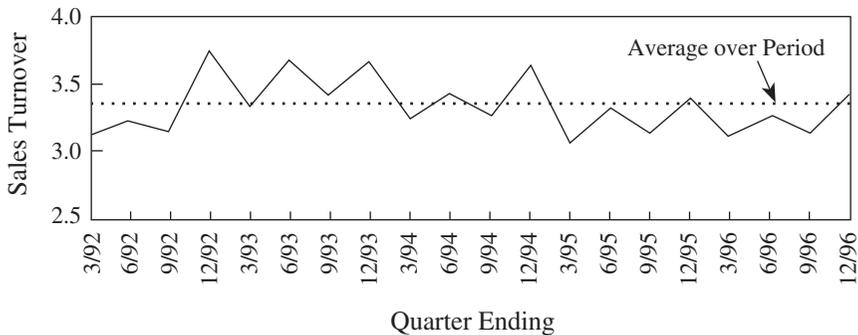


FIGURE 3.2 Average Sales Turnover of the 30 Stocks in the DJIA, 1992–96

Note: Average sales turnover is calculated as the ratio of annualized sales to initial book value (based on index composition as of April 1, 1997).

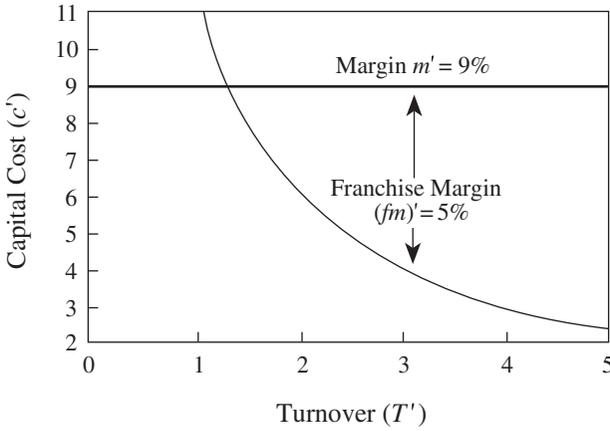


FIGURE 3.3 The Franchise Margin: Annual Capital Cost as a Percentage of Sales versus Sales Turnover Rate

T' , when $k = 12$ percent. Clearly, as T' goes up, c' goes down. For a net margin of 9 percent, a sufficiently high turnover (above $T' = 1.33$ in the diagram) is needed for the cost of capital to fall below the profit margin and lead to a true net excess profit. For a given turnover level, the extent by which the profit margin exceeds the unit cost of capital can be termed the “franchise margin” $(fm)'$; that is,

$$\begin{aligned} (fm)' &\equiv m' - c' \\ &= m' - \frac{k}{T'} \end{aligned}$$

Our basic valuation equation can now be written using this franchise margin as the coefficient for the net present value contribution of future sales,

$$P = S \left[\frac{m}{k} + \frac{(fm)'}{k} G' \right]$$

or

$$P/S = \frac{m}{k} + \frac{(fm)'}{k} G'$$

Similarly, the franchise margin allows the P/E to be expressed quite simply as

$$\begin{aligned} P/E &= \frac{P}{mS} \\ &= \frac{1}{k} + \frac{(fm)'}{mk} G' \end{aligned}$$

The franchise margin has a number of important intuitive interpretations. First, it can be viewed as the present value added per dollar of annual sales. A second interpretation is that the franchise margin represents the excess profit the company is able to extract from a given dollar of sales above and beyond that available to any well-financed, well-organized competitor who would be content merely to cover its cost of capital. This concept is important in a global market in which competitors with these characteristics are looming in the wings and would be able to field their products should any opportunity present itself. Moreover, in markets in which cost-of-production efficiencies offer no persistent benefits, the majority of the franchise margin will derive from the company's ability to extract a better price per unit of sales. In such circumstances, the franchise margin becomes a good proxy for the *pricing power* of the firm's product in a given market. In this sense, the franchise margin truly represents the special value of a brand, a patent, a unique image, a protected distribution system, or some form of intellectual property that enables a company to extract an excess profit in a particular market (Treynor 1994; Smith and Parr 1994; Romer 1994).

THE FRANCHISE MARGIN FOR THE CURRENT BUSINESS

The concept of a franchise margin can also be extended to the firm's current business. The implicit annual capital cost of the current book equity, B , is kB . With current sales, S , and margin, m , the net value annually added by the current business is

$$\begin{aligned} mS - kB &= S \left[m - k \left(\frac{B}{S} \right) \right] \\ &= S \left[m - \frac{k}{S/B} \right] \\ &= S \left[m - \frac{k}{T} \right] \end{aligned}$$

where T is the turnover ratio of total *current* sales to the book equity. If we now define a franchise margin, fm , for the current business as

$$fm \equiv m - \frac{k}{T}$$

then the capitalized net present value of the current business becomes

$$\frac{mS - kB}{k} = S \frac{fm}{k}$$

The firm's tangible value, TV, is the value of the current business—that is, the book capital already in place together with the *net* present value of earnings from the book investments. Thus,

$$TV = B + S \frac{fm}{k}$$

With these definitions, the firm's value can be expressed in a more symmetric form,

$$\begin{aligned} P &= TV + FV \\ &= B + \frac{S}{k} [fm + (fm)'G'] \end{aligned}$$

or

$$P/B = 1 + \frac{T}{k} [fm + (fm)'G']$$

In this form, it becomes clear that the firm can exceed its book value only by attaining franchise margins on either its current and/or its future sales.

In analyses of firm valuation, one often encounters ratios of price to earnings, price to cash flow, price to book value, and sometimes price to sales. In market practice, the price-to-earnings ratio is clearly the dominant yardstick—and by a wide margin (although cash flow is finding increasing use). Both earnings and cash flow, however, are less than totally satisfactory because of their instability and the difficulty in developing broadly accepted “normalized” estimates (Treyner 1972; Fairfield 1994). Because many historical artifices affect book value, the price-to-book ratio also raises many questions as a basis for comparing firms. A firm's sales have a reasonable claim to being a good denominator in that sales are based on a

fairly concrete flow that is relatively little affected by differing accounting conventions (Fisher 1984). It is thus worth pondering why the price-to-sales ratio is so rarely used and the more volatile price-to-earnings ratio is ubiquitous. In this connection, the franchise margin provides a particularly illuminating expression for the price-to-sales ratio,

$$P/S = \frac{1}{S} \left\{ B + \frac{S}{k} [fm + (fm)'G'] \right\}$$
$$= \frac{1}{T} + \frac{fm}{k} + \frac{(fm)'}{k} G'$$

Thus, P/S will exceed the reciprocal of the turnover only to the extent that either current sales or future sales growth provides a positive franchise margin.

Figure 3.4 illustrates the price/sales ratio for the current DJIA companies from 1992 to 1996. The horizontal line represents the reciprocal,

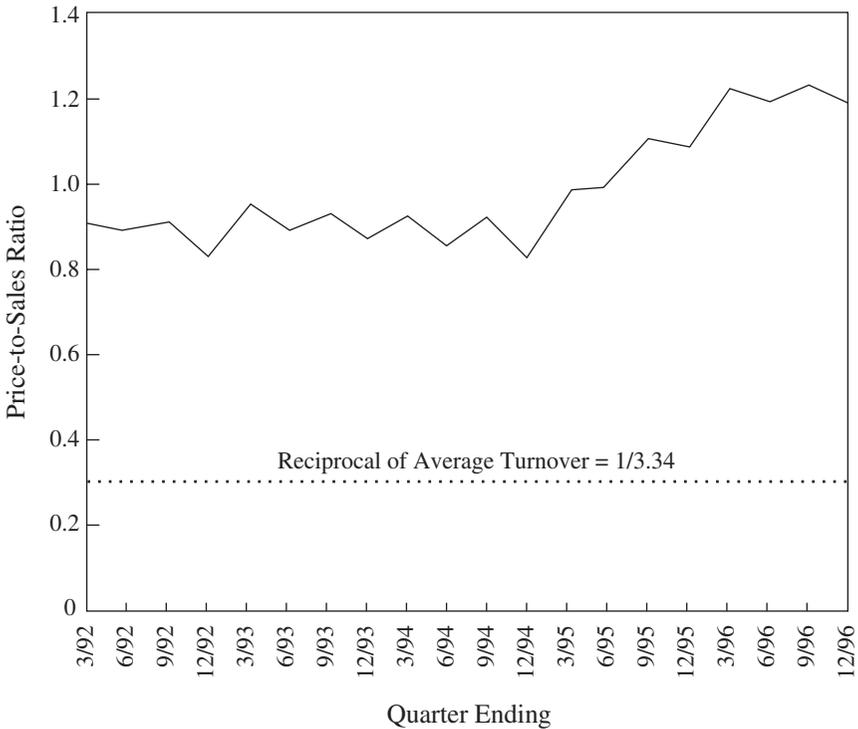


FIGURE 3.4 Average Price-to-Sales Ratio of the 30 Stocks in the DJIA, 1992–96
Note: Average price-to-sales ratio is calculated as the ratio of price at end of quarter to annualized sales.

$1/\bar{T}$, of the average turnover during this period ($\bar{T} = 3.34$). The P/S values above this line provide a crude measure of the contribution from the two franchise margin terms in the preceding equation.

SALES GROWTH MODELS

The estimate of future growth is clearly a central component of a firm's valuation. At the same time, the process of growth estimation is known to be particularly error-prone. Many of these problems, however, derive from implicit assumptions that are buried deep within the common formulations of "growth." The sales-driven approach helps to clarify many of these problems and to facilitate the selection of the most appropriate growth models.

For the simplest class of growth models, the starting assumption is that growth proceeds smoothly, at a constant rate per annum, and that this smooth growth continues indefinitely (i.e., the horizon is infinite). With this infinite horizon, a finite solution is achieved only when the growth rate, g , is less than the discount rate, k . For this very special case, the growth factor takes on the familiar form

$$G' = \frac{g}{k - g}$$

Thus, a uniform annual growth rate of 8 percent, discounted at 12 percent, leads to a G' of 2.

More generally, for sales growth that continues for N years and then stabilizes, the resulting sales growth factor, as derived in Appendix A of Leibowitz (1997), becomes

$$G'(N) = \left(\frac{g}{k - g} \right) \left[1 - \left(\frac{1 + g}{1 + k} \right)^N \right]$$

Table 3.1 provides a tabulation of $G'(N)$ values for various growth rates and growth periods.

This simple termination model enables us to deal with growth rates that could be far in excess of the discount rate and still get finite growth factors and finite firm values. Also, the growth factor, G' , remains the fundamental variable. What the growth rate is and how many years it persists do not matter, as long as they lead to the same growth factor. Any growth pattern that leads to a given growth factor will have the same effect on the

TABLE 3.1 Sales Growth Factors

Years of Growth	Growth Rate						
	6 Percent	8 Percent	10 Percent	12 Percent	14 Percent	16 Percent	18 Percent
1	0.05	0.07	0.09	0.11	0.13	0.14	0.16
2	0.10	0.14	0.18	0.21	0.25	0.29	0.33
3	0.15	0.21	0.26	0.32	0.38	0.44	0.51
4	0.20	0.27	0.35	0.43	0.51	0.60	0.70
5	0.24	0.33	0.43	0.54	0.65	0.77	0.89
10	0.42	0.61	0.82	1.07	1.36	1.68	2.06
15	0.56	0.84	1.18	1.61	2.13	2.77	3.56
20	0.67	1.03	1.51	2.14	2.97	4.07	5.52
25	0.75	1.19	1.81	2.68	3.90	5.62	8.06
30	0.81	1.32	2.09	3.21	4.90	7.46	11.36
Infinite horizon	1.00	2.00	5.00	—	—	—	—

Note: Assumes growth over each year leads to higher rate of annual sales at beginning of next year, resulting in higher sales and earnings receipts at the end of the next year.

firm's value. In fact, one can go beyond a smooth annual growth rate to any irregular pattern of development. *Any* such pattern—no matter how bizarre—can be represented by an appropriate growth factor.

Although this basic growth model has the virtue of simplicity, the idea that a franchise advantage can be maintained indefinitely involves a certain logical inconsistency. Just as nature abhors a vacuum, so the world of economics abhors a perpetual franchise. Competition in one form or another will eventually erode even the very best franchise. The selection of the most appropriate model for “franchise termination” can have a major effect on any estimate of a firm's value.

One termination model treats all ongoing sales—at the annual levels reached prior to the termination point—as retaining their respective franchise margins. This model will be referred to as the “sustained margin” case. The productive sales flows exactly correspond to those that would result from growth coming to a halt at the termination point; both the new sales margin and the then-achieved annual sales level continue indefinitely.

This basic approach of growth termination at some specified time horizon is widely encountered throughout the investment literature. In fact, the investment-driven analogue of this growth-horizon model forms the basis for virtually all commonly used valuation formulas—including the popular

multiphase dividend discount models. In ROE investment terminology, the assumption is that all investments made prior to the termination point continue to earn the same ROE on an annual basis—past the termination point and on to perpetuity.

A second, and vastly different, “end game” treatment arises more naturally from the sales-driven context. Suppose that franchise termination means that from the termination point forward, the margins collapse down to a commodity-pricing level on *all sales growth* (i.e., on all sales above the original level associated with the current book of business). This assumption is radically different in that beyond the termination point, it curtails all increments of value from new sales. In this “collapsing new margin” interpretation, the residual value for today’s shareholders of future new sales beyond the termination point is zero. Intuitive clarity would seem to argue for this cruder but simpler model of a total cessation of value enhancement. After all, when a market ceases to provide franchise pricing, the margin collapse should logically apply to *all* such future sales. Merely because a given level of new sales was reached prior to the termination point, it does not follow that this sales level should be spared from the margin collapse. As might be expected, a firm’s estimated value may be radically reduced when an analyst shifts from a sustained franchise margin to a collapsing new margin viewpoint.

A third, even more stringent termination model assumes that *all* franchise margins collapse. In other words, this “total margin collapse” model presumes that if competition is so fierce as to drive the franchise margin on *new* sales down to zero, then it is also likely to destroy any franchise margin on *current* sales. (An exception to this argument might be multinational environments with differential barriers to competition.)

FRANCHISE-TERMINATION EXAMPLES

The following examples illustrate the three termination models. The discount rate is set at $k = 12$ percent, and both turnover rates are fixed at $T = T' = 3$. The current business has a book value, B , of \$100, annual sales of \$300 per share with a 6 percent margin, and earnings of \$18 per share. The different franchise-termination models are depicted schematically in Figure 3.5, which shows the value contributions derived from the various components of sales. Table 3.2 summarizes the assumptions and results obtained from these examples.

The base case consists of infinite sales growth at 8 percent with constant franchise margins. For this base case, all sales components under the growth curve sustain their respective margins and so contribute fully to

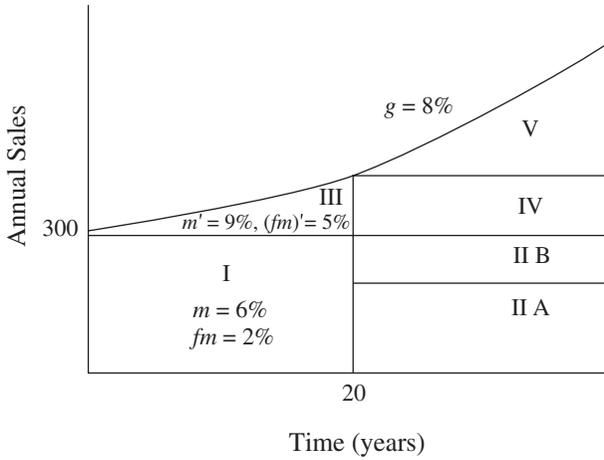


FIGURE 3.5 Growth Patterns in Franchise-Termination Models
 Note: The discount rate is $k = 12$; the turnover rate is $T = T' = 3$.

firm value. Because the initial margin is sustained indefinitely, the tangible value of the current business becomes

$$\begin{aligned}
 TV &= \frac{mS}{k} \\
 &= \frac{0.06 \times 300}{0.12} \\
 &= 150
 \end{aligned}$$

This value reflects full contributions from Areas I, IIA, and IIB in Figure 3.5. New sales are generated with an initial margin, m' , of 9 percent, for a franchise margin of 5 percent; that is,

$$\begin{aligned}
 (fm)' &= m' - \frac{k}{T'} \\
 &= 0.09 - \frac{0.12}{3} \\
 &= 0.05
 \end{aligned}$$

TABLE 3.2 Firm Valuations from Various Franchise-Termination Models

	Infinite Growth	Sales Growth Terminated at 20th Year		
	Sustained Margins	Sustained Margins	New Margin Collapse	Total Margin Collapse
<i>Margin on area^a</i>				
I	6%	6%	6%	6%
II	6	6	6	4
III	9	9	9	9
IV	9	9	4	4
V	9	4	4	4
<i>Franchise margin on area^a</i>				
I	2%	2%	2%	2%
II	2	2	2	0
III	5	5	5	5
IV	5	5	0	0
V	5	0	0	0
Tangible value	150	150	150	146
Franchise value	250	129	86	86
Intrinsic value	400	279	236	232
P/E	22.22	15.48	13.12	12.90
P/S	1.33	0.93	0.79	0.77
P/B	4.00	2.79	2.36	2.32

Note: Discount rate $k = 12$ percent, sales growth rate $g = 8$ percent, turnover ratio $T = T' = 3$, and initial sales $S = 300$.

^a“Area” refers to schematic sales regions depicted in Figure 3.5.

For the base case of infinite growth with sustained margins, the growth factor can be determined from

$$\begin{aligned}
 G' &= \frac{g}{k - g} \\
 &= \frac{0.08}{0.12 - 0.08} \\
 &= 2.00
 \end{aligned}$$

leading to a franchise value of

$$\begin{aligned}
 FV &= \frac{(fm)'}{k} G' S \\
 &= \frac{0.05}{0.12} \times 2.00 \times 300 \\
 &= 250
 \end{aligned}$$

This amount reflects full contributions from the new sales depicted by Areas III, IV, and V. The firm's intrinsic value per share thus becomes

$$\begin{aligned} P &= TV + FV \\ &= 150 + 250 \\ &= 400 \end{aligned}$$

with price ratios of

$$\begin{aligned} P/E &= \frac{400}{18} = 22.22 \\ P/S &= \frac{400}{300} = 1.33 \\ P/B &= \frac{400}{100} = 4.00 \end{aligned}$$

Now, consider termination situations in which productive sales growth comes to a halt after 20 years. At this point, annual sales will have risen mightily to a level of \$1,400 per share. In the simplest model—termination with sustained margins—productive sales stabilize and remain at this level in perpetuity. In essence, we have removed any contribution from Area V in Figure 3.5. The growth factor for the remaining areas, III and IV, is given by the formula cited earlier:

$$G'(N) = \left(\frac{g}{k-g} \right) \left[1 + \left(-\frac{1+g}{1+k} \right)^N \right]$$

From Table 3.1, which tabulates the values for $G'(N)$, we find that for g of 8 percent and N equal to 20,

$$G'(20) = 1.03$$

After a full 20 years of growth leading to an almost quintupling of the annual sales level, this value of $G'(20)$ is a surprisingly large reduction from the $G' = 2.00$ value for perpetual growth.

This growth factor leads to a correspondingly reduced franchise value:

$$\begin{aligned} FV &= \frac{(fm)'}{k} G'(20)S \\ &= \left(\frac{0.05}{0.12} \right) \times 1.03 \times 300 \\ &= 129 \end{aligned}$$

Because the TV remains unchanged,

$$\begin{aligned} P &= TV + FV \\ &= 150 + 129 \\ &= 279 \end{aligned}$$

with price ratios $P/E = 15.48$, $P/S = 0.93$, and $P/B = 2.79$. Here again, the dramatic reduction in P/E from 22.22 to 15.48 is quite striking, given that 20 years at full margin is a rather impressive “franchise run” for any company.

The deletion of Area V as a value contributor results from the leveling of *productive* sales after 20 years. Thus, even if *literal* sales growth continued at 8 percent indefinitely, the same valuation would be obtained if margins on incremental new sales declined to $m' = 4$ percent after the 20th year. This profit deterioration would drive the franchise margin to zero, and all such incremental sales would then provide no further contribution to today’s shareholder value. In this sense, *productive* sales would have leveled off, regardless of any continued growth in literal sales. Only sales with a positive franchise margin can contribute to firm value.

The third example is a termination model in which competitive pressure is so severe that *all* new sales beyond the 20th year have margins that just match the commodity-pricing level. In essence, this condition removes both Areas IV and V of Figure 3.5 from providing a value contribution. The growth factor for this case of new margin collapse turns out to be 0.69. (See Leibowitz 1997 for a detailed calculation.) Tracing through the same prices as above, the firm’s intrinsic value is seen to decline to 236 and the P/E drops to 13.12.

Finally, in the last franchise termination model, the competition becomes so intense that even the margin on the original sales volume is reduced to commodity-pricing levels after the 20th year. In this case of total margin collapse, the lower capitalized value of the original sales reduces the firm’s TV to 146. (See Leibowitz 1997 for the detailed computation.) This decrement is depicted schematically in Figure 3.5 through the deletion of Area IIB. As shown in Table 3.2, the firm’s intrinsic value is reduced to 232 with a P/E of 12.90. This rather modest reduction from the preceding example is a direct result of the choice of a 20-year initial period—shorter horizons would result in a more serious decrement.

This discussion of termination models is certainly not intended to be an exhaustive characterization of how franchises can wind down. Indeed, just as the creation and development of a franchise is a highly complex and dynamic process, so a franchise’s expiration may take on far more forms than can be readily categorized. Rather, the purpose in exploring

the implications of these simple termination models is to illustrate the following key points:

- Virtually any limit to a firm's franchise (even after as long a run as 20 years) can have an extraordinary impact on firm value.
- Seemingly subtle differences in the assumed nature of the franchise limit can also lead to major valuation swings.
- The sales-driven model—by its very nature—brings to the surface fundamental analytic issues that lie buried within the more standard investment-driven formulation.

THE HYPERFRANCHISE

From a theoretical point of view, the franchise value calculation should incorporate all prospects *and* probabilities for sales at a franchise margin. Theoretically, in an ideally transparent market, an analyst would be able to peer into the future to uncover all forthcoming additions to the firm's present value.

When the valuation model is based on a finite set of franchise values, however, the firm must be assumed to ultimately chew through these opportunities in the course of time. Eventually, it will exhaust the prospects and its P/E will decline to the base value of current earnings over the discount rate (or in our sales-driven model, to a price-to-sales ratio that is just equal to the reciprocal of the turnover rate). To preserve an elevated price/earnings ratio, or even to maintain it at levels above the base ratios, management must continue to access additional “franchise surprises” that were not previously embedded in the market forecasts. Of course, these surprises could take the form of actualizations of the happier outcome of prospects that had previously been only discounted probabilities (as when a new drug is actually approved for clinical use by the Food and Drug Administration). A more general construct, however, is to recognize that firms with access to sizable markets on a franchise basis are likely to have an organization, a management culture, and a level of corporate energy that can lead to future franchise opportunities that are currently unimaginable. In essence, the hyperfranchise relates to the value of a continuous series of options that enable the firm to select and pursue those emerging opportunities that best fit its resources and strategic goals at each point in time.

The “hyperfranchise value” can surpass any anticipation of specific market opportunities that may be on the horizon. It represents a positive wild card in the valuation of a great corporation. (By the same token, the cult of ever-growing market share and management ego trips can

lead to destruction of value and may hence represent a negative form of hyperfranchise.)

The hyperfranchise is clearly an elusive concept and generally quite difficult to measure. Nevertheless, it can be a major component of firm value. Moreover, many practical business leaders focus on enhancing their firm's position to take advantage of potential future opportunities that are currently undefinable. To be sure, they do not call it "the pursuit of hyperfranchise"—"vision" is a more likely term. In some respects, hyperfranchising is like a game of chess in which a player strives to achieve a positional advantage. Continuing this analogy, just as a chess player may sacrifice some tactical advantage to attain a better position, so a visionary manager may invest capital or even exchange visible franchise value in order to enhance the firm's hyperfranchise. Indeed, although forgoing maximum profitability to gain market share can be based on a variety of short- and long-term considerations, the pursuit of hyperfranchise may well be one such motivation. Any hyperfranchise will of course itself depend on the nature of the market economy at the time. When more opportunities are opening up globally, when trade barriers are falling, when the best firms can freely confront their peers on a fair playing field, then a hyperfranchise will have a much higher value. In periods of economic contraction, trade frictions, and increased regulation, the hyperfranchise value may not count for nearly as much, even in the very best of firms.

CONCLUSION

The sales-driven franchise value approach suggests a different way to view multinational firms. Envision the global economy in the future as being composed of a set of current product markets, new product markets, and even some hypothetical "hypermarkets" of the yet-to-be-imagined variety. One can then ask the question, "Which firms have the ability to access these markets in a fashion that will generate a positive franchise margin for a significant span of time?" The first set of candidates will be corporations with areas of regional dominance in which the franchise is achieved by barriers to entry that may persist into the future (e.g., German life insurance companies may enjoy a particular competitive advantage for some time with respect to German nationals). In other cases, the brand name and associated imagery surrounding a particular product may project a firm's franchise into distant markets and create sources of value that persist far into the future. In all cases, one would be well advised to think of the inevitable pressures that must be brought to bear on positive franchise margins and their likely duration in the face of global competition and new product innovation. Those firms that can lever their existing product line

and their corporate resources to deliver products that truly have pricing power (and the added value that justifies that pricing power) should be the long-term winners in this valuation game.

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Franchise Value and the Price/Earnings Ratio

This chapter contains the first series of franchise value studies by Martin L. Leibowitz and Stanley Kogelman, which were published over the period from 1990 to 1992. The concept of franchise value is first introduced, the “perpetualization” approach is explored, and this general approach is then applied to a number of topics including spread banking, leverage, growth processes (and illusions), inflation effects, equity duration, and accounting-to-valuation translations.

The sections that form the body of this chapter were originally published as papers by Salomon Brothers Inc (SB). Later, the articles were published in slightly revised form in the *Financial Analysts Journal (FAJ)* or the *Journal of Investing*. The published titles and dates are as follows:

- “Inside the P/E Ratio: The Franchise Factor,” *FAJ*, November/December 1990.
- “Inside the P/E Ratio (Part II): The Franchise Portfolio,” SB, January 1991.
- “A Franchise Factor Model for Spread Banking,” SB, April 1991.
- “The Franchise Factor for Leveraged Firms,” *FAJ*, November/December 1991.
- “Franchise Value and the Growth Process,” *FAJ*, January/February 1992. (Received Graham & Dodd Scroll)
- “The Growth Illusion: The P/E Cost of Earnings Growth,” SB, April 1993. (Received Graham & Dodd Scroll)
- “Inflation-Adjusted ROEs: Strong Effects Even with Low Inflation,” *Journal of Investing*, Winter 1993.
- “Resolving the Equity Duration Paradox,” *FAJ*, January/February 1993.
- “Theoretical P/Es and Accounting Variables,” SB, June 1992.

Introduction

This chapter introduces the *franchise value* (FV) approach to analyzing the prospective cash flows that determine a company's price/earnings ratio. The FV technique provides more flexibility and greater insight than the standard dividend discount model, particularly in light of the dynamic character of today's financial markets.

The decade of the 1980s brought remarkable changes to the business environment not only in the United States but also throughout the world. Products, capital, and expertise began to flow across corporate and national boundaries at an unprecedented pace, and this fluidity of resources breached the traditional constraints on growth and development. New enterprises and regional economies surged into prominence. For investors and entrepreneurs, opportunities to facilitate and participate in this growth were exceptional.

Ironically, the same factors that created investors' successes in the 1980s are adding to their headaches in the 1990s. In this new decade, all economic processes have shifted into fast forward. Product cycles have shortened. Brilliant innovations are quickly reverse-engineered—and then often surpassed. Wonderful ideas rapidly become accepted knowledge or, worse, stale news. The advantages of firm size are no longer overriding, nor can a well-established firm rely on exclusive access to the capital, technical knowledge, and distribution muscle that in earlier days would have ensured continued market dominance.

The global economic machine is working in high gear day and night to reduce everything that was once unique and precious into broadly distributed commodities. Among the first casualties of this global leveling has been the ability of many companies to sustain and compound their historically high levels of profitability. "Earnings momentum" has become an oxymoron.

This environment creates many difficulties for a modern equity investor. Because newly empowered global competitors can challenge the champions in any market, the bridge between a company's past success and its future prospects is increasingly fragile. Today's investor cannot follow the custom of extrapolating past levels of return to tomorrow's investments. The investor must carefully assess each of the following aspects of a firm: (1) the sustainable returns that can be expected from current businesses, (2) the prospects for growth through the pursuit of

new investments, and (3) the return level that can be achieved from those investments.

Just as basic earnings measures indicate the reward that existing businesses offer, the price/earnings ratio (P/E) gauges the market's assessment of the firm's future. To merit a high P/E, a firm must have the prospect of significant earnings growth. Moreover, to the extent that this growth is fueled by new investment, the firm must have the ability to earn an extraordinary return on that investment. Normal returns on future growth prospects will provide no P/E benefit whatsoever. Indeed, no matter how great its expansion in markets, revenues, or earnings, the firm that cannot generate an above-normal profit on future investment cannot command a high P/E. Therefore, high P/Es will surely be even more difficult to sustain in the new market environment than they were in the old. After all, if normal profits are fragile and short-lived, extraordinary profits become all the more scarce and tenuous.

To be useful, any theoretical P/E model should reflect the realities of the business environment, but the standard dividend discount model (DDM) has its limitations in this regard. Although the DDM has always had great appeal because of its fundamental simplicity, this simplicity belies a complex bundle of assumptions that have become increasingly untenable. In particular, the most common form of the DDM embodies the following assumptions:

- Return on equity (ROE) is stable.
- Earnings growth is smooth—at least for specific time spans.
- The financing of new initiatives is solely through retained earnings.
- All growth is beneficial to current shareholders.

Although the FV approach is founded on a more general framework than the DDM, it retains the original DDM's essential simplicity and intuitive appeal. In addition, the FV approach is in several ways better attuned to today's realities:

- In the FV approach, the return from new investments is differentiated from the current ROE.
- Earnings growth from new investments can follow any pattern, no matter how erratic, over time.
- Growth per se is not viewed as evidence of highly profitable investments.
- Productive new investments are assumed to be a scarce resource, limited by the availability of good opportunities rather than by the financing levels attainable from retained earnings.
- The level of retained earnings may have little to do with the "excess profit" potential of new investments; if good projects are not available, earnings retention cannot create them.

At the outset, the FV approach differentiates the firm's past from its future by separating its value into two components: the *tangible value* of existing businesses and the earnings that they are likely to generate over time, and the *franchise value* derived from prospective new investments. The franchise value is then further divided into two factors: a *growth equivalent* that captures the present value of the opportunities for productive new investment, and a *franchise factor* that captures the return levels associated with those new investments. This decomposition provides an intuitive and simplifying framework for separating past, current, and future cash flows and for isolating the different effects that size and achievable returns have on the firm's P/E.

The FV approach allows a much clearer focus than the DDM on how corporate and economic events affect the different components of firm value. Building on this foundation, models are developed that address several important investment issues: reinvestment policy, capital structure, taxes, accounting practices, inflation, and duration.

The analysis leads to the following observations, some rather surprising, about the determinants of the P/E ratio:

- A no-growth firm will have a low "base P/E," one that is simply the reciprocal of the equity capitalization rate appropriate to the firm's risk class.
- High P/Es result only when growth comes from new projects that provide sustainable above-market returns.
- The P/E impact of new investments depends on the size of those investments relative to current book equity. Consequently, enormous dollar investments may be necessary for a significant effect on the P/E of large companies.
- The P/E-producing power of any new investment can be approximated from a knowledge of its internal rate of return and the duration of the payouts.
- Leverage changes the P/E in different directions, depending on the firm's preleverage P/E. This effect is surprisingly modest, however, within the range of conventional debt ratios.
- High P/Es have an intrinsically fragile character. To maintain a high P/E, a firm must continue to uncover new and previously unforeseen investment opportunities of ever greater magnitude.
- When franchise investment opportunities are limited in both scope and timing, the P/E will decline toward the base P/E.
- During a finite franchise period, price growth and earnings growth will differ. The gap between the two growth rates can be approximated by the rate of P/E decline.
- Three factors contribute to a price-to-book premium: (1) a *market-to-book premium*, which results when economic book value exceeds

accounting book value; (2) a *going-concern premium* attributable to an above-market economic return on the current market value of assets; and (3) a *future franchise premium* based on the income-producing power of new investments.

- The ability to pass along inflation increases, even partially, can dramatically enhance a firm's P/E.
- A firm's future investments are likely to be far more adaptive to unexpected inflation than its existing businesses. Consequently, when the value of a firm's equity is derived primarily from prospective businesses, its interest rate sensitivity (equity duration) is likely to be low.
- The FV approach helps explain why equities have much lower observed durations than the high levels suggested by the standard DDM.

All these findings are included in the nine sections that form the body of this chapter. In a sense, these sections represent the evolution of our thinking as we attempted to piece together the ingredients of high P/Es.

"The Franchise Factor" develops the basic FV model and provides definitions and examples of the franchise factor and the growth equivalent. "The Franchise Portfolio" shows how to compute the franchise P/E when a firm has a range of investment opportunities with different return patterns. A key ingredient in this analysis is the development of perpetual streams of "normalized earnings" having the same present values as the more erratic paths of projected earnings. Normalized earnings naturally lead to normalized ROEs, which can be used to test the reasonableness of long-term earnings projections. "A Franchise Factor Model for Spread Banking" applies the FV model to the spread-banking activities found in commercial banks, insurance companies, investment banks, brokerage firms, and many other financial enterprises.

To this point in the chapter, the model makes the simplifying assumptions that firms are tax free and financed solely with equity, and it focuses on the P/E at a single moment in time. The next three sections address these issues directly.

"The Franchise Factor for Leveraged Firms" explores the effects of debt and taxes on the P/E. To a certain extent, the results are counterintuitive. Informal polls reveal that practitioners and academics hold strong but widely divergent views on the directional effects of leverage. Surprisingly, this study finds that either view is correct—under the right conditions. For firms with meager growth prospects and low P/Es, leverage further reduces P/Es. In contrast, for firms with already high P/Es, the introduction of leverage actually elevates those P/Es.

The situation of a firm that has a prescribed set of future franchise opportunities is the subject of "Franchise Value and the Growth Process." This firm's P/E will be greatest when projected investment opportunities

are at their maximum present values. In time, as new investments are made, franchise value is depleted and converted into tangible value. Because tangible value is fully reflected in the base P/E, the P/E will decline toward the base level. After the prescribed franchise is fully consumed, earnings, dividends, and price will all grow at a single rate determined by the firm's retention policy, but the P/E will remain at the low base level.

"The Growth Illusion: The P/E 'Cost' of Earnings Growth" continues the discussion of growth. Its value-preservation line illustrates the continuum of combinations of year-to-year earnings growth and P/E growth that can lead to equivalent levels of price growth. This line enables one to distinguish growth that is value enhancing from growth that is merely value preserving or, worse, value depleting.

The next two sections are devoted to two key issues in a dynamic marketplace: inflation and changing interest rates. Even in a low-inflation environment, long-term investors are under pressure to achieve positive real returns. Companies that can increase earnings to keep pace with inflation tend to be more valuable than otherwise comparable firms that lack this flow-through capacity. Indeed, in countries with very high inflation, high flow-through capability is a prerequisite for survival.

In "The Effects of Inflation," an inflation adjustment factor that reflects a firm's flow-through capacity is developed. This factor permits a simple modification of the earlier formulas that shows how inflation flow-through can lift the base P/E and boost the franchise power.

"Resolving the Equity Duration Paradox" demonstrates how inflation flow-through can dramatically change the interest rate sensitivity of equity. Although the standard DDM predicts an extraordinarily long equity duration, 25 to 50 years, statistical analyses indicate that equity duration is closer to 2 to 6 years. This paradox is resolved by considering separately the durations of the franchise value and the tangible value. For discount rate changes driven by inflation, the FV approach argues for a very low franchise-value duration and a tangible-value duration of 6 to 10 years. This finding leads to a low overall firm duration, which is consistent with observed market behavior. Armed with an understanding of the nature and level of equity duration, portfolio managers can readily calculate their total portfolio durations and, if necessary, adjust their asset mixes to create better matches between the rate sensitivities of assets and liabilities.

As yet, the discussions have made no distinction between economic and accounting measures of earnings, book values, and returns. To facilitate comparisons between observed and theoretical market multiples, therefore, the final section introduces a "blended P/E" computed from a theoretical franchise-factor-based price and the reported accounting earnings.

In summary, the concepts and methodology of the FV approach lead to fresh insights into the building blocks of value. By working backward from

an observed P/E, one can isolate the assumptions for growth and return implicitly embedded in the P/E and assess their reasonableness.

Capital expenditure and product development plans can be the starting point for estimating a firm's franchise opportunities and its appropriate P/E ratio. When the plans include a limit to the franchise opportunities, the P/E projections should generally reflect an ultimate erosion down to base levels. This sobering insight highlights the fragility of franchises and the unrelenting pressure on companies to seek out new avenues for profitable future growth.

The Franchise Factor

Equity analysts use a combination of judgment, understanding of an industry, and detailed knowledge of individual companies plus an arsenal of analytical models and measures to help them assess value. These measures include cash flow, return on equity, dividend yield, and such financial ratios as price/earnings, price to book value, earnings per share, and sales per share. Among the ratios, the P/E is one of the most scrutinized, modeled, and studied measures in use today.

The classic approach to estimating a theoretical P/E is the dividend discount model. Originally proposed by Williams (1938), this model has been modified and extended by many others.¹ Despite this abundance of literature, significant insight into the influence of various factors on P/E multiples can be gained from delving more deeply into the DDM-based models. For example, the authors have found that the investment community often does not appreciate the magnitude and type of growth required to support a high P/E multiple.

The problem stems, in part, from researchers' tendencies to model growth in a simplistic manner as proceeding smoothly at a constant rate, self-funded by retained earnings, and generating added earnings with each growth increment. This convenient and appealing concept forms the basis for most standard forms of the DDM; that is, these models are built on the assumption that dividends, earnings, and/or book values grow at the same constant rate. This growth usually is taken either to continue at the same rate forever or to be composed of two or three different growth rates covering consecutive time periods. Most DDMs further assume that the growth in dividends is solely the result of retained earnings.²

Despite its appeal, this simple concept of growth can be misleading in several ways. First, not all growth produces incremental value. A simple il-

lustration is the “growth” in the amortized value of a discount bond. This growth does not add to the bond’s promised yield to maturity; it is simply one means of delivering on that original promise. The situation is similar for equities: *Growth alone is not enough*. The routine investments a firm makes at the market rate do not add net value, even though they may contribute to nominal earnings growth. (Investments at below-market returns actually subtract from value.) Incremental value is generated only through investment in *exceptional* opportunities that promise above-market ROEs.

Thus, researchers must be careful to distinguish between the different kinds of growth. To do so is often difficult, however, because we are accustomed empirically to viewing the aggregate growth of an overall corporate entity. In the context of total growth, a rate of 8 percent may, on the surface, seem admirable, but in fact, it reveals nothing exceptional about the firm if the firm is obtaining only the market return on all its new investments. Value is added only on that portion of the 8 percent growth that is achieving above-market returns. If the entire 8 percent year-to-year growth is in investments at above-market rates, then this corporation may indeed be offering the investor something special. Only exceptional, “high-octane” growth fuels the engine driving high P/E multiples.

Another point of confusion inherent in the usual growth assumptions is the notion that growth should be self-funded out of retained earnings. This concept is also appealing: The smoothly growing flow of new investments appears to be a sign that the thrifty corporation and its investors will be rewarded. The key issue is not whether the company has retained earnings to self-fund a new investment opportunity, however, but whether that opportunity offers an above-market return. Such exceptional opportunities are, by definition, few and far between. Thus, when a corporation is presented with such a franchise opportunity, it should pursue the investment regardless of whether the funds are in its corporate coffers. In today’s financial markets, by issuing new securities, a firm should always be able, theoretically, to participate in an opportunity to earn above-market returns.

This section looks inside the DDM-based price/earnings ratio and relaxes the restrictions imposed by assuming smooth growth through retained earnings. The resulting model of the exceptional future investment opportunities implicit in any given P/E is surprisingly simple. By representing all future investments by their present values, the model can capture in a single number the impact of all embedded investment opportunities on a firm’s P/E. This number is called the franchise factor (FF).

The focus of this model is narrow. It assumes a stable market in which all stocks are unleveraged and priced according to the DDM. Thus, it does not account for the uncertainty and volatility that are endemic in the equity markets. It also assumes that all earnings are properly reported and

that each firm's ROE remains unchanged over time. In fact, in the discussion of the price/earnings ratio, equity investments are treated as if their earnings, growth, and dividends were all certain. In essence, this approach tackles the complex and uncertain cash flows associated with equities in much the same manner as an analysis of the price and yield characteristics of risk-free bonds.

A Spectrum of Illustrative Firms

To explore the interactions between the P/E, the ROE, growth, and the FF, the next subsections consider the cash flows and reinvestment incomes of four illustrative firms. Relevant financial characteristics of these firms are presented in Table 4.1.

Firm A: Stable Growth in Earnings and Dividends Firm A holds to a constant-dividend-payout policy and expects earnings to grow at a steady 8 percent a year far into the future. Now, examine the cash flows to an investor in Firm A under the simplifying assumption that the investment is subject to neither risk nor taxes. The investor's return will have three components: dividend return, price return, and reinvestment return.³ Because earnings grow at 8 percent and dividend policy remains unchanged, dividends also will grow at 8 percent (see the solid bars in Figure 4.1).

Price appreciation is a consequence of the assumptions regarding the firm and use of the DDM for pricing the stock. The DDM implies that, in a static market, price growth will keep pace with dividend growth. Thus, if dividends grow at 8 percent, the stock price will also grow at 8 percent (see the middle bars in Figure 4.1). A new investor who buys Firm A's stock will

TABLE 4.1 Financial Characteristics of Firms A, B, C, and D

Characteristic	Firm A: Stable Growth	Firm B: No Growth	Firm C: Market ROE	Firm D: Reinvestment
Book equity	\$100.00	\$100.00	\$100.00	\$100.00
ROE	12.00%	12.00%	15.00%	15.00%
Earnings	\$ 12.00	\$ 12.00	\$ 15.00	\$ 15.00
Payout ratio	33.33%	100.00%	100.00%	33.33%
Dividend	\$ 4.00	\$ 12.00	\$ 15.00	\$ 5.00
Market rate	12.00%	12.00%	12.00%	12.00%
DDM price	\$100.00	\$100.00	\$125.00	\$250.00
Dividend yield	4.00%	12.00%	12.00%	2.00%
Growth rate	8.00%	0.00%	0.00%	10.00%
P/E	8.33	8.33	8.33	16.67

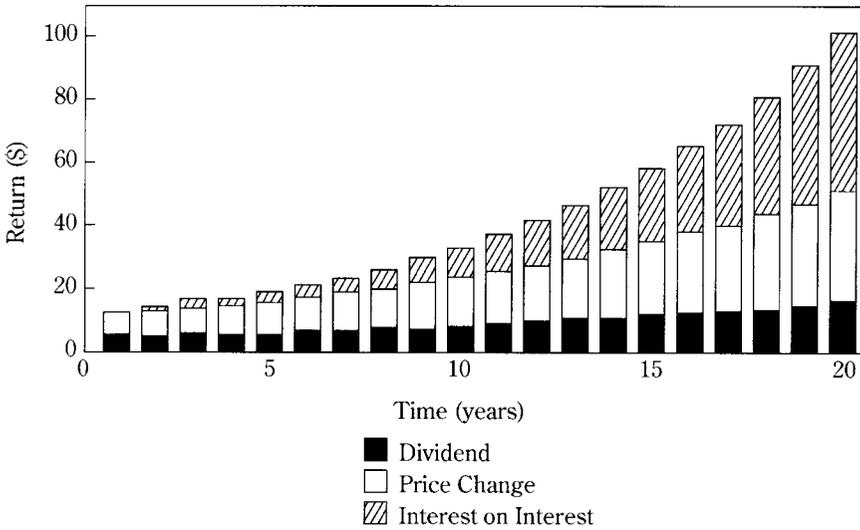


FIGURE 4.1 Growth in Portfolio Value for a Firm with an 8 Percent Growth Rate and a 12 Percent ROE (Firm A)

realize a 4 percent return from dividends and an 8 percent return from price appreciation. In total, in the course of one year, the investor will experience a return on the stock purchase price that is equal to the market rate, which is assumed to be 12 percent.

In the absence of risk, the stock of Firm A is equivalent to a perpetual bond with increasing principal and a constant 4 percent coupon. If the principal is initially \$100, the first coupon payment is \$4. If the principal increases by 8 percent annually, the second coupon will be \$4.32 (4 percent of $1.08 \times \$100$). This “perpetual bond” provides coupon payments that are the same as the dividends for Firm A.

The final consideration is the gain from reinvesting all dividends (see the top bars in Figure 4.1). Assume the investor has the opportunity to continue investing in the equity market to earn the 12 percent market rate.⁴ If all dividend payments are invested and those investments compound at a 12 percent rate, the investor will build a growing “side pool” of wealth. This pool will consist of all accumulated dividends, “interest” on those dividends, and the further compounding of this additional “interest on interest” (or, more accurately, “dividends on dividends”).

At first glance, the overall pattern for the total investment return shown in Figure 4.1 seems to correspond to what would be characterized as a “growth” investment. In the early years, price growth is the dominant component of return. In time, however, interest on interest begins to

dominate, which is consistent with the return patterns observed for fixed-income securities.

Firm B: No-Growth Consider now a second firm, Firm B, that appears, at least on the surface, to be quite different from Firm A. Firm B has the same earnings as Firm A, but it has a 100 percent payout ratio; that is, all earnings are paid out as dividends on a year-by-year basis. Firm B is just the opposite of a growth stock; it has *no* growth in earnings, dividends, or price.

Firm B's dividend remains constant forever, and in the absence of a change in the discount rate, no price appreciation occurs. In fact, the payment stream for Firm B is identical to the payment stream for a perpetual bond with a 12 percent coupon and a principal of \$100. Figure 4.2 compares the period-by-period dividends of Firm A and Firm B. The dividend stream of Firm B clearly dominates in the early years, but by Year 15, the growth in Firm A's earnings leads to dividends that surpass those of Firm B.

Because of Firm B's policy of paying out 100 percent of earnings in dividends and its consequent lack of growth, its stock price never changes. In the first year, the total of the 4 percent dividend yield plus the 8 percent price gain for Firm A matches the 12 percent dividend payment for Firm B. As time passes, however, both the dividend and the price gain from Firm A

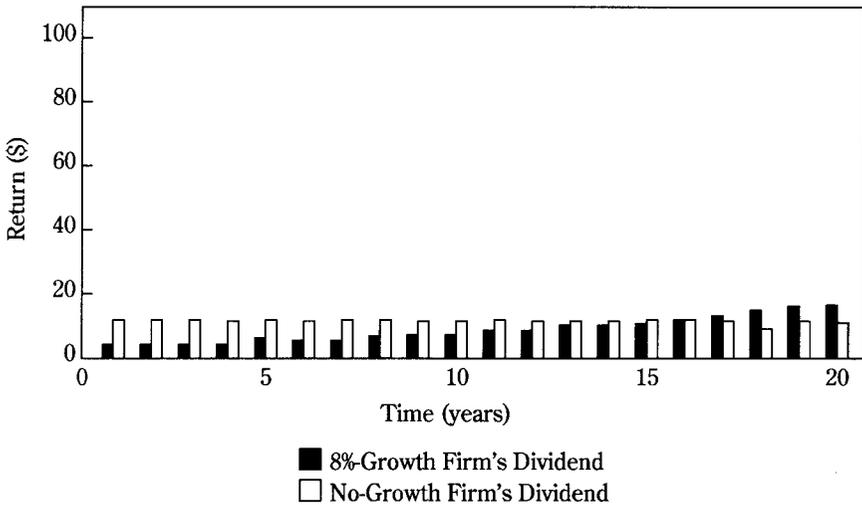


FIGURE 4.2 Comparison of the Dividend Streams of an 8-Percent-Growth Firm (Firm A) and a No-Growth Firm (Firm B)

grow. The combined gain pulls increasingly ahead of the fixed \$12 payment from Firm B.

The growth properties of Firm A enable it to outrun the stable 12 percent return from Firm B. Firm B does have one advantage over Firm A, however. Because Firm B pays out all earnings as dividends, an investor in this firm has the option of either spending or reinvesting those dividends. In contrast, the investor cannot spend the price appreciation from Firm A. By retaining earnings and adding to book value, Firm A is in charge of a major component of the investor's reinvestment decisions.

According to the assumptions of the DDM, $66\frac{2}{3}$ percent of Firm A's earnings are retained and reinvested to produce additional income at the same rate as the firm's initial ROE (12 percent). The same investment opportunity is directly available to an investor in Firm B. That investor can invest all dividend receipts into the general equity market and earn the 12 percent rate. Thus, all of the earnings of both firms will be put to work at 12 percent, either by internal investment of retained earnings (Firm A) or through general market investments of dividends received (Firm B). The effect is illustrated in Figure 4.3, where the incremental year-by-year return from interest on interest is layered on top of the dividend and price gains.

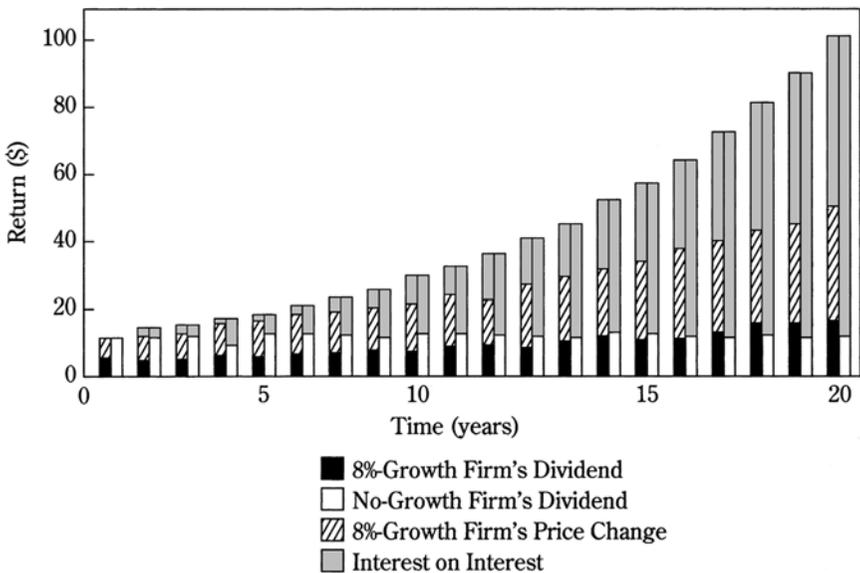


FIGURE 4.3 Comparison of the Total Annual Growth in Portfolio Value for Firms with Equal Initial Investments: An 8-Percent-Growth Firm (Firm A) and a No-Growth Firm (Firm B)

On the basis of returns alone, a fully compounding investor should be indifferent between Firm A and Firm B.

Figure 4.3 illustrates dramatically the importance of interest on interest for Firm B. The constant high dividend payments offer investors reinvestment opportunities that enable Firm B to provide precisely the same year-by-year increments in portfolio value as Firm A. Thus, as expected, under stable market conditions, both firms produce compound returns equal to the 12 percent market rate.

In summary, from the point of view of the fully compounding, tax-free investor, Firms A and B are equivalent in total return. They are also equivalent in current price, because the dividend streams from both firms, when appropriately discounted, have the same present value of \$100. Moreover, because the earnings are the same, both stocks have the same initial P/E of 8.33.

Internal Growth versus External Growth An analysis of the earnings streams of Firms A and B provides further insight into their P/Es. Both firms start with a book value of \$100 and first-year earnings of \$12. Hence, both stocks have identical P/Es of 8.33. Firm B continually pays out all its earnings as dividends, and its book value remains constant at \$100. For Firm B, neither price nor earnings ever grow beyond their initial values. Hence, the P/E for Firm B always remains 8.33. This figure is called the “base P/E.”

Some insight into this base P/E can be gained by again comparing Firm B's stock with a perpetual 12 percent coupon bond. The price of such a bond is found by dividing the earnings (that is, the “coupon” payment of \$12) by the yield (the 12 percent market rate). This approach is equivalent to requiring that the P/E ratio be the same as the reciprocal of the yield. Thus, the P/E of 8.33 is the same as $1/0.12$.

In contrast to Firm B, Firm A retains $66\frac{2}{3}$ percent of each year's earnings and adds this amount to its book value. In the first year, it retains \$8 ($\frac{2}{3}$ of 12 percent of \$100), thereby bringing its book value up to \$108 (that is, $1.08 \times \$100$) by the end of that year. As book value increases, total dollar earnings rise, because the same 12 percent ROE applies to an ever-larger base. Firm A's earnings will be \$12.96 in Year 2 (the ROE of 12 percent applied to a book value of \$108), \$14.00 in Year 3, and so on.

For the “growth stock” Firm A, the dollar earnings build year by year in direct proportion to the 8 percent growth in the book value of the firm. Under the assumed stable market conditions, the price of Firm A's stock also appreciates by 8 percent a year in accordance with its growth in dividends and earnings: \$100.00 in Year 1, \$108.00 in Year 2, \$116.64 in Year 3, and so on. Accordingly, in Year 2 for Firm A,

$$\begin{aligned} P/E &= \frac{\$100 \times 1.08}{\$12 \times 1.08} \\ &= \frac{\$100}{\$12} \\ &= 8.33 \end{aligned}$$

and in Year 3,

$$\begin{aligned} P/E &= \frac{\$100 \times 1.08^2}{\$12 \times 1.08^2} \\ &= \frac{\$100}{\$12} \\ &= 8.33 \end{aligned}$$

In other words, the P/E for Firm A remains at its initial value of 8.33. Thus, Firm A has exactly the same P/E as Firm B in every period.

Because Firm A appears to be a growth firm, one might intuitively expect it to have a higher P/E than Firm B. As discussed earlier, however, a firm that reinvests only at the market rate is not providing any special service to its investors; they could reinvest their dividend receipts at this same rate. Reinvestment at the market rate is thus tantamount to paying out all earnings to the investors: The reinvestment rates are the same; only the labels look different.

Firm A, although a growing enterprise, is simply a full-payout equivalent of Firm B, generating fundamentally the same value for its investors as the literally full-payout Firm B. Any full-payout-equivalent firm has the same price as a perpetual “bond” with an annual coupon payment equal to the firm’s current earnings. Moreover, although the stock price of such a full-payout-equivalent firm will depend on its earnings, any such firm will have the same 8.33 base P/E. In short, any firm with a 12 percent ROE is equivalent in P/E value to Firm B, regardless of the firm’s dividend payout policy. Furthermore, as the next subsection demonstrates, any full-payout firm, regardless of its ROE, is also equivalent in P/E value to Firm B.

A key message from this comparison of Firms A and B is that investors will not “pay up” in stock price or in P/E for access to a firm that reinvests at just the market rate. A firm must achieve a return in excess of the market rate on new investments to command a P/E in excess of the base P/E.

Although the focus in this subsection is on total portfolio returns under stable conditions, note that the stocks of the two firms will exhibit different sensitivities to changes in market assumptions. Because the growth stock of Firm A compounds internally at 12 percent, it may have a longer duration and, hence, a greater sensitivity to declining market discount rates

than the stock of Firm B (see “Resolving the Equity Duration Paradox”). Thus, the stocks are not identical under dynamic market conditions.

Firm C: A Full-Payout Firm with an Above-Market ROE Firm C has an above-market, 15 percent ROE but, as does Firm B, a 100 percent dividend payout policy and, therefore, no expectation of future growth. Based on an initial book value of \$100, Firm C earns \$15 annually in perpetuity. Consequently, the price of its stock must be at a premium to book (that is, at \$125) to bring its return down to the market rate of 12 percent (12 percent = $[15/125] \times 100$ percent). Because all earnings are paid out as dividends, the dividend yield for this firm is also 12 percent.

As in the case of Firm B, Firm C’s stock is equivalent to a perpetual bond. The difference between the two “perpetuals” is that Firm C’s stock is equivalent to a premium bond with a 15 percent coupon, while Firm B’s stock is equivalent to a par bond with a 12 percent coupon. From an investor’s viewpoint, Firm C offers no advantage over Firm B: Both firms provide the same dividend yield and no price appreciation. The only difference is in their stock prices.

The fundamental similarity between Firm B and Firm C is reflected in their P/Es: Firm C has the same 8.33 base P/E as Firm B (that is, \$125/\$15). Thus, A, B, and C are all full-payout-equivalent firms.

Firm D: A Reinvesting Firm with an Above-Market ROE Firm D is significantly different from the full-payout-equivalent Firms A, B, and C and has the same 15 percent ROE as Firm C but a $33\frac{1}{3}$ percent payout ratio. It differs from all the preceding firms in that it can apply its above-market ROE of 15 percent to any new investment it funds out of retained earnings. Applying the DDM (see Appendix 4A for details) indicates that Firm D’s greater ROE and higher growth rate (10 percent) lead to an initial stock price of \$250, which is higher than the price for the other three firms.

Because the initial stock price is no longer \$100, a comparison with results for Firms A and B is facilitated by expressing the three components of return as percentages of their original prices. Although Firm D’s dividend of \$5 is higher than Firm A’s dividend, it represents a lower dividend yield, only 2 percent; Figure 4.4 contains a comparison of the yearly dividends of Firm A and Firm D (as percentages of the original price of each). Observe that, despite the rapid 10 percent growth of Firm D, the dividends of Firm A dominate those of Firm D for many years.

An investor in Firm D would expect yearly rises in stock price, however, to keep pace with the firm’s 10 percent growth in book value and earnings. During the course of a year, the 2 percent dividend yield combined with a 10 percent price gain would provide a new investor with the 12 percent market return on an investment in Firm D’s stock. As Figure 4.5

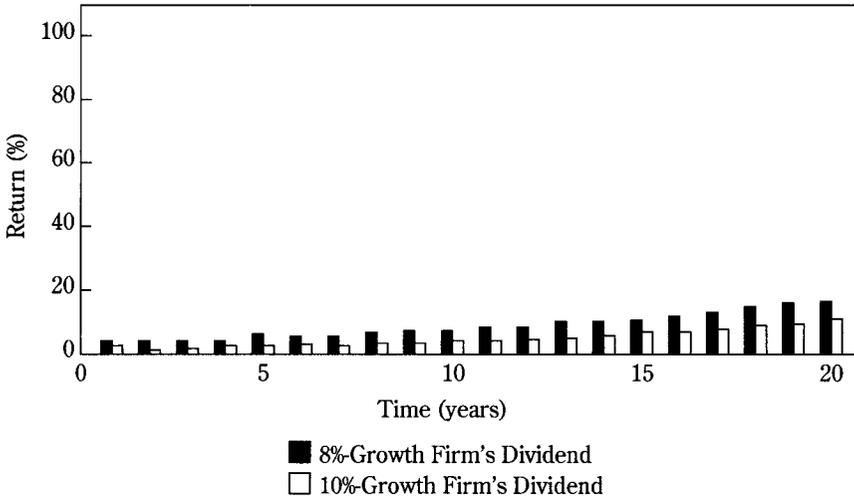


FIGURE 4.4 Comparison of the Dividends of an 8-Percent-Growth Firm (Firm A) and a 10-Percent-Growth Firm (Firm D) (percentages of the original price)

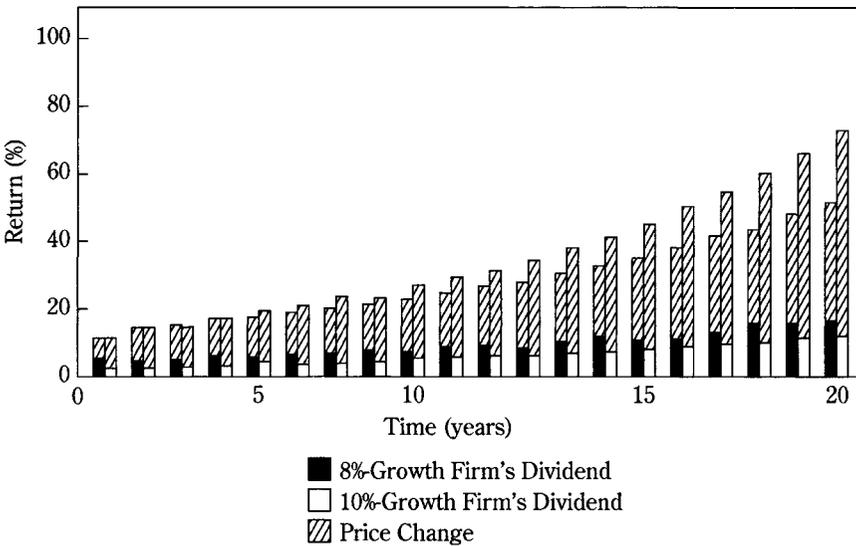


FIGURE 4.5 Annual Dividends and Price Appreciation for an 8-Percent-Growth Firm (Firm A) and a 10-Percent-Growth Firm (Firm D) (percentages of the original price)

shows, the 10 percent annual price return of Firm D is sufficient to bring the combination of its dividends and price increments (expressed as a percentage of Firm D's initial \$250 price) to a level that completely dominates the dividends and price increments for Firm A.

As with Firm A, Firm D's stock, in the absence of risk, is equivalent to a perpetual bond with increasing principal. The only differences are that, in Firm D's case, the coupon is 2 percent and the principal increases by 10 percent a year.

To complete the comparison of the two firms, consider the total portfolio growth an investor in Firm D can expect to receive. A fully compounding investor in Firm D will create a side pool of wealth that compounds at the assumed 12 percent market rate. Because dividends for Firm D represent a relatively small percentage of the initial investment, this side pool will grow more slowly than it would for an investment in the other firms. In fact, the side pool for Firm D grows just enough, in comparison with that of Firm A, that when all components of return are considered, the period-by-period returns for the two firms are identical (see Figure 4.6).

In the context of the narrow model defined in this section, the positive

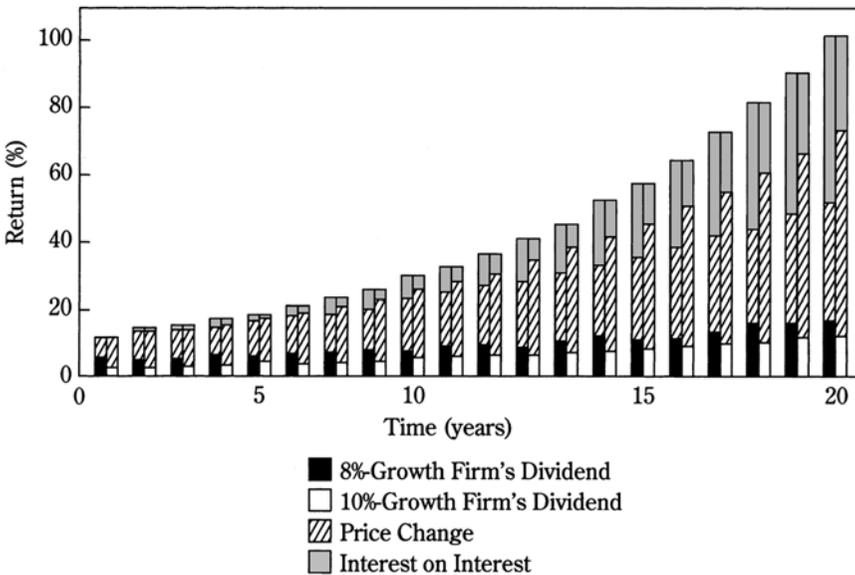


FIGURE 4.6 Comparison of Year-by-Year Returns for an 8-Percent-Growth Firm (Firm A) and a 10-Percent-Growth Firm (Firm D) (percentages of the original price)

impact of growth combined with a high ROE is not on return, but on the P/E. This ratio reflects both current earnings and future franchise opportunities.

Dissecting the Investment Process

Firm D's stock was priced at \$250, whereas the initial price was \$100 for Firm A's stock. The \$250 reflects both Firm D's high current earnings and the expectation of future above-market investment opportunities. By virtue of its business franchise, Firm D has the special opportunity to reinvest a portion of its earnings at the 15 percent ROE. This opportunity is not directly available to investors, because in the equilibrium model, investors are able to achieve only the 12 percent market return. Thus, the excess 3 percent return Firm D is able to achieve produces a pool of incremental value beyond what the investor could do with an external side pool. This compounding stream of excess returns, therefore, has real value to the investor, who will pay up to access it.

The value of the excess returns is reflected in the P/E for Firm D. Because this firm earns \$15 the first year, its P/E is 16.67 (that is, $\$250/\15), twice the P/E of the other firms. This P/E increment can be interpreted as a premium for franchise opportunities.

As noted previously, when a firm's ROE is the same as the market rate (Firms A and B), the P/E always remains at its base level, regardless of the firm's payout policy or growth rate. A firm with an above-market ROE but no growth also offers only the base P/E (Firm C). A growth firm with an above-market ROE (Firm D), however, will have a higher P/E than the base P/E of 8.33. (Note also that a growth firm with a below-market ROE would have a P/E below the base P/E.)

To see how this premium value is created requires a close focus on the reinvestment process. After one year, Firm D pays out \$5 of its \$15 in earnings as dividends and retains and reinvests the remaining \$10. As a result, the firm's book value grows to \$110. The new book value may be viewed as consisting of the original \$100, from which earnings were fully reflected at the outset, and a \$10 new investment, which will be a source of new earnings. By assumption, this new investment will produce returns at the 15 percent ROE in perpetuity.

The year-end reinvestment of \$10 can in itself be viewed as achieving a 3 percent premium return over the 12 percent market rate because of Firm D's special franchise situation. The real added value from Firm D is derived totally from this 3 percent excess return that it earns on its new investments in perpetuity, a compounding stream of incremental earnings. In the second year, the retained earnings available for new investment will grow to \$11 (that is, $1.10 \times \$10$). In the third year, Firm D has \$12.10 (that is, $\$10 \times 1.10^2$) to invest.

In time, this sequence of opportunities produces a growing aggregate stream of excess earnings. The present value of this stream of excess earnings will amount to \$125 a share—that is, 50 percent of Firm D’s price, according to the DDM. The other 50 percent of Firm D’s value is derived simply from its full-payout equivalence to Firm C (recall that the price of Firm C’s stock was precisely \$125). In summary, Firm D can be viewed as a combination of (1) a full-payout-equivalent firm such as Firm A, B, or C and (2) a stream of opportunities for investment at a rate 3 percent above the market rate.

The Present-Value Growth Equivalent

A firm’s opportunities to earn returns on new investments in excess of the equilibrium market rate can be thought of as franchise growth opportunities. As discussed previously, the traditional DDM implicitly assumes that a firm has the opportunity at any time to make investments that offer returns equal to the firm’s initial ROE. Furthermore, the DDM implicitly assumes that such investments are made according to a smooth growth pattern determined by the firm’s sequence of retained earnings. Clearly, franchise opportunities arise in an irregular pattern, however, and the extent of franchise opportunity is not guaranteed to equal the available cash. Nevertheless, the firm will want to take full advantage of these opportunities to earn above-market returns. The lack of cash is not a restriction because, in today’s capital markets, a firm should have no problem selling equity to fund projects that offer exceptional returns.

Thus, the assumptions are that the firm will fully pursue all franchise opportunities and that the cost of capital for the firm will be the market rate.⁵ Whether the funds are supplied by retained earnings or by raising new funds at the market rate does not matter. (This section deals only with the unleveraged firm; the obvious alternative of using debt is the subject of “The Franchise Factor for Leveraged Firms.”)

A variable is needed that will measure the total dollar value of all franchise investments regardless of whether those investments occur at irregular intervals or in the smooth stream implied by the DDM. This variable is the present-value *growth equivalent* of the franchise investments.

The value of the growth equivalent can be derived by discounting all future franchise opportunities at the market rate and then expressing the result as a percentage of the original book value of the firm.⁶ This growth equivalent enables the stream of future opportunities to be viewed as equivalent to a single immediate opportunity to invest and then earn the ROE in perpetuity. In other words, this approach reduces all growth patterns to the simple model of a single immediate “jump” in book value. Moreover, the growth equivalent can represent any sequence of opportuni-

ties; thus, use of the growth equivalent can penetrate the assumption of smooth growth that often obscures the real implications of many DDM models. In this way, the growth equivalent provides insight into the magnitude of investments implicit in any constant-growth assumption.

As an example, recall that Firm D's P/E was at an 8.34 premium to the base P/E of 8.33. Basically, this incremental multiple was the value attached to the growing sequence of opportunities to invest at 3 percent above the market rate. This sequence coincided with Firm D's pattern of retained earnings. By computing the growth equivalent of this series of investments, one can find the magnitude of the single immediate opportunity needed to provide the same present value as the smooth-growth pattern associated with Firm D's retained earnings. This equivalent single immediate investment (*G*) would have to correspond to 500 percent of Firm D's current book value.⁷ In present-value terms, Firm D must have the opportunity immediately to invest an amount equal to five times its current book value and earn 15 percent on that investment in perpetuity.

Figure 4.7 shows the growing increments of book value that Firm D generates through its actual growth, at the 10 percent annual rate, and the hypothetical book value of the corresponding growth equivalent. Both cases start with an original book value of \$100, but for the growth-equivalent firm, book value immediately jumps by \$500 to \$600. It then remains constant at that level.

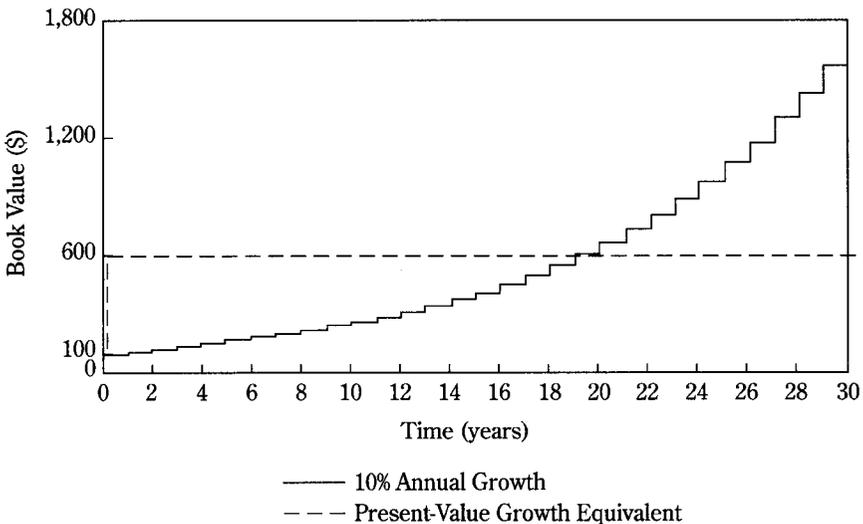


FIGURE 4.7 Present-Value Growth Equivalent for a 10-Percent-Growth Firm (Firm D)

In essence, the growth-equivalent approach creates a hypothetical “alter-ego” for any growth firm. Following the immediate jump in book value, the alter-ego firm has no further growth. It thus retains none of its earnings, and all net flows are paid out immediately as dividends. Consequently, the alter-ego firm can be viewed as an augmented full-payout equivalent of a growth firm.

This view is clarified in Figure 4.8, which compares the dividend flows from the growing Firm D with the constant dividend payments of its full-payout alter-ego. The payouts for Firm D begin with the initial dividend of \$5 (that is, 2 percent of \$250) and grow at a constant rate of 10 percent forever. In contrast, the growth equivalent provides an annual payout consisting of the original \$15 of earnings (the full-payout equivalent), augmented by an additional \$15 from the 3 percent excess return (3 percent = 15 percent – 12 percent) on the \$500 growth-equivalent investment. Thus, this hypothetical growth equivalent provides a constant annual payout of \$30 in perpetuity. When discounted at the market rate, both cash flows have the same present value, \$250.

The expected level of above-market investments implicit in a P/E of 16.67 is startling. Perhaps a start-up firm with a new product and an incontestable franchise can expect several years of spectacular investment opportunities, but a large, mature company in a highly competitive market

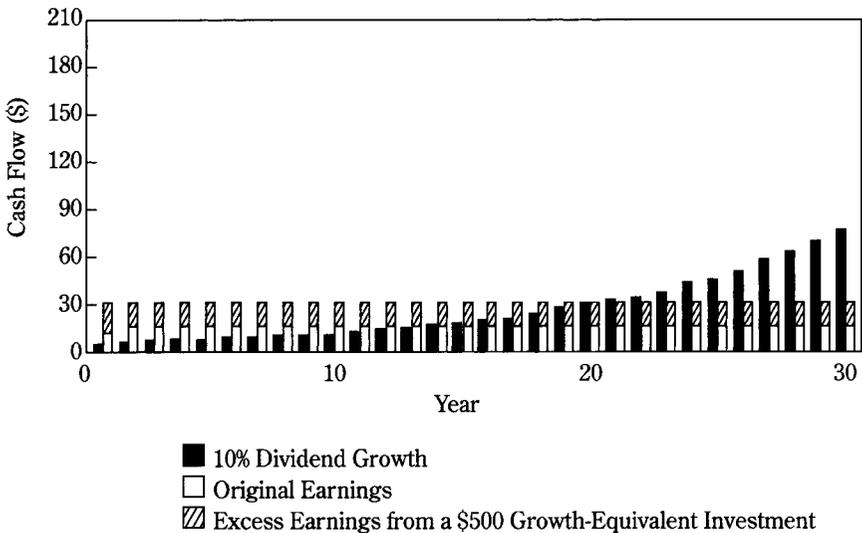


FIGURE 4.8 Comparison of Cash Flows: A 10-Percent-Growth Firm (Firm D) and a Growth-Equivalent Firm

will have difficulty finding investment opportunities that amount to five times current book value and also earn a perpetual above-market return.

The Franchise Factor Model

As demonstrated, firms that offer both growth and above-market ROEs are valued at a premium to the base P/E. The franchise factor (FF) is defined to be a direct measure of the impact of the above-market investments on the P/E. In a stable market, the FF depends only on the firm's ROE for existing and new investments. Computationally, the FF is the return premium offered by new investments divided by the product of the ROE for existing businesses and the market rate (see Appendix 4A for the derivation of the franchise factor). If the ROE on both old and new investments is the same,

$$FF = \frac{r - k}{rk}$$

where r is the firm's ROE, k is the market rate, and all values are expressed as decimals.

Firm D will be used to illustrate how the franchise factor works. Because its ROE is 15 percent and the market rate is 12 percent, the FF for Firm D is

$$\begin{aligned} FF &= \frac{0.15 - 0.12}{0.15 \times 0.12} \\ &= \frac{0.03}{0.018} \\ &= 1.67 \end{aligned}$$

A franchise factor of 1.67 means the P/E will increase 1.67 units for each unit gain in book value (in present-value terms). Recall that the present-value growth equivalent for Firm D was 500 percent of book. Thus, the franchise factor lifts the P/E by 1.67×5 (that is, 8.34) units above the base P/E to a total level of 16.67.

The P/E can be expressed in terms of the market rate, the growth equivalent, and the franchise factor:

$$P/E = \frac{1}{k} + (FF \times G)$$

or

$$P/E = (\text{Base P/E}) + (FF \times G)$$

The second term captures the increase in the P/E that results from the combination of growth and an above-market ROE. Recall that, in a stable market, the franchise factor depends only on the ROE, whereas the growth equivalent depends only on the assumed growth rate. Thus, the franchise factor and the growth equivalent fully, but separately, capture the impact of ROE and growth on the P/E.

Figure 4.9 illustrates the franchise factor for a wide range of ROEs. When an ROE is the same as the market rate, the FF is zero. As a result, growth makes no contribution to the P/E. For example, recall that Firm A had 8 percent growth but only a market ROE; thus, its FF was zero, and its growth did not contribute to its P/E.

Consider a firm with an FF of 1 (that is, from Figure 4.9, a firm with an ROE of 13.64 percent). For such a firm, an immediate investment equal to 100 percent of its current book value lifts the P/E only by a single unit, from 8.33 to 9.33. With an FF of 4 (that is, an ROE of 23.08 percent), an investment equal to 100 percent of book value raises the P/E only by four units. These examples underscore the difficulty of creating a high P/E.

As the return on equity increases, so does the franchise factor. Thus, as expected, the higher the ROE, the greater the P/E impact of new investment. As illustrated in Figure 4.9, however, this impact levels off as the ROE increases. In particular, as the ROE approaches infinity, FF approaches the inverse of the market rate. With the 12 percent market rate assumed here, this FF implies that a 100 percent increase in book value can never lead to more than an 8.33-unit increase in the P/E.

These findings are summarized in Table 4.2. Because Firms B and C

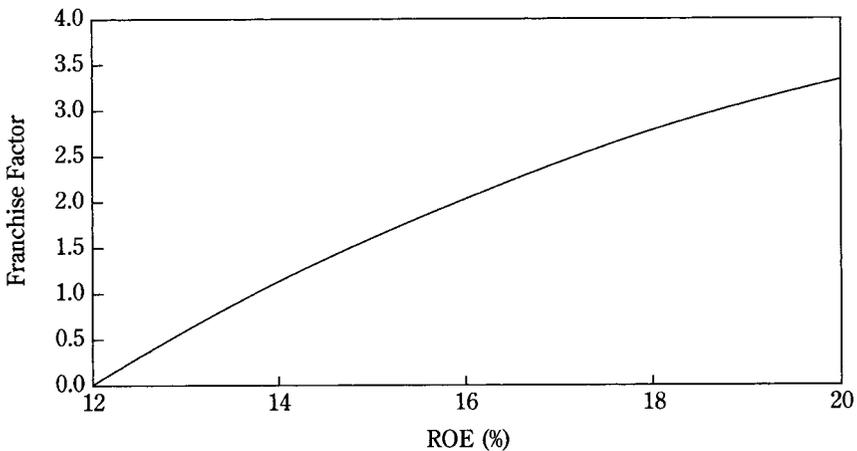


FIGURE 4.9 The Franchise Factor

TABLE 4.2 P/E Ratios and Franchise Factors for Firms A, B, C, and D

Firm	ROE	Growth Rate	Growth Equivalent	Franchise Factor	P/E Increment	P/E
A	12%	8%	200%	0.00	0.00	8.33
B	12	0	0	0.00	0.00	8.33
C	15	0	0	1.67	0.00	8.33
D	15	10	500	1.67	8.34	16.67

have no growth, their growth equivalents are zero. In contrast, Firm A has a 200 percent growth equivalent, and Firm D has a 500 percent growth equivalent. Firm A's growth fails to add value, however, because its FF is zero (its ROE is the 12 percent market rate). In addition, observe that Firm C has the same FF as Firm D (it has the same 15 percent ROE), but because of a lack of new investments, its potential is not being used. Only Firm D with its combination of positive growth and a positive franchise factor is able to command a premium P/E.

Figure 4.10 is a graphic view of how the franchise factor and growth equivalent explain the P/E level of the four example firms. When the P/E is plotted against the growth equivalent, all firms that have the same ROE will plot along a straight line. This line will always start at the base P/E (8.33 here), and the slope of the line will be the FF for that ROE.

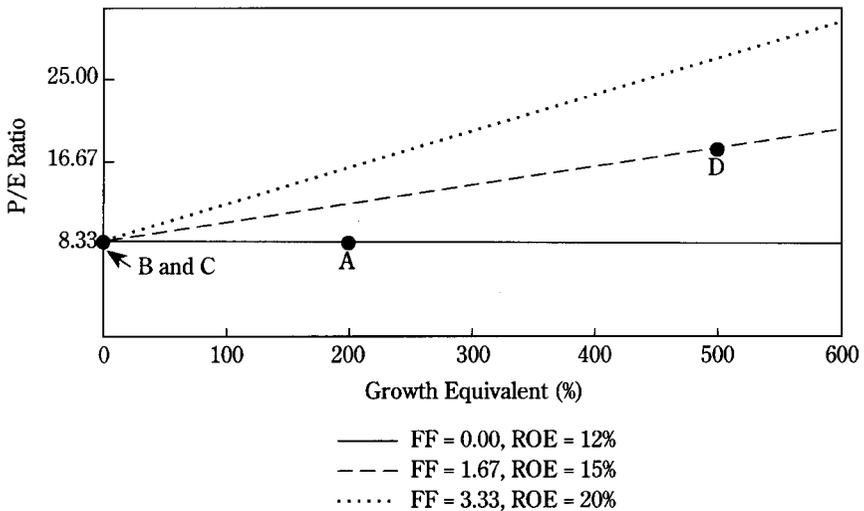


FIGURE 4.10 Interpreting the P/E through the Franchise Factor

Thus, firms with a 12 percent ROE have an FF of zero and plot along a horizontal line; firms with a 15 percent ROE plot along the line with a slope of 1.67.

In Figure 4.10, Firm A has 200 percent growth, but it is on the horizontal ($FF = 0$) line. Thus, it commands only the base P/E ratio of 8.33. Because Firms B and C have no growth, they too can obtain only the 8.33 base P/E. Only Firm D has the right combination of growth (a 500 percent growth equivalent) and an above-market ROE (15 percent) to enjoy a high P/E. It lies on the line with a slope of 1.67.

Figure 4.10 also shows how firms with 20 percent ROEs plot in such a diagram: A high ROE certainly makes growth valuable, but to obtain a high P/E, even with an ROE that is significantly above the market, the firm must possess some sizable growth prospects.

Summary

The analysis in this section was based on the simplifying assumption of a static market in which stock prices are at their theoretical values according to the DDM. Under these market conditions, when the three components of return are taken into account, all investments produce the same market return. The relative importance of each component of return is, however, directly related to a firm's return on equity and growth prospects. Analysis of the cash flows that a fully compounding, tax-free investor realizes shows how each component of return contributes to the cumulative growth of the investor's portfolio.

In the context of the dividend discount model, the combination of growth and an above-market ROE can have a significant impact on the price/earnings ratio. Growth alone is not enough, however, to boost the P/E above a base level. When a firm can invest only at the market rate, it provides no advantage to investors, because an investor can also reinvest all dividend payments at the market rate. Similarly, if a firm has a high ROE but no opportunities to earn that rate on new investments, the firm's stock is essentially equivalent to a high-coupon bond that makes payments equal to the firm's earnings in perpetuity. Thus, a high-ROE, no-growth firm can command only a base P/E.

Firms that have opportunities to invest and earn above-market returns may be said to possess embedded franchise opportunities. The impact of such opportunities can be captured in a franchise factor, which depends only on the firm's ROE. It is a measure of the impact on the P/E of all future investments that provide a return equal to the firm's ROE.

One surprising result of the analysis is the small size of the franchise factor. When the ROE is 15 percent, for example, the FF is only 1.67. Thus, a series of investments that is equal in terms of present value to the

initial book value of the firm is necessary to raise the P/E by 1.67 units. A firm with a 15 percent ROE and a 16.67 P/E, for example, must have investment opportunities equivalent to 500 percent of its current book value.

The requirement for such large investments raises the question of what types of firms can sustain above-market P/Es. To be sure, the market has seen many a new company that offered an exceptional product in a rapidly developing market, and such companies have often grown many times in size in a fairly short time. Mature companies with significant market shares, however, face substantial obstacles to growth.

By representing above-market investment opportunities by their present values, this analysis was able to look beyond the pattern of smooth, constant growth implied by the DDM. Thus, this analysis can be readily extended to an entire portfolio of investment opportunities. Each investment could have its own (possibly irregular) capital schedule, return pattern, and life cycle.

The FF approach can provide valuable insights into the structural relationships that lie inside the price/earnings ratio. The results presented in this section were derived under highly simplified assumptions, however, and must be interpreted with appropriate care. In reality, taxes, leverage, and uncertainty do exist, prices do not coincide with their theoretical values, and market rates, investment opportunities, and year-to-year ROEs change constantly. Later sections in this chapter deal with some of these issues.

The Franchise Portfolio

This section presents a methodology for estimating the theoretical impact on the price/earnings ratio of the portfolio of investment opportunities available to a firm. The analysis makes the highly restrictive assumptions of a world without taxes, leverage, or uncertainty.

A franchise opportunity has two components: the magnitude of investments and the pattern of payments that evolves over time. The magnitude of a given investment opportunity is measured by the present value of the total amount of funds that can be invested in it. Because the accumulation of these investments constitutes the growth in the firm's book value, this measure, the growth equivalent, is the first component of the franchise opportunity.

The second component, the sequence of payments the investment generates, is the return pattern. Return patterns exhibit a wide variety of shapes. Annual returns may increase rapidly at first, for example, and then

level off; ultimately, a period of deteriorating returns may result from the declining value of the franchise. The P/E-producing power of a given return pattern is captured in the investment's franchise factor. The incremental P/E value of a specific investment opportunity is given by the product of its FF and the size of the investment as measured by its growth equivalent. An infinite number of combinations of franchise factors and growth equivalents can give rise to the same P/E increment.

The first part of this section examines fairly general return patterns for new investments and develops a duration-based formula that can be used to approximate the franchise factor.⁸ The approach to finding the exact FF that corresponds to any pattern of investment returns is to compute the investment's *perpetual equivalent return*. This return is simply a constant annual payment that has the same present value as the payment pattern. After the tools of analysis are developed, the methodology is applied to a portfolio of franchise investment opportunities.

A Duration-Based Approximation

To develop a formula for computing an exact FF for any return pattern, a formula for approximating FF is needed. For the approximation, consider a choice between two investment opportunities: Investment A provides annual earnings equal to 20 percent of the investment for 10 years. At the end of 10 years, both the returns and the salvage value of the investment drop to zero. Investment B offers a lower return (16.06 percent) than Investment A, but this return is sustained for 20 years. Because the returns for both investments are constant over a fixed interval, the earnings flows from these investments are level-payment annuities.

The evaluation of the two investments begins with computation of their net present values (NPVs) per \$100 of investment. This computation is done by discounting the returns back to the time the investment is made, subtracting the original \$100 investment, and dividing by 100. The results for a range of discount rates are illustrated in Figure 4.11. Observe that the 20-year investment has a higher NPV than the 10-year investment when discount rates are low. When the discount rate reaches 15.1 percent, the NPV for each investment is equal to zero. For discount rates above 15.1 percent, the NPV of the 10-year investment is higher than that of the 20-year investment.

By definition, the internal rate of return (IRR) is the discount rate at which the NPV of an investment is zero. Thus, Investments A and B each have a 15.1 percent IRR. If the only measure of the relative worthiness of investments were the IRR, one would conclude that Investments A and B are of equal value to investors. The problem with the IRR is that it accounts for neither the timing of returns nor the sensitivity of returns to

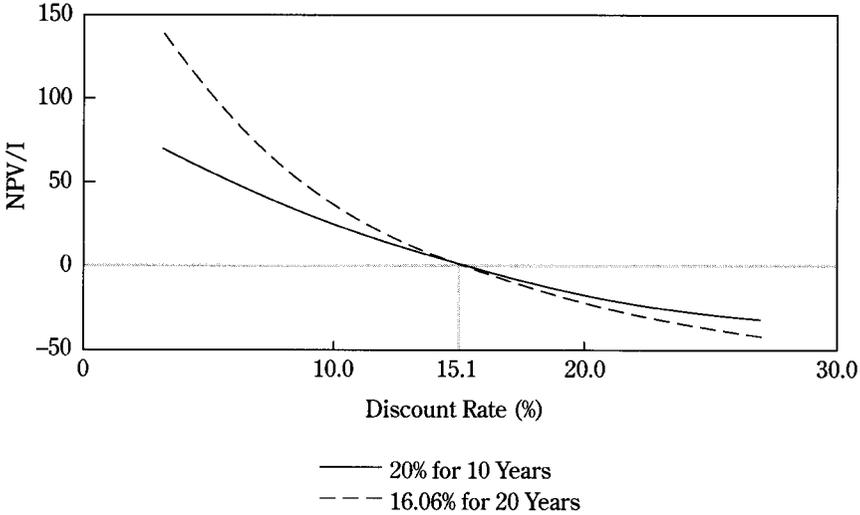


FIGURE 4.11 Net Present Value per \$100 Investment for a 10-Year and a 20-Year Investment

changes in the discount rate. For example, at the 12 percent market rate, the NPVs of the 10- and 20-year investments are \$13.00 and \$19.98, respectively. Clearly, at this rate, the 20-year, 16.06 percent annuity adds significantly more “present value” than the 10-year, 20 percent annuity.

The greater slope of the NPV curve for the 20-year annuity compared with that of the 10-year annuity indicates that the value of the longer annuity is more sensitive to changes in the discount rate. This variation in sensitivity is consistent with the well-known duration concept for bonds: All other things being equal, bonds with longer maturities have longer durations than bonds with shorter maturities. As a result, the price (present value) of a long-maturity bond will be more sensitive to changes in interest rates than the price of the bond with a shorter maturity. The duration concept applied here is referred to as *investment duration*.

The importance of both investment duration (D) and IRR in providing additional P/E is captured in the approximation formula for FF (which is derived in Appendix 4B):

$$FF \approx \frac{D(\text{IRR} - k)}{r}$$

in which k is the discount rate and r is the return on equity (ROE). This formula has general application; it applies to any pattern of investment payoffs, not solely to annuities.⁹

Observe that when the IRR is the same as the market rate, the franchise factor will be zero. In that case, the investment will not add value, regardless of its duration. When the IRR is greater than k , however, duration is critical, because FF is computed by multiplying the difference between the IRR and the market rate by the duration. In both example annuities, the IRR is 15.1 percent. Thus, both investments offer the same 3.1 percent IRR advantage over the 12 percent market rate. Yet, the investments have different durations: The duration of the 10-year annuity is 4.09 years, while the duration of the 20-year annuity is 6.27 years. If the firm has a 15 percent ROE (r) on its initial book value, the FFs for the 10- and 20-year investments are approximately 0.85 and 1.29, respectively. Thus, each unit of investment in the 20-year annuity contributes 1.29 units to the P/E; whereas each unit of investment in the 10-year annuity contributes only 0.85 units. The greater duration of the 20-year investment makes its IRR advantage count more in terms of P/E expansion.

The duration of an annuity increases with the term of the annuity but is independent of the magnitude of the cash flow (assuming a constant discount rate). In addition, as the term increases, the annuity approaches a perpetuity. Thus, the duration of the annuity approaches the duration of a perpetuity (which is simply the inverse of the discount rate). Because the duration is evaluated at the market rate, the perpetuity duration in the examples here is 8.33 (that is, $1/0.12$).

The relationship between duration and the term of the annuity is illustrated in Figure 4.12. The duration initially increases rapidly as the number

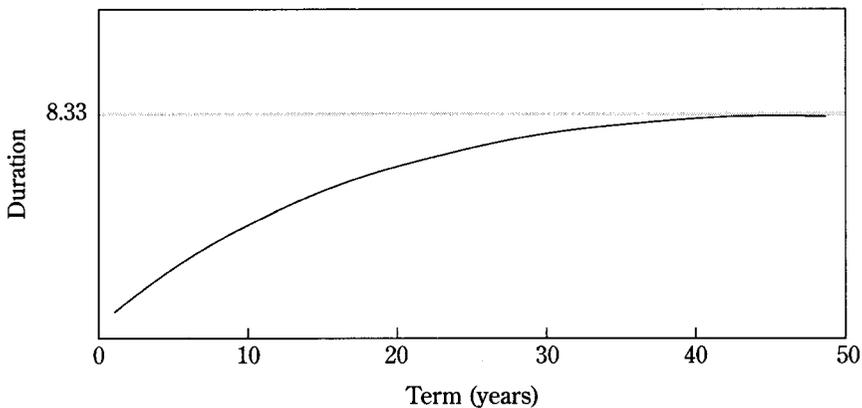


FIGURE 4.12 Duration versus Term of the Annuity (at a 12 percent discount rate)

of years of earnings increases; the rate of increase slows as the duration approaches 8.33.

Consider now the other component of FF estimation—the IRR advantage. As indicated earlier, the IRR is an incomplete measure of value, because an infinite number of combinations of annual payment rates and payment periods will result in the same IRR. The combinations of payment rate and period required to maintain a constant IRR are illustrated for IRRs of 15 percent and 20 percent in Figure 4.13.

The approximation formula states that, for a given IRR, the FF increases with duration. Because the duration of an annuity lengthens with its term, the franchise factor also increases and, eventually, reaches a maximum value for a perpetual annuity—that is, for a duration of 8.33. In addition, at a given duration, FF increases with the IRR.

These results are illustrated in Figure 4.14. Observe that the franchise factor is zero when the IRR is 12 percent; it would be negative for an IRR of less than 12 percent.

A further insight into the approximation formula can be gained by noting that, as the number of years of returns increases, the duration approaches $1/k$ and the annual return approaches the IRR. Thus, as the term of the annuity increases, the approximation formula,

$$FF \approx \frac{D(IRR - k)}{r}$$

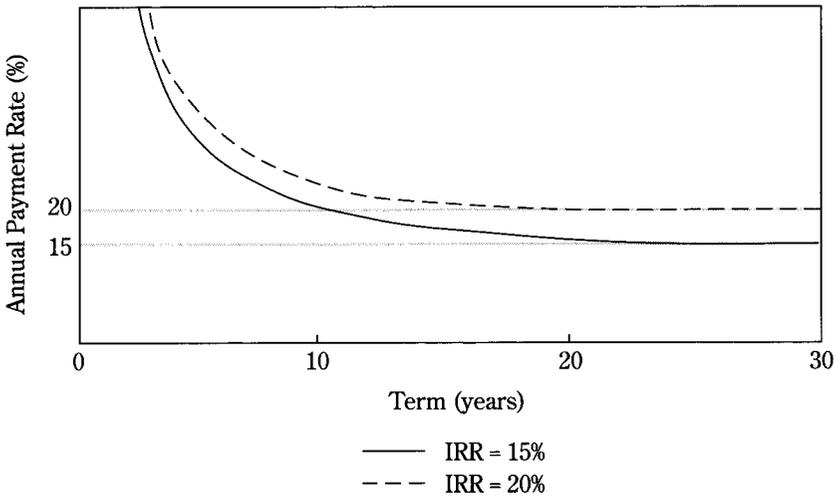


FIGURE 4.13 Annual Payment Rate versus Term of the Annuity for IRRs of 15 Percent and 20 Percent

approaches the exact FF formula,

$$FF = \left(\frac{1}{k}\right) \left(\frac{R-k}{r}\right)$$

To illustrate the accuracy of the FF approximation formula, Figure 4.15 plots the actual and approximate FFs for 20-year annuities with a range of IRRs.¹⁰ Note that the FF approximation is quite accurate for IRRs within about 400 basis points of the 12 percent market rate. For example, if the IRR is 17 percent, the error in this approximation is slightly more than 4 percent of the FF value.¹¹

When all new investments generate the same pattern of payments, the theoretical P/E is given by the following formula:

$$P/E = \frac{1}{k} + (FF \times G)$$

In this formula, the base P/E (that is, $1/k$) can be interpreted as the duration of a perpetuity that corresponds to level earnings on the firm's initial

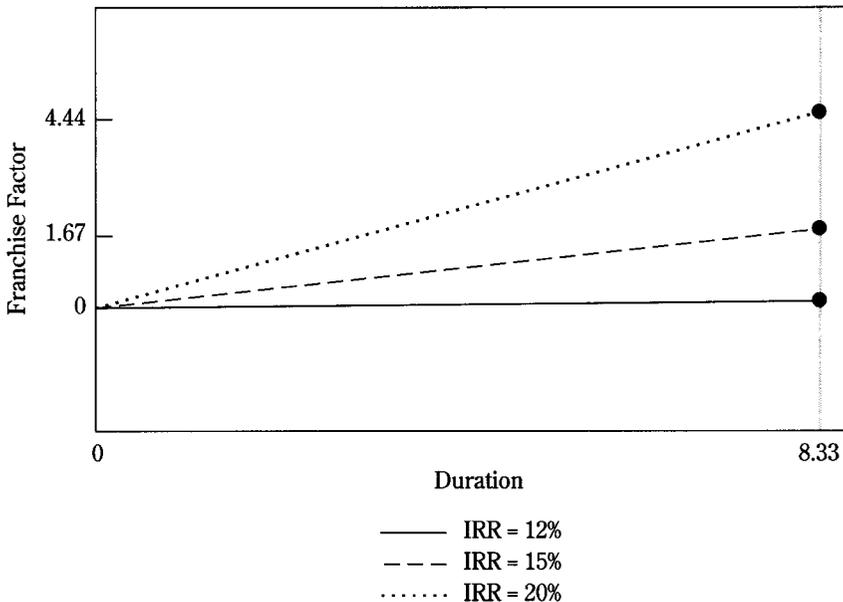


FIGURE 4.14 Approximate Franchise Factor versus Annuity Duration (ROE = 15 percent)

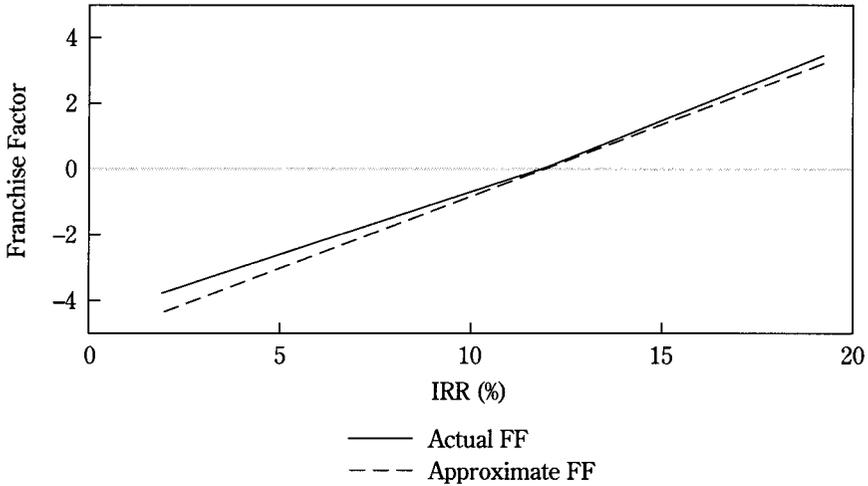


FIGURE 4.15 Approximate versus Actual Franchise Factors (for 20-year, level-payment annuities)

book value. The franchise factor is approximately equal to the duration of the new investment payment multiplied by the investment’s IRR advantage. Consequently, the P/E can be written as

$$P/E = \frac{1}{r} \left[\left(\text{Duration of base earnings} \right) r + \left(\text{Duration of new investment} \right) (IRR - k)G \right]$$

This formula shows that the P/E builds from duration-weighted net earnings (expressed as a fraction of base earnings, r). In the first term in the brackets, the net earnings are the same as the base earnings (per \$100 of book value), because no financing costs associated with the firm’s basic book of business are being considered. The duration can be roughly interpreted as the present-value weighted-average time at which earnings occur.¹² In the second term in brackets, net earnings on new investment are measured by the investment’s IRR advantage over the market rate, multiplied by the magnitude of the investment as measured by the growth equivalent.

The Perpetual-Equivalent Return

In the standard dividend discount model, all new investments are assumed to provide the same return in perpetuity. This perpetual-return

model allowed the development in “The Franchise Factor” of a simple formula for the exact franchise factor. In a certain sense, the perpetual-return model turns out to be general, because any pattern of payments can be converted to an equivalent perpetual return (see Appendix 4B). An exact franchise factor can be computed for any return pattern by using the perpetual-equivalent return in the original FF formula.

The perpetual-equivalent return is the return on a perpetual investment that provides the same present value (at the market capitalization rate) as a given return pattern. For example, an investment that provides an annual return of 20 percent for 10 years (Investment A) is equivalent in present value to an equal investment that provides a 13.56 percent annual return in perpetuity.¹³

Figure 4.16 shows the behavior of the perpetual-equivalent return as the years of constant annual returns increase. At first, the perpetual equivalent grows rapidly. After 15 or 20 years, however, the perpetual equivalent begins to level off and, as the period extends to infinity, slowly approaches the constant annual return. For example, an investment that returns 20 percent annually for 20 years has a perpetual equivalent of 17.93 percent.

Because investments that provide 20 percent returns for 20 years are not easy to find, perpetual equivalents above 18 percent are clearly difficult to attain. Furthermore, with the more “normal” patterns of rising and declining returns, the perpetual equivalents will be even lower than 18 percent. Figure 4.17 depicts such a normal return pattern. The annual

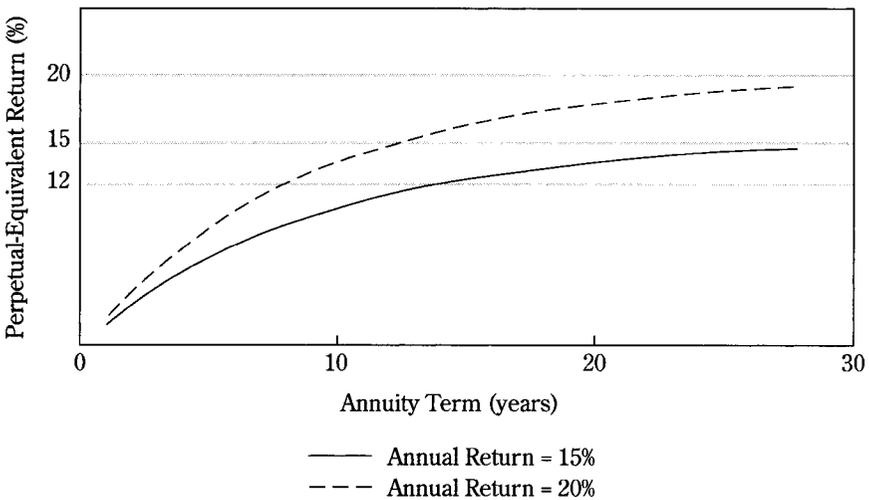


FIGURE 4.16 Perpetual-Equivalent Returns for 20 Percent and 15 Percent Annuities with a Range of Terms

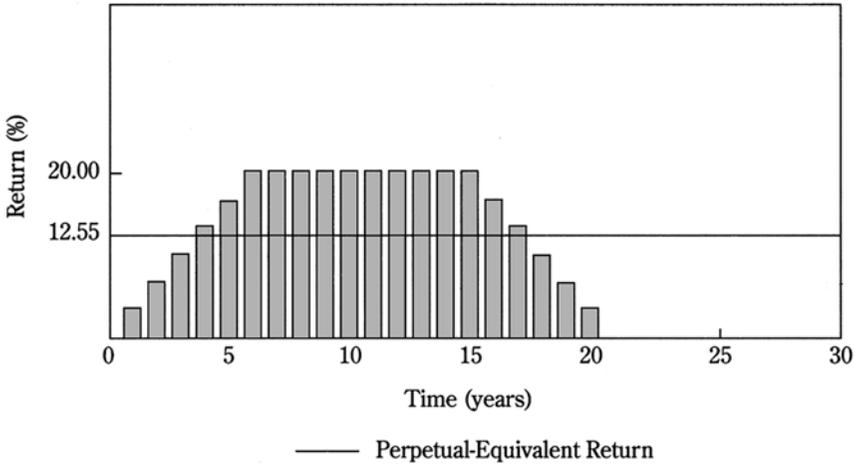


FIGURE 4.17 Rising-and-Falling Pattern of Returns

investment returns increase steadily for five years until they reach the 20 percent level; these superior returns then continue for 10 years, after which the payments decline to zero. The IRR for this investment is 12.62 percent, and the perpetual equivalent is 12.55 percent. This perpetual equivalent represents only a 55-basis-point advantage over the market rate, and because such an investment has an FF of only 0.31, it contributes little to the firm’s P/E.

The exact FF can be computed from the perpetual return (R_p) according to the previously provided formula:

$$FF = \frac{R_p - k}{rk}$$

The linear relationship between the franchise factor and R_p for a firm with a 15 percent return on its initial book equity is illustrated in Figure 4.18. The franchise factor is zero when the return on investment is the same as the market rate, and it increases by 0.56 units for each 100-basis-point increase in R_p .¹⁴ Thus, when R_p is 15 percent (300 basis points above the market rate), the franchise factor increases to 1.67 (3×0.56). In addition, the franchise factor is negative if R_p is less than the market rate.

Perpetual-equivalent returns can be used to evaluate investment opportunities. If a firm has a fixed amount of capital to invest and must choose between several different potential projects, the project with the highest perpetual equivalent will make the greatest P/E contribution. This result is both intuitively reasonable and consistent with the FF approach. It is also

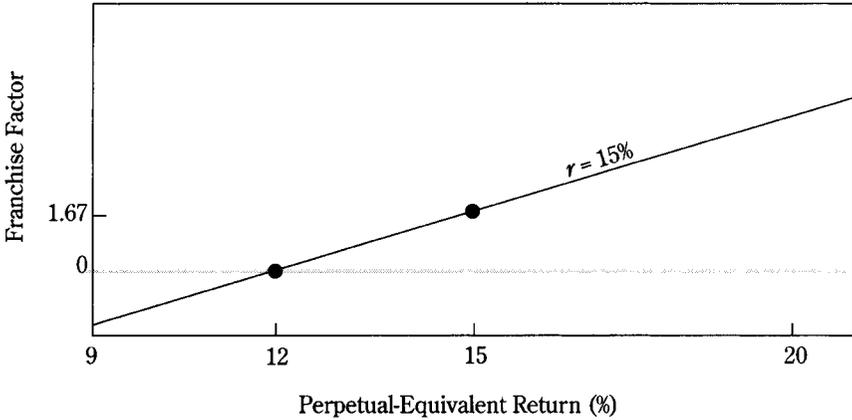


FIGURE 4.18 Franchise Factor versus Perpetual-Equivalent Return

consistent with the NPV approach to project valuation. That is, the ranking of projects by the magnitude of their NPVs will be the same as the ranking of projects by the magnitude of their perpetual-equivalent returns.

The Growth Equivalent

Recall from “The Franchise Factor” that, if two investments have the same G , the one with the higher FF will have the greater impact on P/E. Similarly, the magnitude of investment required to raise the P/E by one unit will decrease as FF increases (see Figure 4.19). For perpetual-equivalent returns

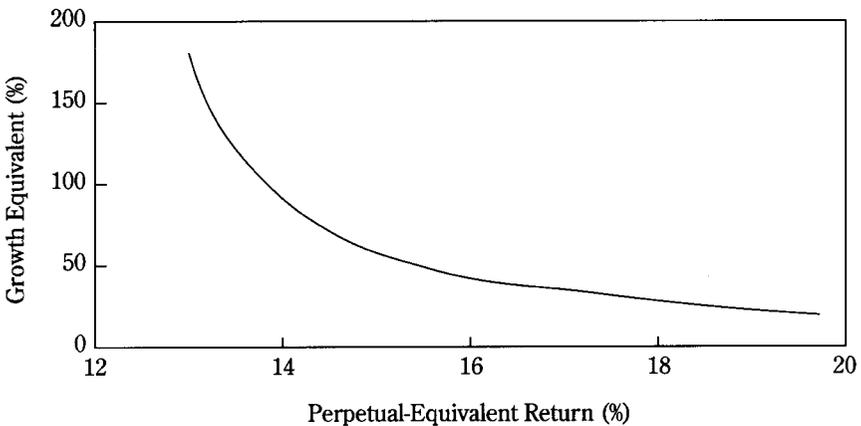


FIGURE 4.19 Required Growth Equivalent per Unit of P/E

above 16 percent, the growth equivalent tends to level off, but even at high perpetual-equivalent returns, a substantial investment is required to raise the P/E. At a return of 18 percent, for example, an investment equal to 30 percent of book value is required to raise the P/E by one unit. When the perpetual-equivalent return drops below about 16 percent, the growth required to raise the P/E increases dramatically. If the perpetual-equivalent return is 14 percent (200 basis points above the market rate), an investment equal to 90 percent of the current book value is needed to raise the P/E by just a single unit.

Consider now the factors that influence the growth equivalent. Suppose that, by virtue of its business franchise, a firm expects to have a 9 percent annual growth rate for the next 10 years. The firm thus expects to be able to make a new investment at the end of each year equal to 9 percent of its book value at the beginning of the year (see Table 4.3). Assume also that the firm will achieve a perpetual-equivalent return on each new investment equal to the firm's current ROE. Recall that if the ROE is 15 percent, the franchise factor for each such investment will be 1.67.

If the firm has an initial book value of \$100, it is assumed to have a \$9 investment opportunity (9 percent of \$100) at the end of the first year, and the book value will increase to \$109. At the end of the second year, the investment opportunity is \$9.81 (9 percent of \$109). This pattern of growth continues for 10 years. The growth equivalent is found by computing the present value of all future investments and expressing that present value as a percentage of the current book value. This computation indicates that G is \$71.33.

Now suppose that the firm could, as an alternative, invest \$71.33

TABLE 4.3 Firm with a 15 Percent ROE Growing at a 9 Percent Annual Rate

Year	Book Value at Beginning of Year	Amount of New Investment at Year End	Present Value of New Investment at 12 Percent Discount Rate
1	\$100.00	\$ 9.00	\$ 8.04
2	109.00	9.81	7.82
·	·	·	·
·	·	·	·
·	·	·	·
10	217.19	19.55	6.29
Total			\$71.33

immediately and earn the same 15 percent a year in perpetuity. Under these conditions, the immediate investment and the series of investments are of the same value to current stockholders, which is why G is called the growth equivalent.

Table 4.4 presents values of the growth equivalent for three different growth rates. Growth is assumed to continue for a fixed number of years and then stop. For a given number of years of growth, the higher the growth rate, the greater the value of G . As the number of years of growth increases, so does the value of G . If the growth rate is less than the market capitalization rate, however, the value of G levels off as the number of years of growth approaches infinity. This result is illustrated in Figure 4.20. Observe that although a 9 percent growth rate may sound modest, it represents 300 percent of book value in present-value terms.

If the growth rate is the same as the market rate, the growth equivalent will increase linearly with the years of growth. If the growth rate is greater than the market rate, the growth equivalent will increase exponentially with time. Clearly, growth rates at or above the market rate can be sustained for only a few years.

Multiphase Growth

The FF model can be extended to firms experiencing different types of growth and return opportunities. Because the growth equivalent incorporates both magnitude and time of occurrence, any pattern of investment opportunities and returns is accommodated by computing the sum of the products of franchise factors and corresponding growth equivalents to obtain the total above-market P/E increment. This gen-

TABLE 4.4 Growth Equivalents at a 12 Percent Discount Rate for Three Growth Rates

Years of Investment	8 Percent	9 Percent	10 Percent
5	33.25%	38.08%	43.08%
10	60.98	71.33	82.44
15	103.36	125.70	151.29
50	167.54	222.81	296.90
∞	200.00	300.00	500.00

Note: Growth rates are amounts invested annually as percentages of book value.

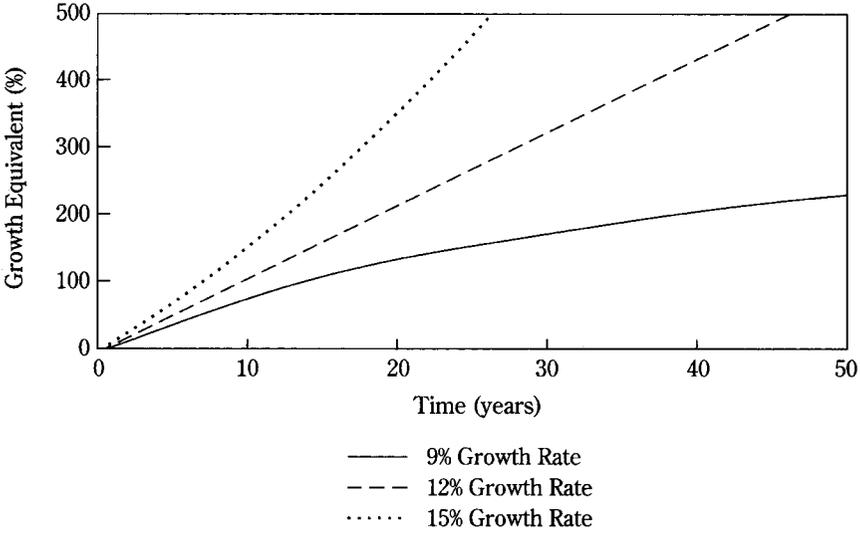


FIGURE 4.20 Growth Equivalents for Various Growth Rates

eral result, which is derived in Appendix 4B, is summarized in the following formula:

$$P/E = \frac{1}{k} + (FF_1 \times G_1) + (FF_2 \times G_2) + \dots$$

As an example of the general methodology, consider the two-phase growth example described in Table 4.5. During years 1 through 10, the firm invests 10 percent of book value each year and earns 18 percent in perpetuity on each investment. The franchise factor for these investments is 3.33, and the growth equivalent is 82.44. During the final investment phase, the firm grows at a 5 percent annual rate and earns 15 percent on each investment. In this case, FF and G are 1.67 and 59.65 percent, respectively.

TABLE 4.5 Two-Phase Growth Example

Phase	Years	Growth Rate	Perpetual Return	Franchise Factor	Growth Equivalent
I	1-10	10%	18%	3.33	82.44%
II	11-∞	5	15	1.67	59.65

Phase I growth contributes 2.75 units to the P/E ($FF \times G = 3.33 \times 0.8244$), while Phase II growth contributes just 1 unit to the P/E (1.67×0.5965). Thus, the P/E of this two-phase growth firm is 12.08 (that is, $8.33 + 2.75 + 1.00$).

The accumulation of the additional P/E provided by the firm's growth can be illustrated in a vector diagram as shown in Figure 4.21. The first vector, corresponding to Phase I growth, raises the P/E from 8.33 (the base P/E) to 11.08. The slope of this vector is 3.33 (the franchise factor for Phase I), and the vector extends over 82.44 units of Phase I growth. The slope of the second vector, 1.67, is the franchise factor for Phase II, and this vector extends over an additional 59.65 units of growth, bringing the P/E up to 12.08. The timing of the investments matters only to the extent that it affects the value of the growth equivalent. Thus, although Phase II follows Phase I in this example, once the phases are reduced to their *G* and *FF* values, the sequence is irrelevant.

The Portfolio

A firm with a unique business franchise will have a range of current and expected investment opportunities. If the company's sole objective is to maximize P/E, the FF model can be a guide in choosing among investments. Consider the franchise opportunities for the firm described in Table 4.6. The firm has an initial book value of \$100, can invest \$50 (in present-value terms, representing a *G* of 50 percent), and can achieve an extraordi-

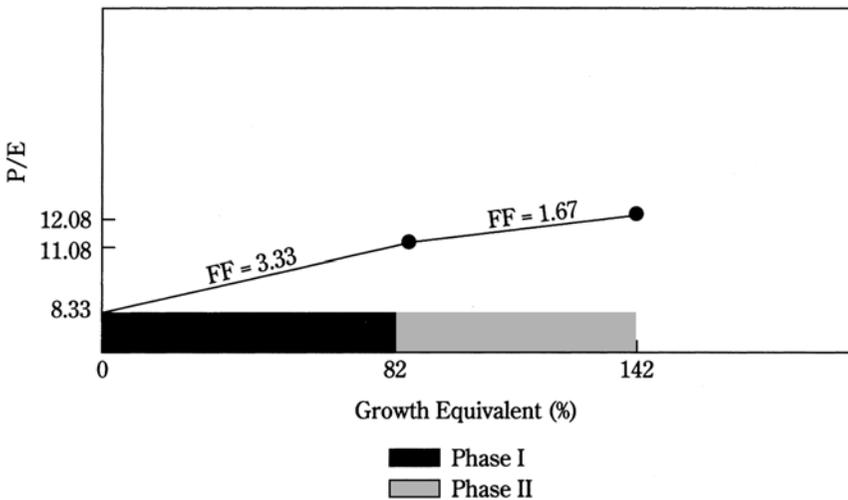


FIGURE 4.21 Vector Diagram of Two-Phase Growth

TABLE 4.6 The Franchise Portfolio: Example for a Firm with \$100 Book Value

Investment	Perpetual Return	Franchise Factor	Growth Equivalent	P/E Increment
1	20%	4.44	50%	2.22
2	15	1.67	100	1.67
3	13	0.56	150	0.83
4	12	0.00	200	0.00
Total			500%	4.72

nary 20 percent return in perpetuity. Other investments provide successively lower returns and, therefore, have lower franchise factors.

Although the third investment is three times as large as the first ($G = 150$ percent), it contributes less to P/E than the first because of its low FF. The fourth investment has a zero FF because it provides only the market return. Only the first three investments, with their combined growth equivalents of 300 percent, will add value. The accumulated P/E value is shown in the vector diagram of Figure 4.22.

Suppose the firm in this example expects to build up its cash holdings by retaining a portion of its earnings year after year. This cash then becomes available as a source of financing for franchise opportunities. The present value of all such future cash generation is the G available from retained earnings. Ideally, if the firm expects to have available less than \$300 (300 percent of the \$100 book value), it should raise the necessary capital to achieve its full P/E potential. Funds beyond \$300 will not add to P/E and

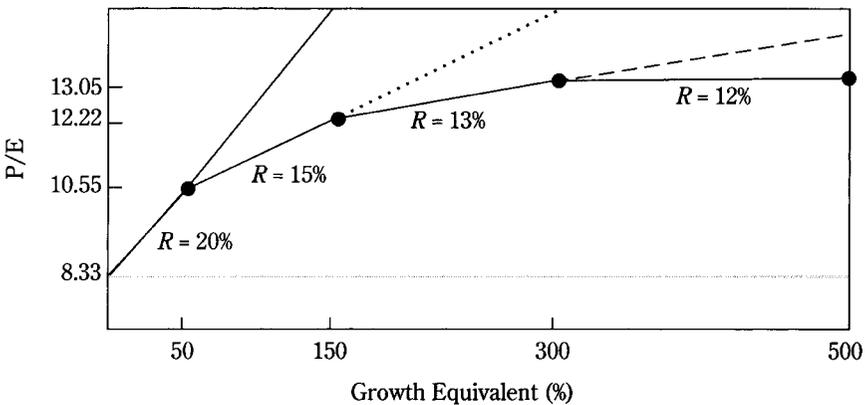


FIGURE 4.22 Vector Diagram of P/E Growth

should be returned to investors in the form of either increased dividend payments or stock buy-backs. Of course, these idealized conclusions neglect the fact that, in the real world, the firm must consider factors other than P/E gain. It must, for example, take into account the signaling effect that increases in dividends have on stock prices.

Finally, note that the FF model can accommodate the general situation in which an investment phase is followed by an earnings phase. For example, suppose a firm needs four years to build a new plant; the firm must continue to add to its investment during each of the four years, and payoff on the investments begins in Year 5. (The inflows and outflows are illustrated in Figure 4.23.) The payoff grows to a maximum level that is sustained for 10 years before it begins to decline. Determination of the P/E impact of such a pattern of investments and payments can be accomplished, as before, by computing appropriate franchise factors for the annual payments and growth equivalents for the investments.

Summary

A firm with an exceptional business franchise should have a variety of opportunities to make investments that provide above-market returns. Both the timing of investments, however, and the pattern of payments on those investments may vary considerably. This section introduced a general methodology to assess the P/E impact of a portfolio of franchise opportunities with different payoff patterns.

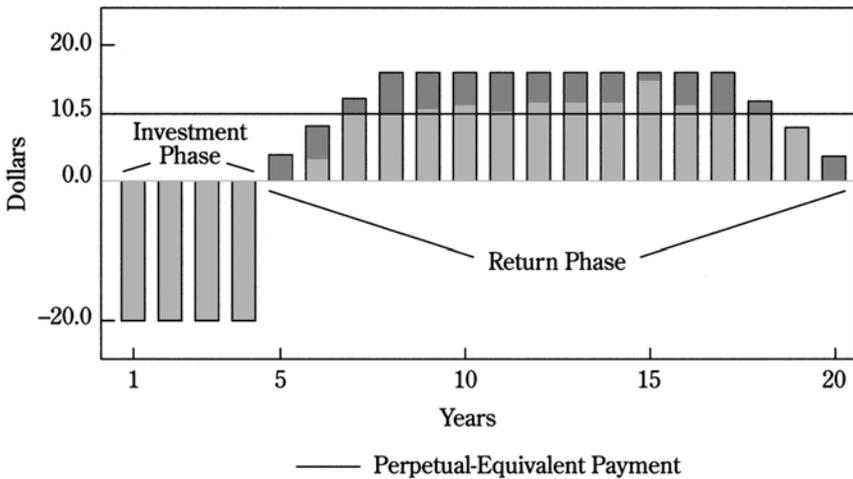


FIGURE 4.23 Schematic Diagram of Investments and Payments

The procedure involves three steps. The first is to calculate a perpetual return that has the same present value as the actual flow of returns on investment. Although this step is not crucial, the perpetual-equivalent return does simplify the computation of the franchise factor, and it provides a convenient measure to use in comparing investment returns. The second step is to compute the franchise factor that measures the P/E impact per unit growth in new investment. Finally, when the magnitude of investment is represented by its growth equivalent, the impact of new investment on the P/E can be determined as the product of the franchise factor and the growth equivalent.

Despite the restrictive assumptions of no volatility, leverage, or taxes, the model provides insight into the inherent difficulty in raising a firm's P/E. Furthermore, if a firm's only goal is to maximize its P/E, the model suggests that the managers consider dividend increases and/or stock repurchases in lieu of below-market investments.

The franchise factor is essentially the product of the excess annual return that the investment generates (compared with the market rate) and the duration of its payments. Because the franchise factor emerged as a fundamental measure of the P/E impact of new investments, the section provided a simple formula for its estimation involving the IRR of the new investment and the duration of its payments. A high franchise factor alone cannot elevate the P/E, however; it must be combined with a growth equivalent that represents a substantial percentage of current book value.

In general, franchise situations tend to erode over time, although certain business enterprises are apparently able to continue capitalizing on their basic strengths. They seem to "compound" their franchise positions—as if they had a *franchise* on the generation of new franchise opportunities. In the terminology of this chapter, these firms have what it takes to justify exceptionally high P/Es, namely, a superior franchise factor working on large growth-equivalent investments.

A Franchise Factor Model for Spread Banking

Spread banking is borrowing money at one rate and lending it out at a higher rate in order to profit from the "spread" between the two rates. Although the term spread banking is most commonly associated with commercial banks and thrift institutions, many other financial firms, such as insurance companies, also engage in such activities. In addition, many non-financial firms have important activities that can be viewed as essentially spread banking.

This section offers a theoretical model for relating a spread-banking firm's price/earnings ratio to the franchise factors that characterize returns on the firm's *prospective* new books of business. In theory, a firm should try to expand its asset base (called "footings" in the banking industry) to include all opportunities that provide a positive franchise factor (even if doing so means reducing the overall return on book equity). At this point, the firm will have reached its optimal size and should resist temptation to expand.

To some extent, the profitability of spread-banking firms depends on their ability to seize opportunities by quickly shifting resources from businesses with tightening spreads to fast-growing new businesses with ample returns. Such opportunities cannot always be fully and rigorously pursued, however, because of explicit regulatory constraints. In addition, implicit regulatory constraints may limit the magnitude and sustainability of large spread opportunities. In contrast, industrial concerns may have virtually unlimited growth prospects, at least in theory, because they can create entirely new markets through, for example, discoveries and patents. For these (and other) reasons, the equity of spread-banking concerns is not usually placed in the category of a growth stock.

The subject of growth is never simple, however. In the case of footings, U.S. commercial banks have certainly demonstrated an ability to sustain substantial growth over the years. In spread banking, however, as in all businesses, asset growth alone guarantees neither earnings nor price performance. Despite an almost sixfold increase in bank assets during the past two decades, bank P/Es have remained chronically and significantly below average market levels. The theoretical extension of the FF model in this section provides some insight into why such low P/Es have persisted.

Most spread-banking lines of business look best at the outset. The initial spreads are booked into the earnings stream immediately; the prospect of negative surprises lurks in the future. In response to such events as a sudden rise in market interest rates, a change in credit quality, or increased competition, the effective spread between borrowing costs and lending income can quickly narrow. Thus, the net spread structure of current and prospective businesses may be quite vulnerable. Questions about the reliability and/or sustainability of spread businesses lead to low franchise factors, which may partly explain the banking industry's below-market P/E.

This section uses the simple FF model to clarify the relationship between market forces and the P/E valuation of spread-banking firms. The model does not pretend to address the complete spectrum of issues, complexities, and interrelationships that must be considered when analyzing specific firms or sectors. However, even in its simple form, the FF model can prove helpful in illustrating and sharpening the insights derived from more traditional analyses of spread-banking problems and opportunities.

Building Return on Equity through Leverage

With its equity capital as a base, a bank can borrow up to some maximum multiple (*L*) of the equity capital and make loans or investments with those borrowed funds. If the net spread earned on leveraged funds is positive, leverage enables the bank to add to its return on equity. The net spread (*NS*) is defined here as the after-tax difference between the marginal cost of borrowed funds and the net return on those funds (that is, the net return after expenses). Also, the assumption is that a bank always earns a risk-free rate on funds that correspond to the equity capital. The formula for the ROE is as follows:

$$\begin{aligned} \text{ROE} &= \text{Risk-free rate} + (\text{Leverage multiple} \times \text{Net spread}) \\ &= R_f + (L \times NS) \end{aligned}$$

For example, consider a bank that has \$100 in equity capital and a 5 percent after-tax cost of borrowing.¹⁵ If the bank is allowed to borrow up to 20 times capital, it will be able to borrow an additional \$2,000 by paying 5 percent interest. The lending rate that can be earned on these borrowed funds is assumed here to be 5.75 percent after taxes and expenses.¹⁶ This combination of lending and borrowing rates is illustrated in the region to the left of the dotted line in Figure 4.24. This region represents current borrowings.

The bank believes that it will have the opportunity to extend another

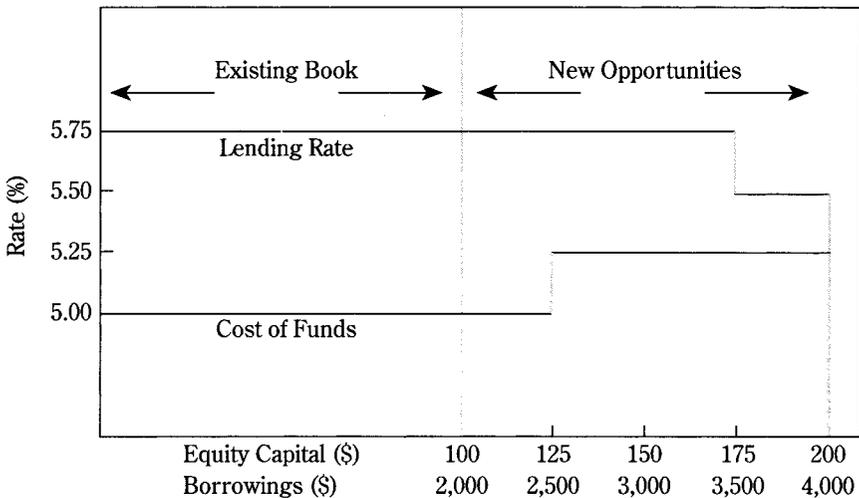


FIGURE 4.24 The Lending Rate and the Cost of Funds

\$1,500 in loans (beyond the initial \$2,000 in loans) at 5.75 percent. To take advantage of this opportunity, the bank must raise an additional \$75 in equity capital (at the assumed 20:1 leverage ratio), which will bring its total equity capital to \$175. Beyond this level, \$500 in lending opportunities exist at a lower, 5.50 percent, rate. This final opportunity would require another \$25 addition to the capital base.

The cost of borrowed funds follows a different path from that of the lending rate (see Figure 4.24), namely, 5.00 percent for the first \$2,500 in borrowings and 5.25 percent for the next \$1,500 in borrowings. By calculating the difference between the lending rate and the cost of funds, one can see that a 75-basis-point net spread is earned on the \$2,000 in current borrowings (see Region A in Figure 4.25). This same 75-basis-point net spread is also expected for the first \$500 in new borrowings (Region B). The next \$1,000 in new borrowings (Region C) produces a net spread of 50 basis points, and the final \$500 in new borrowings (Region D) yields a spread of only 25 basis points. At this point, the simplifying assumption is added that each net spread can be earned in perpetuity. As indicated in Figure 4.25, the new borrowings of \$500, \$1,000, then \$500 will require \$25, \$50, and \$25 in new equity capital, respectively.

Now consider the return on equity for the current book of businesses and the prospective ROE for the investments related to the new businesses, labeled B, C, and D. In general, earnings on equity capital are distinguished from earnings on borrowings. Assume that equity capital is invested in

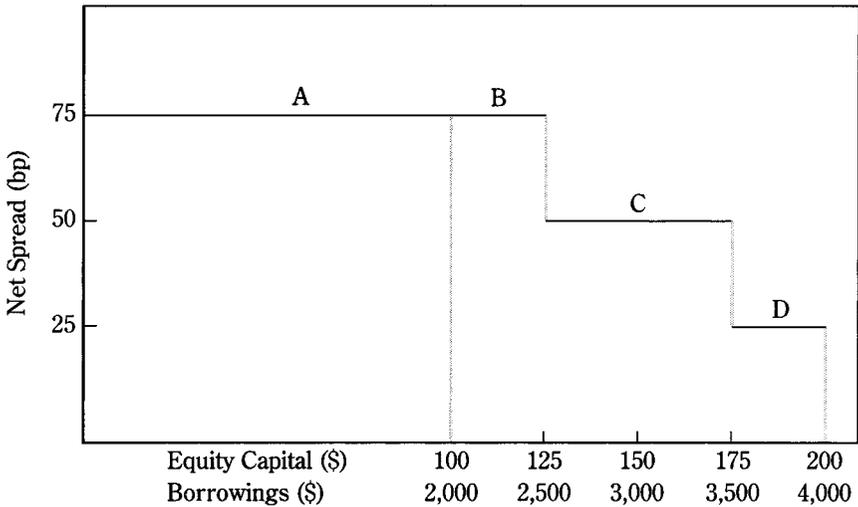


FIGURE 4.25 The Net Spread on Borrowed Funds

Note: bp = basis points

risk-free instruments that can earn 5 percent after taxes. The ROE for both the current \$100 in equity capital (Region A) and the first \$25 in new equity capital (Region B) is computed as follows:

$$\begin{aligned} \text{ROE} &= R_f + (L \times \text{NS}) \\ &= 5.00 \text{ percent} + (20 \times 0.75 \text{ percent}) \\ &= 20.00 \text{ percent} \end{aligned}$$

The relationship between ROE and net spread is illustrated in Figure 4.26. Point A corresponds to the 20 percent ROE on the current book. Because the first incremental expansion of the equity capital base also generates a net spread of 75 basis points, the new capital provides the same 20 percent ROE (Point B in Figure 4.26). Continued expansion leads to lower spreads of 50 basis points (Point C) and 25 basis points (Point D), with ROEs of 15 percent and 10 percent, respectively. At the limit, if the net spread were zero, leveraging would gain nothing and the ROE would be the same as the 5 percent risk-free rate.

A Perspective on Bank Asset Growth

Although the generic structure of spread-banking entities is the focus of this chapter, a look at the rate at which commercial bank assets have grown since 1950 is illuminating. Figure 4.27 is a comparison of the com-

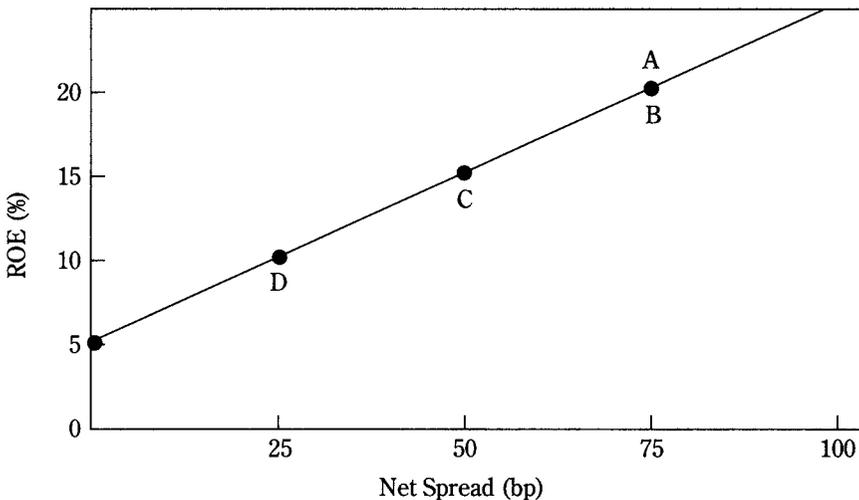


FIGURE 4.26 Return on Equity versus Net Spread (leverage = 20)

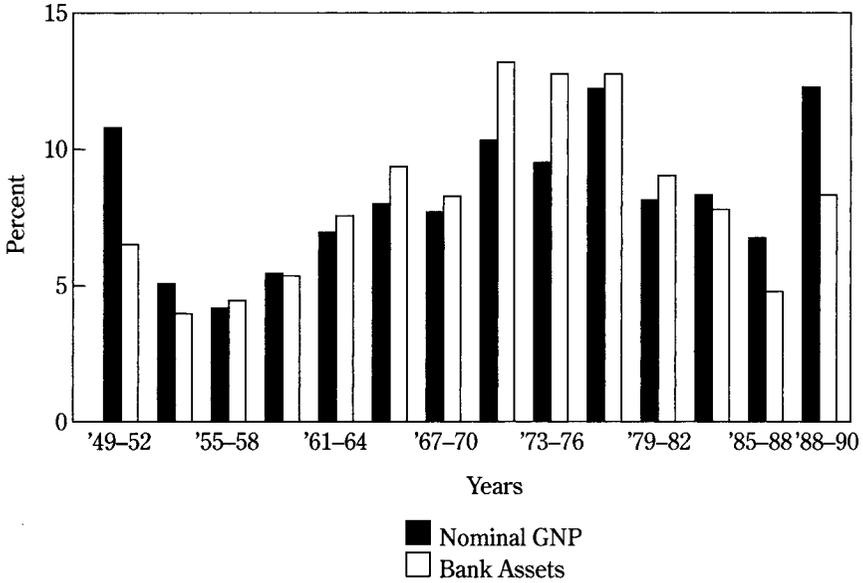


FIGURE 4.27 Growth in Nominal GNP and Bank Assets, 1949-90 (compound growth rate over three-year periods)

Note: The banks are commercial banks insured by the Federal Deposit Insurance Corporation.

pound annual growth rates of nominal gross national product (GNP) and bank assets for three-year periods from December 31, 1949, to December 31, 1988, and for the final two-year period ended December 31, 1990. During the 1949-52 period, GNP grew almost twice as fast as bank assets, but that period was the last to exhibit such extreme dominance. In most nonoverlapping three-year periods until the early 1980s, bank assets grew somewhat faster than GNP. Since then, growth in both GNP and bank assets has slowed, but GNP growth has again dominated bank asset growth.

Because bank assets are geared to the transactional flows of the economy at large, a correspondence between the growth in nominal GNP and the growth in bank assets would be expected, but the closeness of that correspondence over a 41-year period is surprising, given the dramatic changes in the financial markets during that time period. Figure 4.28 compares the cumulative growth in GNP and bank assets. For the comparison, the value of GNP and the value of commercial bank assets were each assumed to be \$100 on December 31, 1949. The rapid rise in GNP during the early 1950s enabled GNP to stay ahead of commercial bank assets until the 1970s. By 1973, however, the steady dominance of bank asset

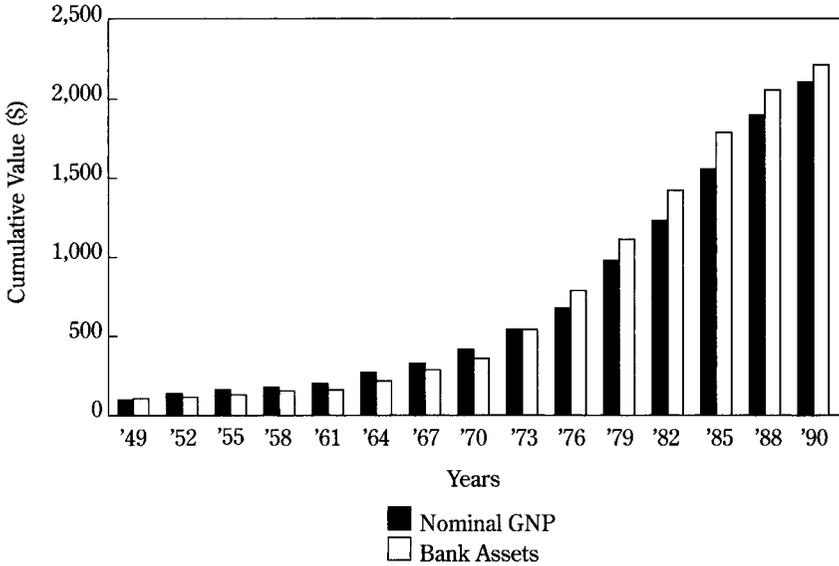


FIGURE 4.28 Cumulative Growth in Nominal GNP and Bank Assets, 1949–90 (relative to a base of \$100 on December 31, 1949)

growth through most of the 1960s had allowed cumulative bank asset growth to overtake cumulative GNP growth. For the entire 41-year period ended December 31, 1990, the compound annual growth rate of bank assets was 7.8 percent, and the rate for GNP was 7.7 percent.

If asset growth alone were enough to ensure high P/Es, one would expect the shares of banks during this period to have sold at ample P/E multiples. Bank P/Es, however, have for many years (even prior to the well-advertised troubles in the banking sector in the early 1990s) been consistently below average market P/Es.¹⁷ Some of the causes of this underperformance can be understood by looking at the franchise factors that are applicable to spread investments.

The Franchise Factor in Spread Banking

This subsection focuses on the impact on P/E of new investment opportunities presented to spread-banking entities. When computing the P/E, the base earnings (E) will represent the (sustainable) earnings from the firm's current book of business. If the firm experiences neither growth nor contraction and if current earnings are maintained in perpetuity, the investor's sole source of return will consist of E . In equilibrium, this perpetual stream of earnings would be capitalized at the general market rate (k).

This earnings capitalization results in a theoretical price (P) that is equal to E/k , and as in previous sections, this price/earnings relationship implies a base P/E equal to $1/k$ for all firms.

If current earnings are fully and properly reflected in the base P/E, an above-market P/E can be realized only if, by virtue of the firm's business franchise, the market foresees future opportunities for the firm to invest in new projects with above-market returns.¹⁸ Recall from "The Franchise Factor" and "The Franchise Portfolio" that the formula for computing the theoretical P/E that explicitly incorporates the impact of future earnings expectations is as follows:¹⁹

$$P/E = \text{Base P/E} + (\text{Franchise factor} \times \text{Growth equivalent})$$

Recall also that, in general, each new investment opportunity will have its own franchise factor and growth equivalent. In the case of multiple investment opportunities, the P/E is computed by adding in the $(FF \times G)$ term for each new investment. Without any new investment opportunities (and assuming the 12 percent market rate), all firms would sell at a P/E multiple of 8.33.

The FF for an investment is computed according to the formula,

$$FF = \frac{R - k}{rk}$$

In the current context, r is the return on equity that applies to the existing book of business (20 percent in the bank example) and R is the ROE on the new investment opportunity (20 percent for Business B, 15 percent for C, and 10 percent for D). For investment in Business C, for example,

$$\begin{aligned} FF &= \frac{0.15 - 0.12}{0.20 \times 0.12} \\ &= 1.25 \end{aligned}$$

Because the total equity investment in Business C was \$50 (that is, 50 percent of the existing \$100 book), C adds 0.625 units to the P/E (that is, $FF \times G = 1.25 \times 0.50$).

Figure 4.26 illustrated that, if the degree of leverage is fixed, ROE increases with net spread. Consequently, FF will also increase with net spread. If the market capitalization rate is 12 percent, the relationship between the franchise factor and the net spread is as illustrated in Figure 4.29 (for the incremental new Businesses B, C, and D).

Business D has a net spread of only 25 basis points (and a 10 percent

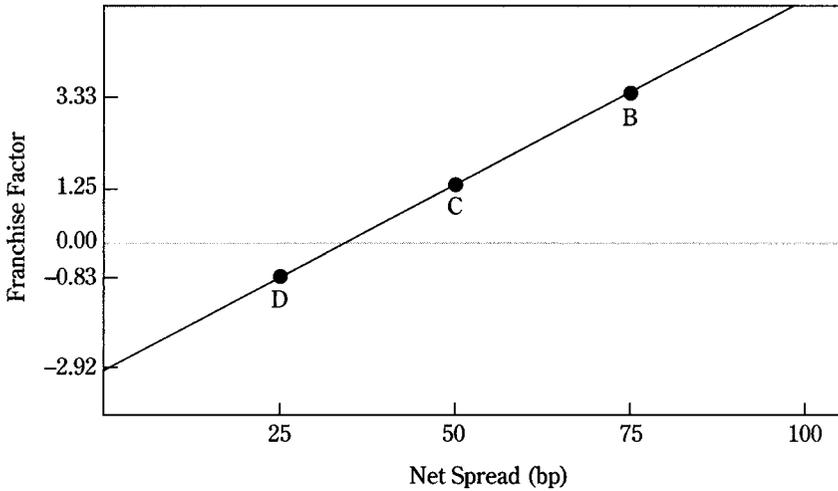


FIGURE 4.29 The Franchise Factor versus the Net Spread (leverage = 20)

ROE), and its FF is -0.83 . (A negative FF results whenever the ROE of an investment falls below the 12 percent market capitalization rate.) A prospective investment with a negative FF, such as Business D, will reduce both the firm's P/E and its value to shareholders.

The Impact of Future Franchise Opportunities

To see the dynamics of the P/E impact of prospective projects, consider a firm that has only one future investment opportunity. When the time comes to implement this final anticipated project, the firm will find the needed capital (possibly through the issuance of new shares) and begin to reap the project's promised returns. Once these returns are fully implemented, however, the firm's overall earnings will stabilize at the higher level. At this point of equilibrium, the firm can be viewed as providing this new earnings stream on an ongoing basis with no further prospect of change. When these conditions are realized, the P/E must return again to the base P/E of 8.33. Thus, although the anticipation of additional earnings from a new project will raise a P/E, the complete realization of the project will bring the P/E (relative to the expanded earnings) back to the base level.²⁰

Figure 4.30 illustrates the P/E gains (or losses) that result from expectations that the bank in this section's example will pursue various new business opportunities. The horizontal axis is the growth equivalent avail-

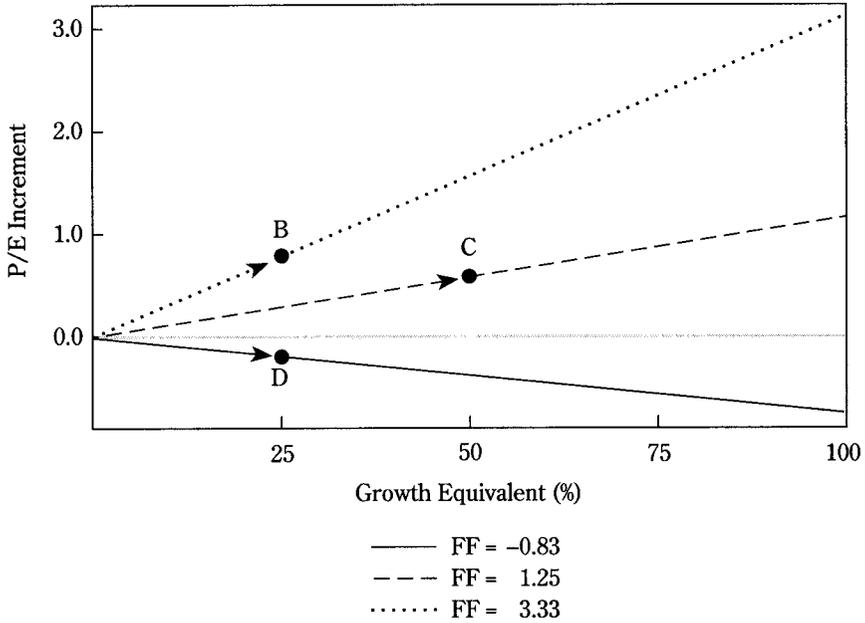


FIGURE 4.30 P/E Gain versus Size of Investment (with varying franchise factors)

able for a given investment opportunity. The slope of each line in the figure corresponds to the franchise factor for a new business activity. Each line represents the relationship between the expected P/E increment attributable to a new business and the size of that business. For example, the P/E impact of Business B can be read as 0.83 units, which corresponds to a size limit of \$25 (that is, 25 percent of the \$100 current equity capital) and an FF of 3.33. Although Business C has a lower FF than Business B, it provides almost as much P/E enhancement because of the greater magnitude of Business C's opportunity. Business C can accommodate an equity investment that is twice that of Business B. On the other hand, Business D's negative FF results in a reduction in the P/E.

The P/E of this bank is illustrated in Figure 4.31's vector diagram of P/E increments. If all of these businesses are expected to be undertaken, the P/E ratio is 9.58. If the firm's goal is to maximize value to shareholders, however, it will not undertake Business D; without Business D, the P/E is 9.79.

In the example, the footings of the bank have almost doubled (from \$100 to \$175), but the P/E has improved only from 8.33 to 9.79. Even a full doubling of the bank's size, if additional opportunities existed at the 20 percent ROE level, would not lift the P/E above 12.

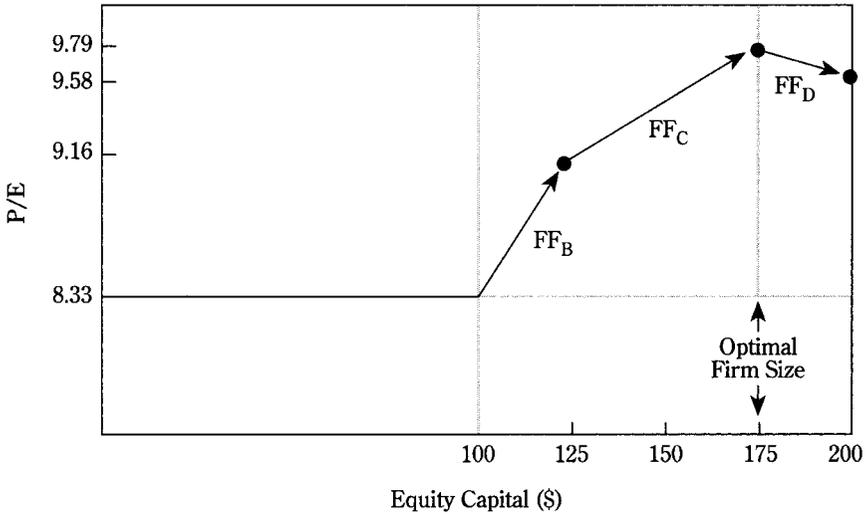


FIGURE 4.31 Vector Diagram of P/E Value

Figure 4.32 is a comparison of the relationships between the P/E and the ROE at various levels of expansion of the bank's capital base. The 20 percent ROE on the current book of business does not provide P/E enhancement, because the share price should already have adjusted upward to drive the base P/E to its equilibrium value of 8.33. The prospect of undertaking Business B is attractive to current shareholders, however, because it holds out the promise of gain *beyond* the current level of earnings. Business B's 20 percent ROE represents an 8 percent return advantage over the cost of new equity capital (assumed here to be 12 percent). This incremental value is reflected in the price, and the P/E is pushed up by 0.83 units to 9.16.

Business B's ROE is the same as the 20 percent ROE on the current book, so the firm's overall ROE will remain at 20 percent as earnings from Business B are realized. Anticipated expansion into Business C will, again, raise the P/E, because Business C provides a 3 percent return advantage over the cost of equity capital. As earnings from Business C are realized, however, its 15 percent ROE will reduce the average return on total equity capital to 18.6 percent. Nevertheless, this expected future ROE reduction should not deter the bank from moving into Business C, because by doing so, the bank achieves its optimal size in terms of shareholder value. In general, a new business added to the bank's book that has an ROE greater than 12 percent will have a positive franchise factor and will enhance the P/E value of the bank; an ROE that is positive but below 12 percent will be viewed negatively by shareholders.

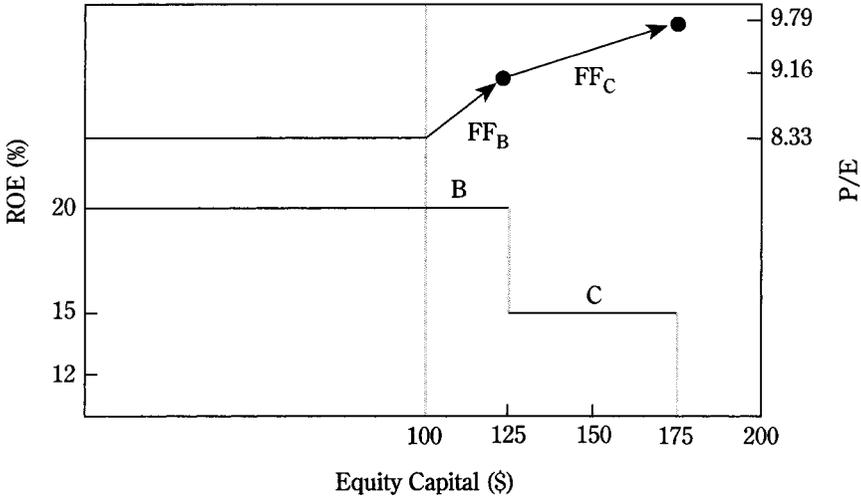


FIGURE 4.32 Comparison of Return on Equity and P/E

The Impact of Changes in Investment Duration and Leverage

To this point, certain simplifying assumptions have been made—that the net spread for each business unit could be sustained in perpetuity and that a leverage ratio of 20 is always attainable. This subsection discusses how a relaxation of these assumptions influences the franchise factor and, consequently, the P/E.

Figure 4.33 illustrates the relationship between the franchise factor and the net spread when the spread is constant for five years and then changes.²¹ For comparative purposes, Figure 4.33 also includes the FF line for perpetuities (see Figure 4.29). For spreads above 35 basis points, the line for perpetuities appears above the five-year line. This dominance is expected, because the bank surely prefers good spreads forever to good spreads for only five years. At spreads below 35 basis points, however, the ROEs are below 12 percent and the FFs are negative. Hence, the five-year period would be “preferred,” at least on a relative basis.

As an example of the relationship between the franchise factor and the magnitude and duration of net spread, consider an investment, Business C*, that offers a 70-basis-point net spread for five years. Although Business C* initially has a 20-basis-point higher net spread than Business C, the franchise factors for C* and C are equal. Consequently, equal investments in C* and C have the same P/E impact, because the net spreads for C* and C have the same present value. In effect, the higher net spread of

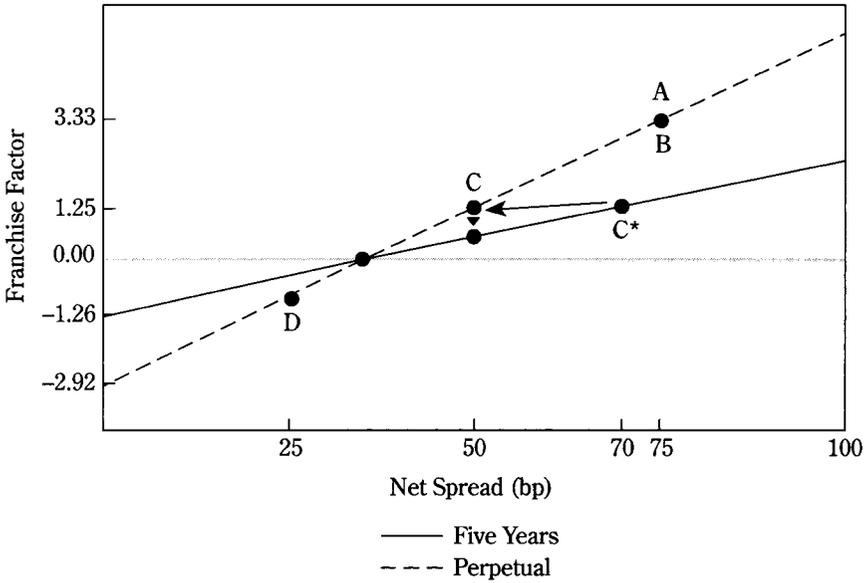


FIGURE 4.33 The Franchise Factor versus the Net Spread when the Net Spread Changes after Five Years

C* during the first five years is just enough to counterbalance its lower net spread in later years.

Figure 4.33 also clarifies the impact of a change in *expectations* regarding a given net spread. Suppose that, as a result of increased competition in spread banking, Business C's net spread of 50 basis points is expected to last only five more years. The revised franchise factor can be found in Figure 4.33 by moving vertically from Point C to the five-year spread line, where FF is only 0.54. This 57 percent decrease in the franchise factor (from 1.25) means that the P/E gain from a \$50 investment in Business C is 57 percent lower than expected.

Changes in the leverage ratio can also affect the P/E dramatically. For any positive net spread, the ROE decreases as the leverage multiple falls. Consequently, lowering the leverage results in a lower franchise factor and a decrease in the P/E impact of a new investment opportunity, as shown in Figure 4.34. The upper line in Figure 4.34, as in Figure 4.29, represents the relationship between the franchise factor and the net spread when the leverage multiple is at the assumed level of 20. The lower line represents the franchise factor when the leverage is lowered to 10. As indicated earlier, Business C provides a franchise factor of 1.25 when the leverage is 20

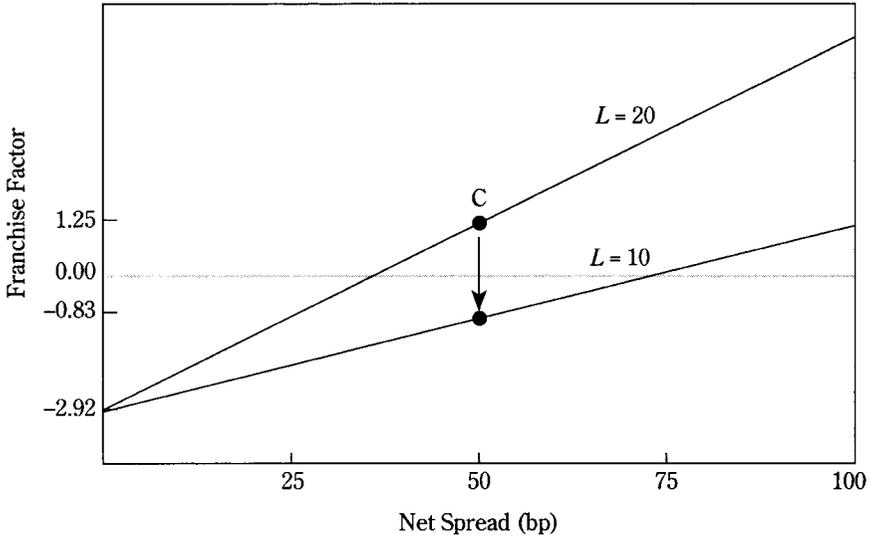


FIGURE 4.34 The Franchise Factor versus the Net Spread with Varying Leverage

but provides a negative franchise factor when the leverage is 10. Thus, the investment in Business C should not be made if the leverage is 10.

Figure 4.35 illustrates how leverage and the net spread produce a given ROE. As the leverage multiple decreases, achieving good returns through spread banking becomes extremely difficult, because an ever-increasing net spread is necessary to achieve a desired ROE. A leverage multiple of 10, for example, at a net spread of 150 basis points is required to match the 20 percent ROE on the existing book of business.

By the same token, if the net spread becomes too tight, an unacceptably high leverage multiple may be necessary to achieve a target ROE. For example, if the net spread is 50 basis points, a leverage multiple of 30 is required to achieve a 20 percent ROE.

Restructuring the Existing Book of Business

The concept of a base P/E derives from the implicit assumption that earnings on the current book of business (that is, the current ROE, *r*) can be sustained in perpetuity.²² If the current book can be restructured, however, and a higher ROE obtained, current shareholders should benefit.

The analysis begins with the observation that the base P/E can be expressed in a formula that is similar to the overall P/E formula.²³ In the earlier formula for P/E, incremental P/E value was shown to depend on the franchise factors of *future* investments. For the base P/E, a similar type of

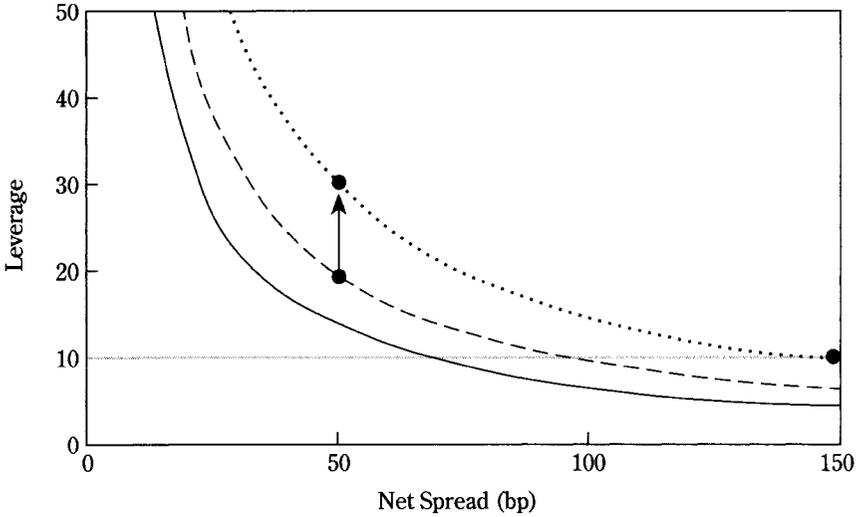


FIGURE 4.35 Leverage Required to Achieve a Given Return on Equity versus Net Spread

incremental P/E value can be ascribed to the franchise factors of the subunits of the *current* book of business.

In the bank example, a leverage multiple of 20 was applied to the current book, and the corresponding average net spread on leveraged assets was 75 basis points. These assumptions resulted in a 20 percent average ROE. Now the assumption is added that the current book of business comprises three subunits— B_1 , B_2 , and B_3 —each of which represents \$33.33 in equity capital. The net spreads for these subunits are 133 basis points, 75 basis points, and 17 basis points, respectively. Table 4.7 summarizes the characteristics of the subunits. The incremental P/E attributable to each subunit is computed by multiplying the unit’s franchise factor by its size (33 $\frac{1}{3}$ percent of the total \$100 in current book

TABLE 4.7 The P/E Value of Subunits of the Current Book Equity

Business Subunit	Dollar Value	Net Spread (basis points)	Return on Equity	Franchise Factor	Incremental P/E Value
B_1	\$ 33.33	133	31.6%	8.17	2.72
B_2	33.33	75	20.0	3.33	1.11
B_3	33.33	17	8.4	-1.50	-0.50
Overall	\$100.00	75	20.0	3.33	3.33

equity). The total incremental P/E provided by the subunits is equal to an overall current-book franchise factor of 3.33.

To arrive at the base P/E of 8.33, the incremental P/E value of 3.33 is added to $1/r$ (that is, $1.0/0.2$, or 5.0).²⁴ This result is illustrated by the vector diagram in Figure 4.36. Observe that the first vector emanates from the 5 point on the P/E axis. The slope of this vector, 8.17, is the franchise factor for Subunit B₁. The vector extends over the first \$33.33 of equity capital, thereby boosting the P/E by 2.72 units, to 7.72. Similarly, the second vector extends over the next \$33.33 in equity capital and raises the P/E by an additional 1.11 units, to 8.83. The final vector corresponds to a negative franchise factor and thus slopes downward. The P/E is reduced by 0.50 units, which brings it down to the 8.33 base level.

Clearly, Subunit B₃ reduces value. Shareholders would be better off if this last business could be unwound and the book equity released for more effective deployment. For example, if the full \$33.33 book value of Subunit B₃ could be redirected to earn the 12 percent market rate, FF_3 would increase from -1.50 to zero, reflecting a 6 percent increase in earnings, from \$20.00 to \$21.20 (see FF_3^* in Figure 4.37).²⁵ As an interim step, FF_3^* could be viewed as increasing the base P/E to 8.83. The new level of earnings would be quickly capitalized into a 6 percent increase in the market price, however, as the process of market equilibrium drove the P/E back to 8.33. The net effect would be to provide an immediate windfall profit (the height of the shaded area in Figure 4.37) to current investors.

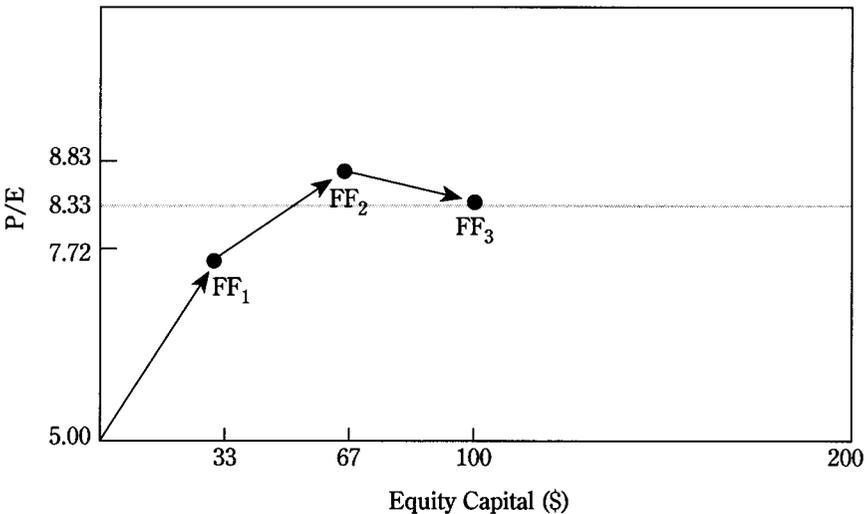


FIGURE 4.36 Vector Diagram of the P/E Value for the Current Book of Business

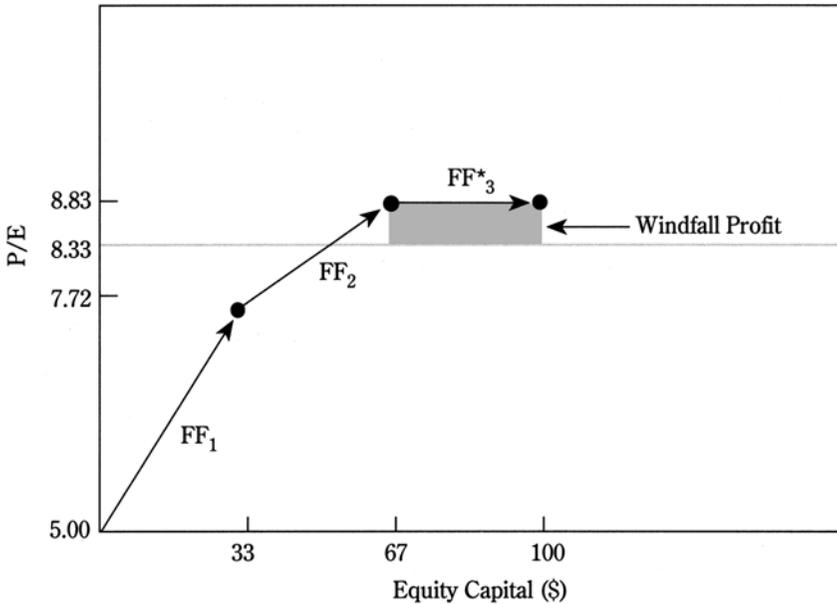


FIGURE 4.37 Restructuring the Current Book of Business

Summary

Spread banking is particularly well suited to FF analysis for several reasons. In spread banking, the return on equity capital for a given book of business is determined by the spread between borrowing and lending rates and the degree of leverage. For many spread-banking activities, the allowable leverage (or, equivalently, the equity capital requirement) is specified through regulation of one form or another. This specification results in well-defined values for the return on equity; thus, the franchise factor can be readily computed. In addition, the financial nature of spread banking generally leads to a relatively simple time pattern of returns, in contrast to the complex investment and payback flows generated by a typical manufacturing project. Moreover, spread-banking lines of business tend to be more homogeneous and better delineated in scope than manufacturing businesses. At the conceptual level, at least, the relative simplicity of spread banking makes the franchise factors for a spread-banking firm easier to characterize than those for a general industrial concern.

Any anticipated opportunity with a positive franchise factor raises the price/earnings ratio; a new investment with a negative franchise factor lowers the P/E. By accepting all P/E-enhancing business and rejecting all non-

P/E-enhancing business, a spread-banking firm can set a long-term target that will maximize its P/E.

By the same token, if a subunit of the existing business has a negative franchise factor, removing that subunit will benefit the shareholders. If a merger or restructuring achieves cost efficiencies that result in an increase of net spread, the franchise factor will increase. Finally, any action that raises a subunit's franchise factor will benefit existing shareholders by providing them with an immediate windfall profit.

The Franchise Factor for Leveraged Firms

One striking result discussed in "The Franchise Portfolio" and "A Franchise Factor Model for Spread Banking" is the high level of future franchise investment required for even moderately high price/earnings ratios. For example, a P/E of 15 implies that new franchise investments must have a magnitude of 2.5 to 5.0 times the current book value of equity, even when the available return on the new investments is fairly high—in the range of 15 to 18 percent. This section addresses the question of whether debt financing might moderate these unusual findings and lead to reasonable levels for the required franchise investment.

The general topic of the effect of leverage on P/E has received little attention in either academic or practitioner literature. Because leveraging the current book shrinks both shareholder equity and firm earnings, intuition regarding the net impact of leverage on the price/earnings ratio is unreliable. Does leverage lead to increasing, decreasing, or perhaps stable P/Es?

The Impact of Leverage on Current Earnings

The value of a firm derives from two fundamental sources: the tangible value of the current book of business, and the franchise value based on future opportunities that enable the firm to experience productive growth. The total market value is simply the sum of these two terms, or

$$\text{Market value} = \text{Tangible value} + \text{Franchise value}$$

The focus of this subsection is primarily tangible value (TV), defined as the total of two quantities: (1) the *book value* of assets and (2) the addi-

tional *premium over book value* for firms that are able to generate above-market returns on existing book assets. Thus,

$$\text{Tangible value} = \text{Book value} + \text{Premium over book}$$

Note that this definition of “tangible” is *not* the usual accounting definition.

As an illustration, consider a tax-free firm that has no franchise opportunities and the following characteristics:

Characteristics		Per-Share Values	
Book value (B)	\$100 million	Book value	\$100
Return on equity (r)	15 percent	Premium over book	
Earnings (E)	\$ 15 million	for current earnings	25
Total market value	\$125 million	Share price	125

This firm is unleveraged and has 1 million shares outstanding. Although the \$15 million in earnings (15 percent of \$100 million) generated by today’s book will fluctuate from year to year, a simplified deterministic model is assumed in which the firm generates a perpetual earnings stream of \$15 million annually.²⁶ The market capitalization rate for the unleveraged firm is assumed to be 12 percent, and the cost of debt 8 percent, regardless of the extent of leverage or the likelihood of bankruptcy. For this example of a firm without productive growth prospects, the tangible value (and the firm’s total market value) is \$125 million. This theoretical value results from capitalizing the prospective \$15 million in earnings at the 12 percent market rate. The \$25 million premium over book value is a direct consequence of the fact that the return on equity is 3 percent greater than the market capitalization rate.

The P/E for this firm is 8.33, determined by dividing the market value of \$125 million by the total earnings of \$15 million. Now, consider the impact of leverage. Assume an equilibrium model in which debt is used to repurchase shares so that the firm’s total value remains unchanged. Thus, leverage alters the financial structure of the existing firm, but it does not expand the capital base. This equilibrium model assumes that the firm is fairly priced and that all transfers take place at fair market value. No windfalls come to any shareholders—be they the original shareholders who sold out during the repurchase process or the remaining shareholders in the leveraged firm.²⁷

If the firm is free of debt, all its earnings belong to the equityholders. The use of debt to repurchase shares has two immediate effects: The earnings available to shareholders are reduced by interest payments, and the

aggregate shareholder claim to the firm's (unchanged) total value is reduced by the total value of the debt. For example, as shown in Figure 4.38, if the firm is leveraged 50 percent, its debt will be 50 percent of its book value (\$50 million), its annual interest payments at 8 percent will be \$4 million, and its earnings will then be \$15 million – \$4 million (or \$11 million).²⁸

If the firm is leveraged to 100 percent of book value, the interest payments will be \$8 million, and the earnings will drop to \$7 million. Note that the assumption of a constant 8 percent debt rate ignores the fact that both agency costs and the probability of bankruptcy increase with leverage.

Leverage and the Tangible-Value Firm

In addition to the effect of leverage on the distribution of earnings claims between bondholders and equityholders, the leverage also reduces shareholder equity. For the example firm, if its unleveraged market value of \$125 million is assumed to be constant under increasing leverage, \$50 million in loan proceeds is used to repurchase shares, and the price per share does not change, the total value of the firm will remain at \$125 million but the equity value will drop to \$75 million. At a leverage ratio of 100 percent of book (an impractical but theoretically illuminating level), \$25 million in residual shareholder value still remains, because leverage is defined here relative to book value rather than to market value.

The findings on earnings and shareholder equity can now be com-

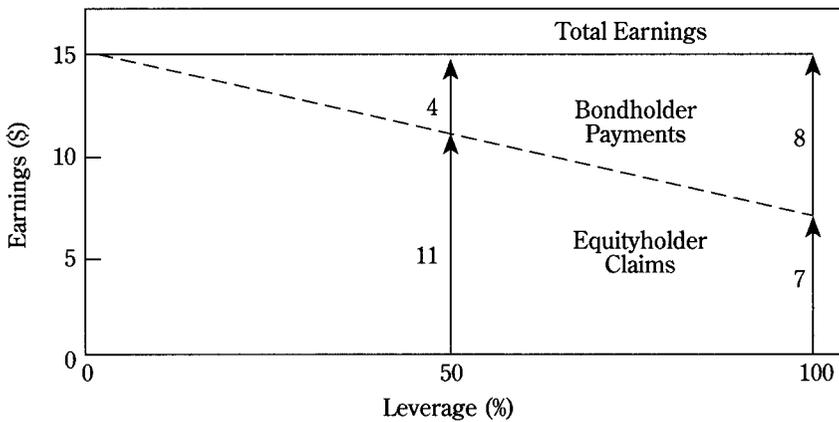


FIGURE 4.38 Total Earnings under Varying Degrees of Leverage (dollars in millions)

bined to determine how leverage affects the P/E. For the firm with 50 percent leverage, a P/E of 6.82 is obtained by dividing the revised \$75 million equity value by the \$11 million in earnings. At 100 percent leverage, the P/E drops to 3.57. The full range of leverage ratios produces a declining P/E curve.²⁹

The preceding examples demonstrate that leverage leads to a declining P/E for any firm that derives all of its value from its current book of business. As long as the debt cost is less than the market rate, the P/E will start at 8.33 and follow a pattern of decline similar to the pattern of the no-franchise-value firm in Figure 4.39.

Growth Opportunities and the Franchise-Value Firm

The firm in the preceding subsections generated \$15 million in earnings a year but had no prospects for productive growth. Turn now to the more representative situation in which a firm has opportunities for future growth through investment at above-market returns. As in previous sections, assume that firms are able to take advantage of all franchise investment opportunities because the market should always be willing to supply sufficient funds for such purposes.

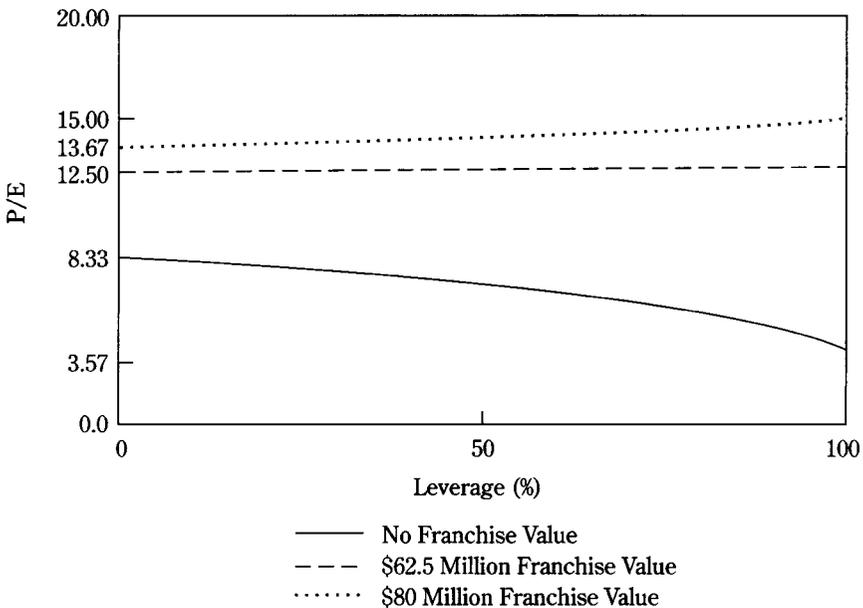


FIGURE 4.39 P/E versus Leverage for Three Firms

The opportunity to invest in productive new businesses represents, in itself, a franchise value to this firm, even though the opportunity does not contribute to current book value. Assume that this franchise amounts to \$80 million of net present value above and beyond the cost of financing the requisite future investments. The addition of this \$80 million franchise value brings the total market value of the firm to \$205 million:

$$\begin{aligned}\text{Market value} &= \text{Tangible value} + \text{Franchise value} \\ &= \$125,000,000 + \$80,000,000 \\ &= \$205,000,000\end{aligned}$$

Without leverage, the P/E of this firm is 13.67 (\$205 million divided by \$15 million in current earnings), which is 5.33 units higher than the 8.33-unit base P/E of the unleveraged tangible-value firm illustrated in Figure 4.39.

Now look at the effect of leverage on the equity value and the P/E multiple of the franchise-value firm. At 50 percent leverage, the equity value falls by \$50 million, from \$205 million to \$155 million, and the earnings drop to \$11 million. Consequently, the P/E increases to 14.09 (\$155 million/\$11 million). At 100 percent leverage, the equity value drops by \$100 million, leaving only \$105 million. Because earnings decline to \$7 million, the P/E grows to 15. Intermediate values for the P/E of the \$80 million franchise-value firm are plotted in Figure 4.39, in which the P/E curve can be seen to rise with increasing leverage.

In general, any firm with a positive franchise value will have an initial (unleveraged) P/E that is greater than the 8.33-unit base P/E. If the unleveraged P/E is greater than a certain “threshold” value, the P/E will follow a pattern of increase with higher leverage ratios.

To see how such a threshold P/E responds to leverage, consider a firm with \$15.0 million in current earnings and a franchise value of \$62.5 million. Its total market value will be \$187.5 million, and its initial P/E will be 12.5. The P/E is also 12.5 at 50 percent leverage. In fact, when the franchise value is \$62.5 million, the P/E remains unchanged at 12.5 for *all* leverage ratios.

Combining the results from these three examples, Figure 4.39 graphically illustrates a finding that might surprise many market participants. The directional effect of leverage on P/E depends on the “value structure” of the existing firm. For a no-growth firm for which the equity value is derived solely from current earnings, the P/E always starts at 8.33 if the capitalization rate is 12 percent, and higher debt ratios lead to lower P/Es. The same declining P/E pattern is observed for all firms with P/Es below a threshold value (12.5 in this example). In contrast, for firms with future

franchise opportunities that place their initial P/Es above the threshold level, leverage results in higher P/Es.

Figure 4.39 could have been obtained without reference to either the base P/E or the franchise value; the results of this analysis are totally general because they require only the basic assumptions of a fixed debt cost and a constant firm value. The critical determinant of the direction of the leverage effect is the initial P/E. The base P/E and the franchise value simply provide a convenient way to explain the mechanisms that lead to different leverage effects.

Leverage and the Franchise Factor Model

The basic FF model can be applied to leveraged firms by extending the definitions given in earlier sections. First, the base P/E is revised by reducing the tangible value of the unleveraged firm by the size of the debt incurred. This adjusted tangible value corresponds to the capitalized value of the current earnings stream under the new debt load. The leveraged base P/E is now calculated by dividing the adjusted tangible value by the annual earnings, net of interest payments:

$$\text{Base P/E (leveraged)} = \frac{\text{Tangible value} - \text{Debt value}}{\text{Net earnings}}$$

where net earnings are annual earnings minus annual interest payments.

For example, if the tangible value is \$125 million and the firm is 50 percent leveraged against a \$100 million book value, then the debt value is \$50 million and the adjusted tangible value is \$75 million. The graph of the resulting base P/E (versus leverage) is exactly the same as the “no franchise value” curve in Figure 4.39, for any firm that has a 15 percent return on unleveraged equity.

Because the debt-induced decrement to shareholder value is embedded in the adjusted tangible value, the franchise value can be viewed as remaining constant in the face of leverage. This invariance can be interpreted in the following way: (1) The current shareholders are entitled to the full value of the franchise; (2) the franchise value reflects the excess of the return on new investment *above* the cost of future capital; and (3) the weighted-average cost of future capital will theoretically be equal to the market capitalization rate, regardless of the extent of leverage used in future financings.

The Leveraged Franchise Factor

In the case of leverage, the P/E increment from franchise value can be found by dividing that value by the net earnings. Because the net earnings *decrease* as leverage increases, the P/E increment from a given franchise will always be greater than in the unleveraged case. In the FF model, the P/E increment from franchise value is captured in the product of the franchise factor and the growth equivalent. To assume that *G* will not be affected by leverage is logical. Therefore, because *G* does not change, the entire impact of leverage is, in effect, “loaded” into a raised FF (see Appendix 4D for details):

$$FF \text{ (leveraged)} = \frac{R - k}{(r - ib)k}$$

where *i* = interest rate on debt

b = leverage as a percentage of book value

As an example, assume *R* = 18 percent and *r* = 15 percent. With *k* = 12 percent, FF is 3.33 for the unleveraged firm (that is, for *b* = 0).

At first, the franchise factor grows slowly with leverage, reaching 4.55 at 50 percent leverage (see Figure 4.40):

$$FF \text{ (50 percent leveraged)} = \frac{0.18 - 0.12}{[0.15 - (0.08 \times 0.50)] \times 0.12} = 4.55$$

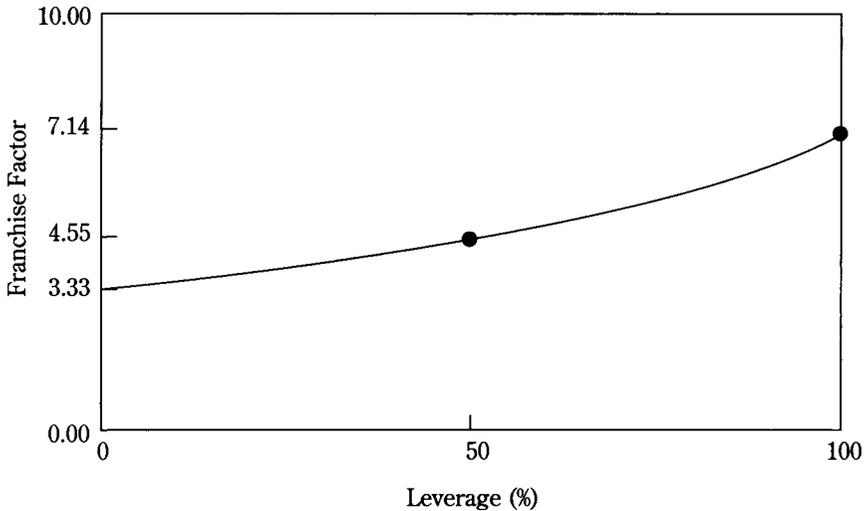


FIGURE 4.40 Franchise Factor versus Leverage

At higher leverage percentages, FF increases more rapidly, reaching 7.14 for the 100 percent leveraged firm. The increasing franchise factor suggests that the P/E gain from a given franchise situation increases when a firm takes on a higher proportion of debt funding.

The Total P/E

The two P/E components are plotted in Figure 4.41 to show their responses to leverage. The base P/E reflects the firm's tangible value, which always declines with added debt. In contrast, the incremental P/E from the franchise value exhibits an ascending pattern. The sum of these two terms is the firm's P/E.

If G is 160 percent and the unleveraged FF is 3.33 (corresponding to $R = 18$ percent and $r = 15$ percent), the incremental P/E is 5.33 (3.33×1.6) and the total P/E is 13.67 ($8.33 + 5.33$).³⁰ With this G value, the P/E increases with leverage. Lowering the G value results in a lower P/E increment from the franchise value and, consequently, an overall P/E that rises more slowly. At a G of 125 percent, the incremental franchise P/E will just

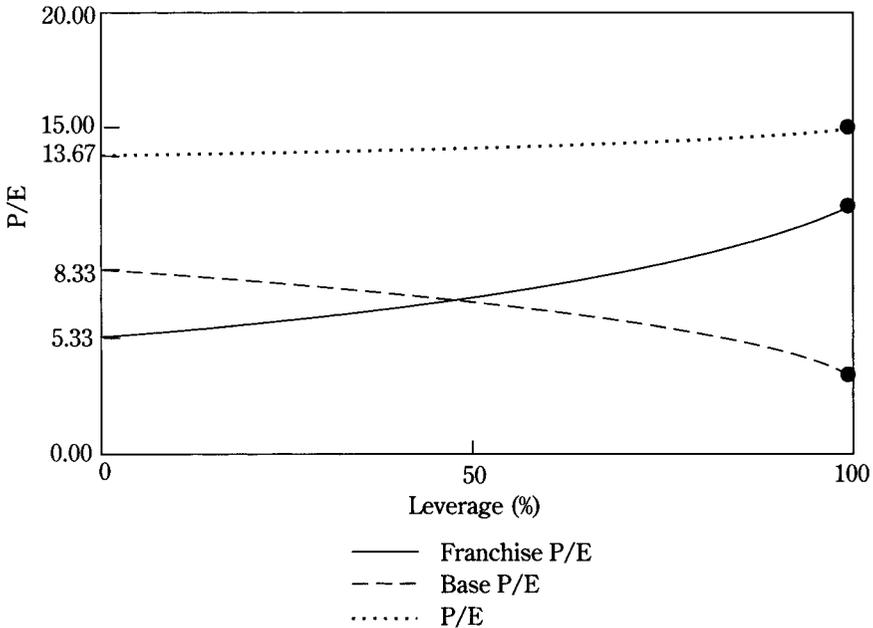


FIGURE 4.41 P/E versus Leverage (growth equivalent = 160 percent)

offset the declining base P/E.³¹ The net result will be an overall P/E that is constant in the face of leverage.

The combined effects of the level of franchise opportunities and the degree of leverage are shown in Figure 4.42. At zero leverage, the P/E starts at an unleveraged base value of 8.33 and rises by 3.33 units (the unleveraged FF) for each unit increase in *G*. At 50 percent leverage, the base P/E drops to 6.82 but the P/E grows faster because of the greater FF slope of 4.55 (see Figure 4.40). For 100 percent leverage, the base P/E drops farther, to 3.57, but the P/E line has an even greater slope than with lower leverage, a slope that corresponds to the leveraged FF value of 7.14.

In Figure 4.42, all the lines cross at a *G* of 125 percent, thereby giving a common P/E of 12.5. For firms with this P/E multiple, the earnings yield (that is, the reciprocal of the P/E) is equal to the 8 percent debt rate. Consequently, the addition of debt blends in with the original structure and leaves the earnings yield unchanged. From another vantage point, one can see that substantial franchise investments—125 percent of current book value—are needed just to sustain this relatively modest P/E of 12.5. When the growth equivalent is less than 125 percent, the decline in the base P/E with leverage overpowers any gain from franchise value; thus, at low *G* values, the P/E is greatest when the firm is unleveraged. If the growth equivalent is

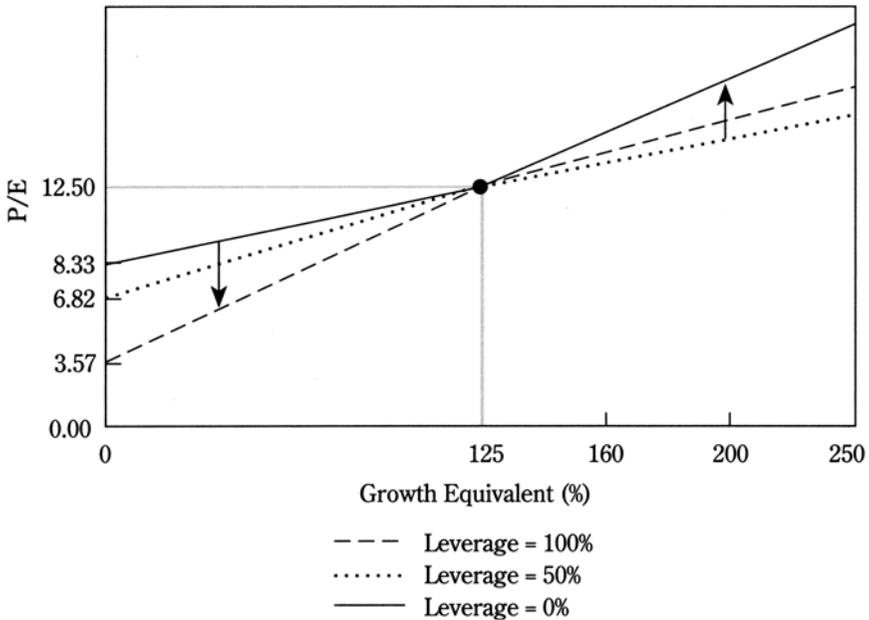


FIGURE 4.42 P/E versus the Growth Equivalent at Varying Degrees of Leverage

greater than 125 percent, the P/E response to leverage is positive, which means that, with leverage, a somewhat lower G value is needed to sustain a given P/E. The reduction in G is not sufficiently dramatic, however, to alter the earlier finding that substantial investments are required to sustain even moderately high P/Es. Thus, regardless of financial structure, the key to high P/Es remains access to franchise opportunities.

Sensitivity Analysis

Previous parts of this section demonstrated that the P/E may rise or fall with leverage, and both the direction and magnitude of the P/E change depend on the extent of the firm's franchise opportunities. This subsection looks at the *magnitude* of P/E variation for "reasonable" levels of leverage and initial P/E.

Figure 4.43 shows the variation of P/E with leverage for initial P/Es ranging from 8.33 to 16.67. Regardless of the initial P/E, the leverage effect on P/E is modest for firms that are as much as 40 percent leveraged. The muted leverage effect stems from the counterbalancing behavior of the base P/E and the franchise P/E. Another factor is the *numeraire* chosen to measure the degree of leverage. Expressing the debt as a percentage of book value rather than market value, in effect, understates the theoretical extent to which a firm can leverage. For firms with high P/Es, the book value may be only a small percentage of market value. Consequently, a high leverage ratio relative to book value may actually be a modest ratio relative to market value. Figure 4.44 shows how the leverage as a percentage of market value compares with the same amount of debt expressed as a percentage of book value.

The Impact of Taxes

To this point, the analysis has proceeded under a no-tax assumption. In the real world, the differential taxation of debt and equity creates several problems and opportunities. In terms of adjustments to the FF model, two tax effects are relevant: Earnings are reduced by the after-tax (rather than pre-tax) interest payments, and the total value of the firm is augmented by the introduction of debt.³² The value enhancement can be modeled by assuming that the additional value is just the magnitude of the "tax wedge" (that is, the tax rate times the debt amount).

The two tax effects can be incorporated into the base and franchise components of the P/E by replacing the nominal leverage with the "after-tax" leverage (see Appendix 4D for a derivation of this result). For example, if the firm's marginal tax rate is 30 percent, one can determine the P/E at 50 percent leverage by using the base P/E and the franchise factor for a nontaxable firm with a leverage of 35 percent (that is, 70 percent of 50 percent).

Figure 4.45 illustrates how the P/E impact of leverage is moderated for

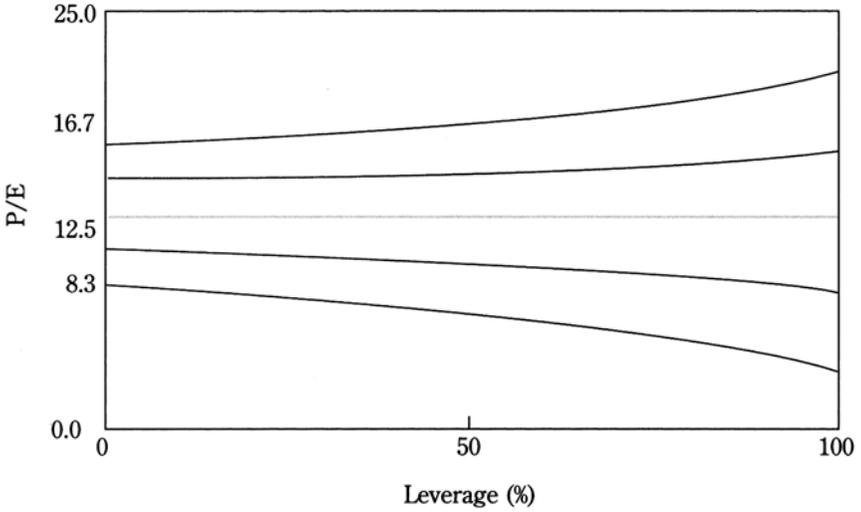


FIGURE 4.43 P/E versus Leverage at Varying Initial P/Es

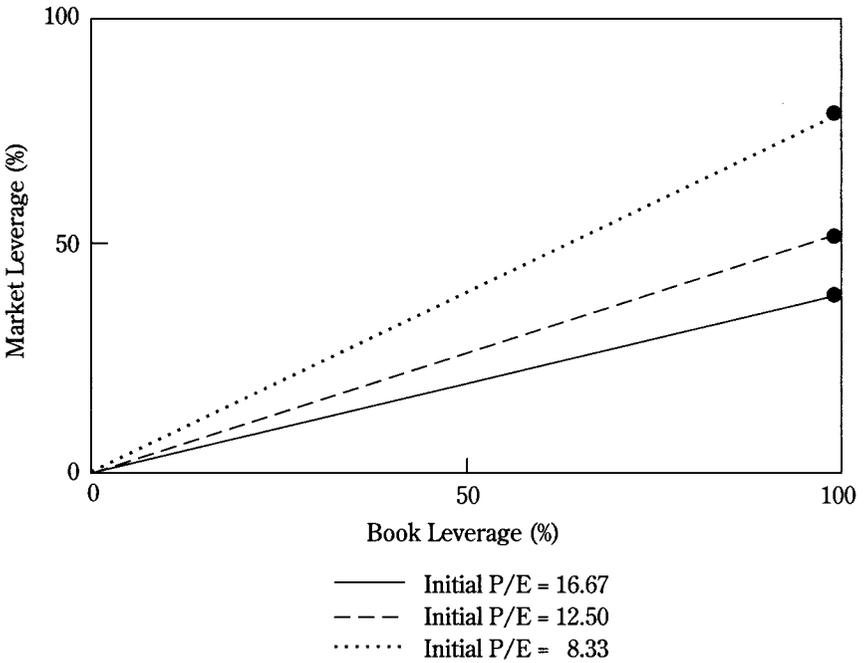


FIGURE 4.44 Market Percentage of Debt versus Book Percentage of Debt

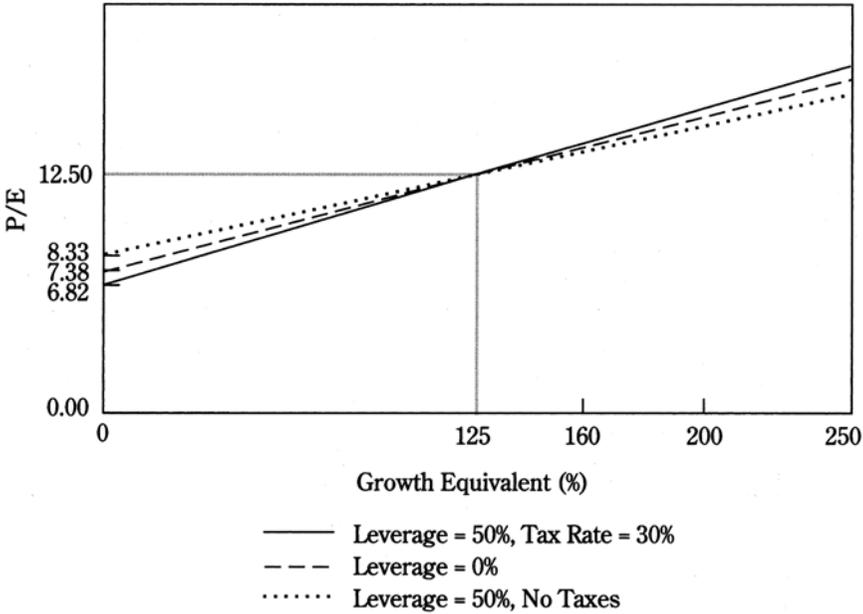


FIGURE 4.45 The P/E Effect of Taxes

taxable firms. The P/E lines still intersect when G is 125 percent, but at all other values of G , the P/E line for 50 percent leverage (and a 30 percent tax rate) is closer to the P/E line for the unleveraged firm than it was in the tax-free environment of Figure 4.42.³³

Summary

For firms with high franchise values and high P/Es, the theoretical market response to leverage—no matter what the taxation environment—is to place an even higher P/E on the existing earnings. Low-P/E stocks should experience the opposite effect—a decline in P/E with a rise in leverage.

Over a realistic range of leverage ratios (0–40 percent), however, the P/E changes are relatively modest. Thus, even with an expanded FF model that incorporates taxes and leverage, the key finding of all the studies reported so far in this chapter remains intact: Regardless of the firm’s financial structure, the fundamental basis for high P/Es is access to substantial franchise investments. For typical rates of return, these new investments must reach levels that can be measured in multiples of the firm’s current book value.

Franchise Value and the Growth Process

The preceding sections focused on the current value of a firm's price/earnings ratio. This section moves forward from that instantaneous snapshot to explore how the P/E evolves over time. For this purpose, the concepts of tangible value (the capitalized value of a firm's current earnings stream) and franchise value (the capitalized value of the potential payoff from all future franchise investments) are particularly useful as explanatory tools.

Because franchises are both perishable and finite, it is usually advantageous for a firm to fund these opportunities as soon as they become available. As projects are funded, the investment process converts franchise value to tangible value, with the result that the relative proportion of franchise value typically declines as franchise prospects are realized. The purpose of this section is to show that this franchise realization leads to a P/E that eventually declines until it reaches the base P/E value.

As an example of the franchise conversion process, imagine a retailer with a unique concept who projects that, over time, a substantial number of stores can be built that will provide earnings at a rate above the cost of capital. Such projected earnings enhance the price of the firm's equity because current equityholders have a stake in these future flows. As new stores are built, the number of prospective stores declines and a portion of the total franchise potential is funded—and, therefore, “consumed”—which lowers the franchise value. At the same time, the value of the new stores adds to the firm's current book value. Potential earnings are translated into actual earnings, and the firm's earnings base increases, thereby raising the tangible value. This transformation of franchise value into tangible value reduces the P/E because the franchise component of the P/E is diminished.

Price/earnings ratios obviously rise as well as fall, however, and situations exist in which P/Es appear to be stable. One situation that can lead to a rising P/E is a delay in franchise consumption. The very nature of certain franchise situations may entail a period of waiting before productive investments can be made. In such instances, franchise consumption will not begin immediately and the present value of the franchise will grow just through the passage of time. Under these conditions, the P/E will rise until the consumption phase begins.

The P/E will also increase when a business makes a major innovation or discovery that provides a new and unanticipated boost in franchise possibilities. Such “unexpected” franchise value provides an immediate wind-

fall profit to existing shareholders and leads to a sudden jump in P/E. Thereafter, the cycle of franchise consumption resumes, and the P/E again ultimately declines to the base P/E.

This framework leads to the following generalizations regarding the behavior of a firm according to the franchise factor model:

- Franchise consumption will lead to abnormal earnings growth.
- Abnormal earnings growth will come to an abrupt end as soon as all franchise opportunities have been fully exploited.
- The P/E will erode toward the base P/E, even while the earnings growth remains high.
- During the franchise period, price appreciation will be lower than earnings growth, with the gap being roughly equivalent to the rate of P/E decline.
- After the franchise is fully consumed, earnings, dividends, and price will all grow at a single rate that will be determined by the firm's retention policy.

These results raise questions about equity valuations based solely on projections of recent earnings growth over a prespecified horizon period. By itself, the earnings growth rate is not a sufficient statistic. Even with the same franchise structure, different investment policies can lead to vastly different levels of earnings growth over various time periods, all of which add the same value to the firm and lead to the same P/E.

According to the FF model, the challenge is to peer beyond the recent earnings experience to discern the nature, dimensions, and duration of a firm's franchise opportunities. These investment opportunities create the franchise value that is the ultimate source of high P/Es.

Conversion of Franchise Value to Tangible Value

The market value of a firm, as discussed in "The Franchise Factor for Leveraged Firms," can be expressed as the sum of the firm's tangible value and franchise value:

$$\text{Market value} = \text{Tangible value} + \text{Franchise value}$$

In essence, the tangible value is a sort of "economic book value," computed by discounting projected earnings from current businesses. The franchise value represents the value to current shareholders of all future flows that arise from new businesses that the firm will develop over time. This value is simply the total net present value of the returns from all future franchise investments. Together, the P/E, franchise value, and tangible

value provide a snapshot of the current firm and its future potential. This snapshot reveals little, however, about how the firm will change in time.

The flow chart in Figure 4.46 shows how franchise value is converted to tangible value. Because both of these quantities are present values of future cash flows discounted at the market rate, with the passage of time, the tangible value and franchise value each generate “interest” at the market rate. For the tangible value, this annual interest takes the form of the firm’s

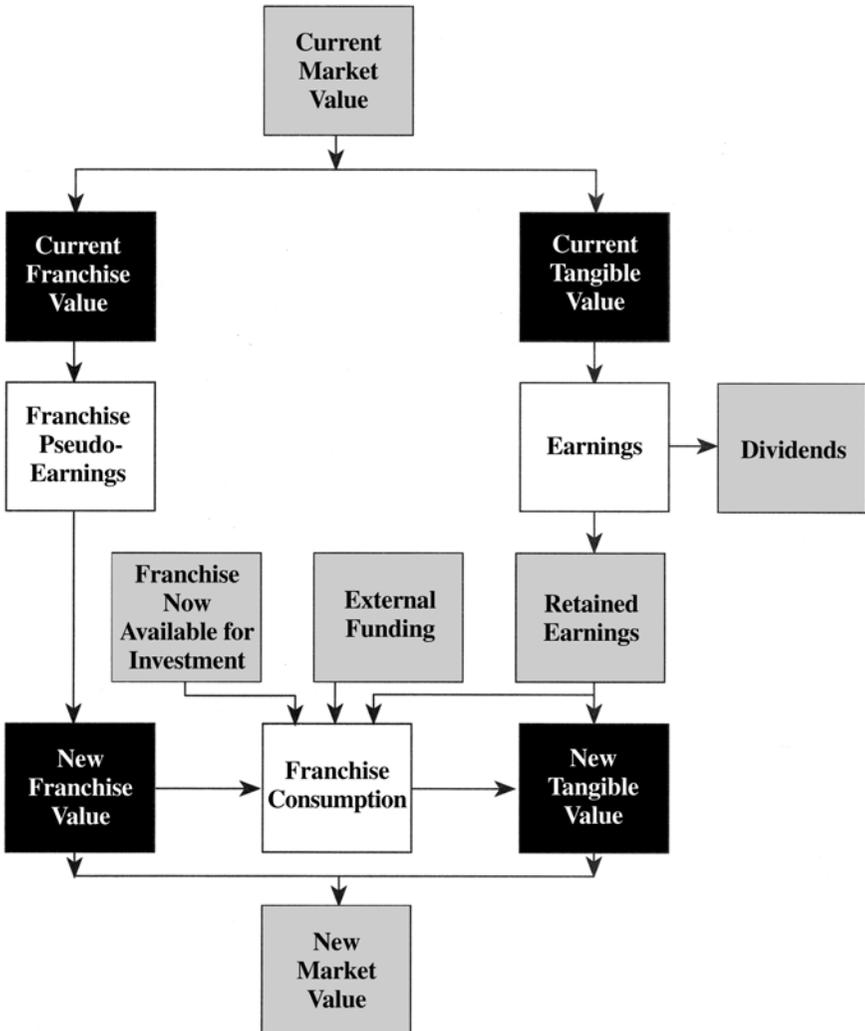


FIGURE 4.46 Schematic Diagram of Franchise Consumption

earnings. In theory, the allocation of earnings is quite visible: Dividends are distributed; retained earnings are reinvested within the firm, thereby furthering growth in tangible value.

The interest associated with the franchise value is less visible than that associated with the tangible value. These FV pseudo-earnings are similar to the accretion on a discount bond. On the one hand, without franchise consumption, the franchise value increases in magnitude from simple accretion over time. On the other hand, when a franchise investment actually is funded, the total present value of the residual franchise investments drops by the amount of the outflow. Thus, the franchise value will be eroded by the realization of franchise opportunities. These realizations are tantamount to payments out of the franchise value and into the firm's tangible value.

When a franchise opportunity becomes available for immediate investment, whether funded through retained earnings or external financing, the actual franchise investment will produce an incremental earnings stream that, when capitalized, adds to the firm's tangible value. Because the potential value of this earnings stream was already embedded in the firm's franchise value, the act of funding a franchise opportunity simply transforms a potential value into (quite literally) a tangible value. Thus, franchise investment consumes franchise value as future potential becomes current reality. The firm's theoretical total market value will be increased by the value of any retained earnings and/or external funding. Apart from this added investment, however, the firm's market value is not altered by the franchise consumption process.

Franchise Consumption

Consider a tax-free, unleveraged firm, Firm A, with a book value of \$100 million and a return on equity of 15 percent. The earnings of \$15 million a year (15 percent of \$100 million) are assumed to continue year after year, and the firm's tangible value of \$125 million is computed by capitalizing the perpetual earnings stream at an assumed 12 percent market rate. Firm A's market value is assumed to be \$225 million, based on the tangible value of \$125 million and additional franchise value of \$100 million. The firm's P/E is 15 (that is, \$225 million/\$15 million).

The \$100 million in franchise value is based on the firm's ability to make new franchise investments that provide a 20 percent return on equity in perpetuity. Each \$1 million of such investments will generate an earnings stream of \$200,000 a year. Capitalizing this earnings stream at the assumed market rate of 12 percent produces additional tangible value of \$1.67 million (that is, $\$200,000/0.12$).

The *net* value added for the firm's shareholders will be \$0.67 million,

because an incremental \$1 million investment is required to realize the \$1.67 million value. Thus, a franchise value of \$100 million is derived from the opportunity to make a series of franchise investments with a total present value of \$150 million ($\$100 \text{ million} = \$150 \text{ million} \times 0.67$).

Because the total of all franchise investments is defined in present-value terms, the franchise value is the same whether the \$150 million in investments is made immediately or spread out over time. Figure 4.47 illustrates a specific time pattern of franchise investments. This schedule is assumed to reflect the points at which investment opportunities first become available; the schedule cannot be further accelerated, and the firm will pursue these opportunities as expeditiously as possible, either through retained earnings or through external financing.

In this example, Firm A's franchise opportunities can be fully exploited through earnings retained at a rate of 85 percent. During the first year, the firm earns \$15 million, invests \$12.75 million (85 percent of \$15 million) in a franchise business, and pays out the remaining \$2.25 million in dividends to shareholders. During the second year, the \$15 million in earnings is augmented by \$2.55 million in earnings from the new enterprise (20 percent of \$12.75 million). This increase represents earnings growth of 17

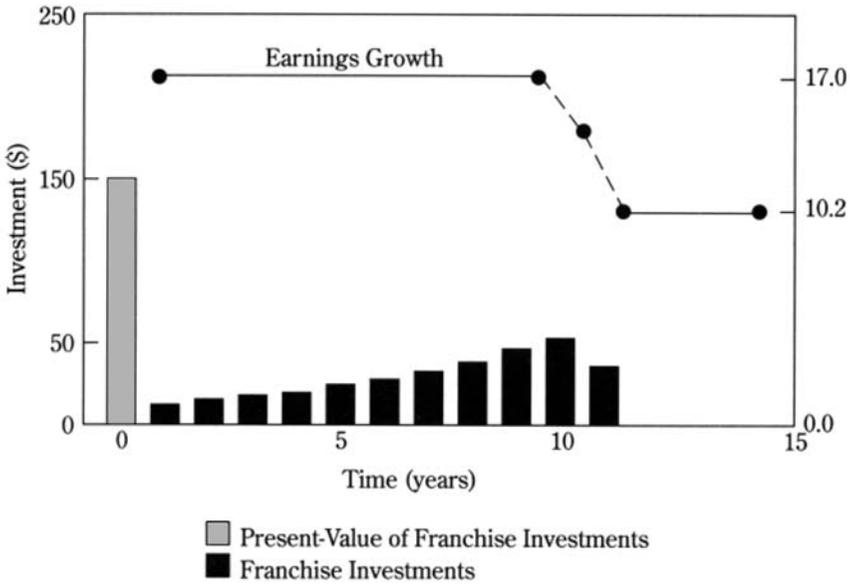


FIGURE 4.47 The Franchise Consumption Process (dollars in millions)

percent, which provides more capital for investment at the end of the second year.

This pattern of increasing investment continues through the 10th year. At this point, almost all of the franchise value has been consumed. The consumption process is completed in the 11th year, and additional retained earnings can be invested only at the 12 percent market rate. With the onset of such market-rate investments, the rate of earnings growth drops to 10.2 percent (85 percent of 12 percent).³⁴

Figure 4.48 shows how the book value of Firm A grows over time while the present-value magnitude of the remaining franchise opportunities shrinks. Initially, the present value of all future franchise investments, the growth equivalent, is 150 percent of the book value. At the end of the first year, the book value grows as the first \$12.75 million in franchise investment becomes part of the firm's book of business. The present value of future franchise investments also experiences a slight increase, because the increase in present value one time period forward is greater than the \$12.75 million investment. When the incremental franchise investments

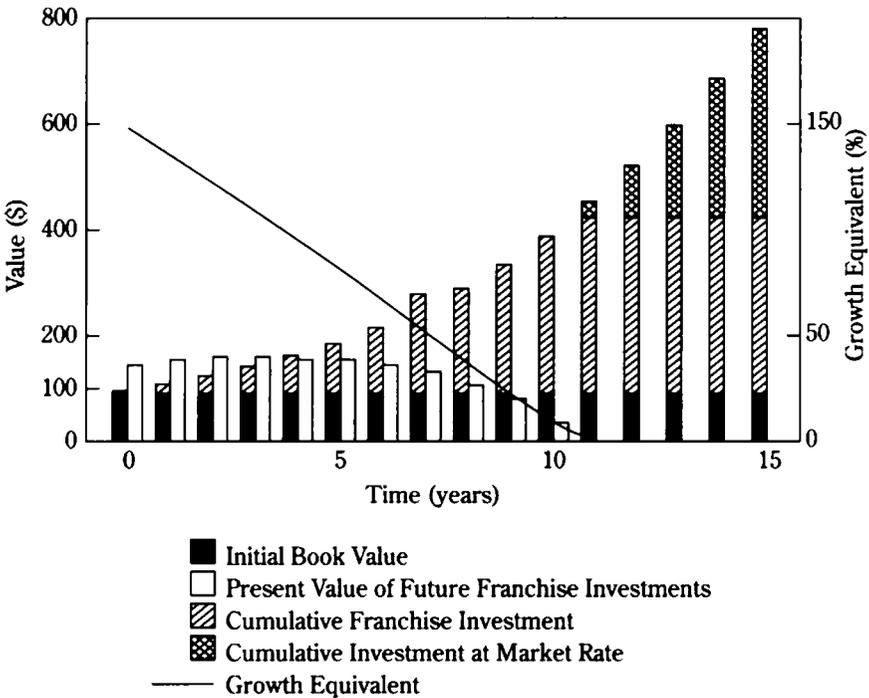


FIGURE 4.48 Book-Value Growth during Franchise Consumption (dollars in millions)

begin to exceed the pseudo-earnings, however, the present value of future franchise investments decreases.

In the 11th year, the retained earnings will exceed the remaining franchise potential; thus, the excess retention must be invested at the market rate. From Year 12 on, the book-value increases are solely the result of market-rate investments. By this point, the P/E will have declined to the base P/E value of 8.33. During this same 11-year period, as also depicted in Figure 4.48, a corresponding decline occurs in the available franchise investment when expressed as a percentage of book value (the growth-equivalent value).

Role of the Franchise Factor

The franchise factor for Firm A can now be computed according to the formula used in previous sections.

$$\begin{aligned} \text{FF} &= \frac{R - k}{rk} \\ &= \frac{0.20 - 0.12}{0.15 \times 0.12} \\ &= 4.44 \end{aligned}$$

At the outset, Firm A has a (present-value) franchise investment potential of \$150 million and a growth equivalent of 150 percent. Thus, the price/earnings ratio is initially,

$$\begin{aligned} \text{P/E} &= \text{Base P/E} + (\text{FF} \times G) \\ &= \frac{1}{k} + (\text{FF} \times G) \\ &= 8.33 + (4.44 \times 1.50) \\ &= 15 \end{aligned}$$

In time, as the franchise value is consumed in accordance with the prospective schedule of investment opportunities, the book value grows. This process leads to a decline in the value of the growth equivalent until it reaches zero after the franchise is fully consumed in the 11th year. This pattern of G decay was exhibited in Figure 4.48 and is shown again in Figure 4.49, which also illustrates how both the franchise factor and the P/E change over time. The franchise factor is fairly stable as it decreases slowly over the 11-year franchise period.³⁵

The incremental P/E (that is, the value beyond the base P/E of 8.33) is

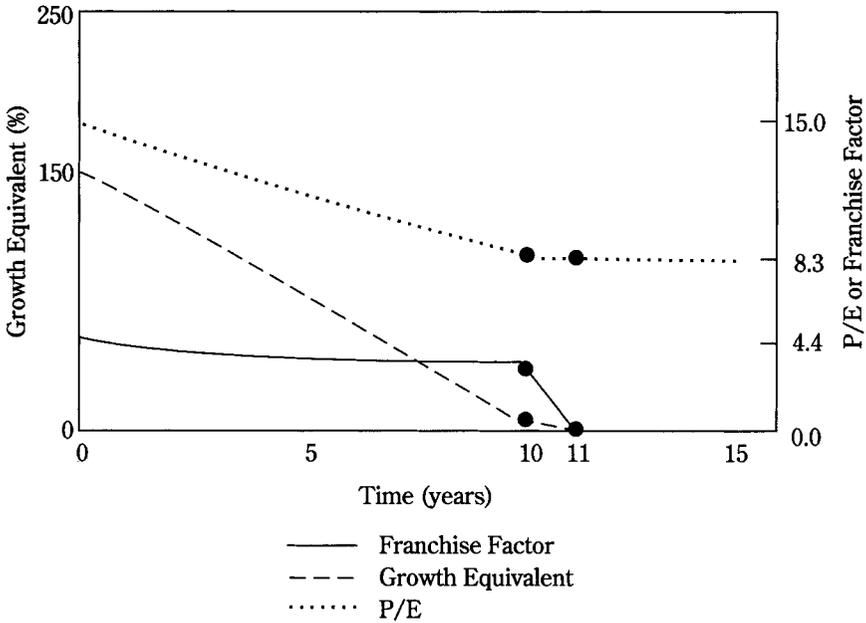


FIGURE 4.49 The Changing P/E

simply the product of FF and G. As time passes, the P/E will, therefore, reflect the rapid decay in G and the more modest decline in FF. By the 11th year, the P/E increment is totally eroded and the P/E assumes the base value of 8.33.

The Franchise Value over Time

The path of the P/E over time can be better understood by observing how the franchise value declines during the franchise consumption process. Figure 4.48 illustrated how the present value of future franchise investments changes during the 11-year consumption period. The franchise value itself follows this same pattern of change. Figure 4.50 shows the path of the firm’s overall market value and its franchise- and tangible-value components.

The relationship between the remaining present value of franchise investments and the changing proportions of franchise and tangible value can be viewed from a slightly different perspective by expressing franchise value and tangible value as percentages of market value (see Figure 4.51). The proportion of franchise value declines steadily even during the early years, when some growth occurs in the present value of

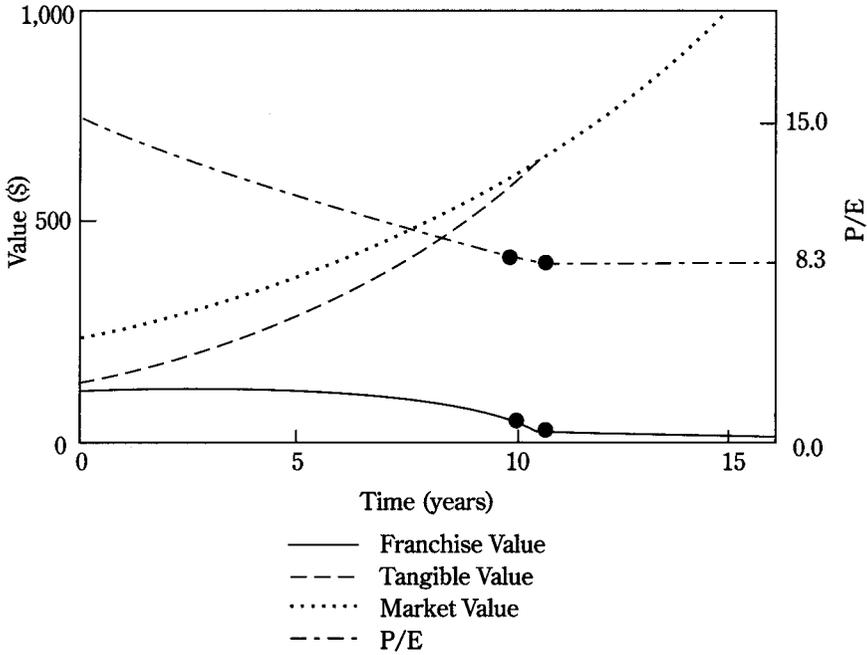


FIGURE 4.50 Components of Firm Value (dollars in millions)

franchise investments. Note that the P/E declines along with the proportion of franchise value.³⁶

The relationship between the P/E and the relative proportions of franchise value and tangible value can be made explicit by expressing the P/E in terms of the ratio of franchise value to tangible value.³⁷

$$P/E = (\text{Base P/E}) \times (1 + f\text{-ratio})$$

where the *f*-ratio = FV/TV.

This formula shows that the *f*-ratio includes *all* of the information needed to compute the P/E. Another interpretation of this formula is that the *f*-ratio is the percentage by which the actual P/E exceeds the base P/E. Figure 4.52 illustrates how, over time, the *f*-ratio determines the P/E.

Growth from Market-Rate Investments

To this point, all investment has been treated as part of the franchise realization process, but a variety of situations may cause the firm to make in-

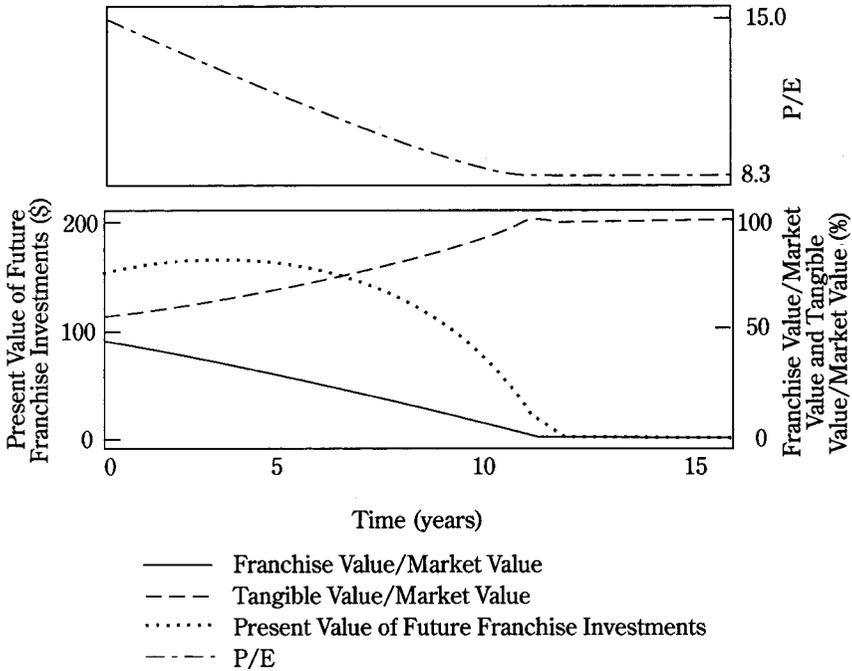


FIGURE 4.51 Changing Proportions of Franchise Value and Tangible Value (dollars in millions)

vestments that provide only market-rate returns. For example, although a franchise has been fully consumed, management may continue to retain a certain portion of the firm’s earnings, which can then earn only the market rate. Such investments will produce growth in book value and tangible value, so total firm value will grow, but those investments do not boost the P/E above the base P/E (see Figure 4.53). If Firm A maintains its 85 percent retention rate even after the franchise is consumed, the postfranchise retention will result in a 10.2 percent earnings growth because such retained earnings can earn only the 12 percent market rate. A retention rate of 50 percent during the postfranchise period, on the other hand, will result in a 6 percent (0.50×12 percent) earnings growth. In any case, in this postfranchise period, the choice of retention rate will have no effect on the P/E, which must remain at the base level of 8.33.

The Myth of Homogeneous Growth

The intuitive appeal of uniform growth is powerful. In an ideal world, the interests of management, shareholders, analysts, and accountants would be

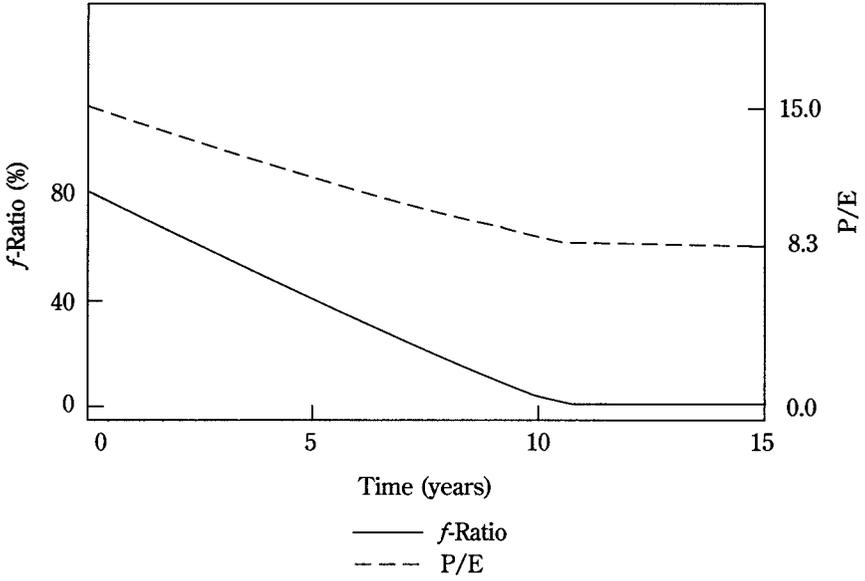


FIGURE 4.52 The P/E and the *f*-Ratio

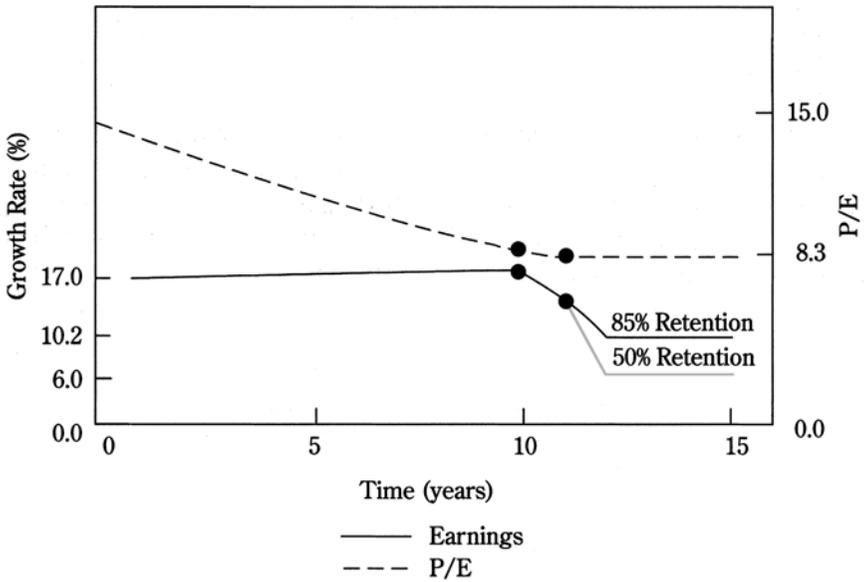


FIGURE 4.53 The P/E Effect of Terminal Growth

well served by such a simple growth process. Given such an intersection of powerful interests, one should not be surprised that the uniform-growth concept pervades much of our intuition about how equity value “should” develop over time. The appeal of simple, uniform growth can create a self-fulfilling prophecy—at least temporarily. How convenient it would be if all expansion took the form of a single growth rate that applied homogeneously to all of the firm’s variables—price, book value, earnings, and dividends. In the real world, however, growth is erratic; it exhibits neither uniformity over time nor homogeneity in its impact on each of the firm’s characteristics.

Consider the growth rates of price and of earnings for Firm A with the uniform 85 percent retention rate shown in Figure 4.54. During the franchise consumption phase, the earnings growth rate is fixed at 17 percent. In contrast, the price appreciation is only 11 percent at the outset and declines slightly over the franchise consumption period, which results in a widening gap between the price and earnings growth rates. When franchise consumption is complete, however, all retained earnings are invested at the market rate, and both price and earnings grow uniformly at the same 10.2 percent rate.

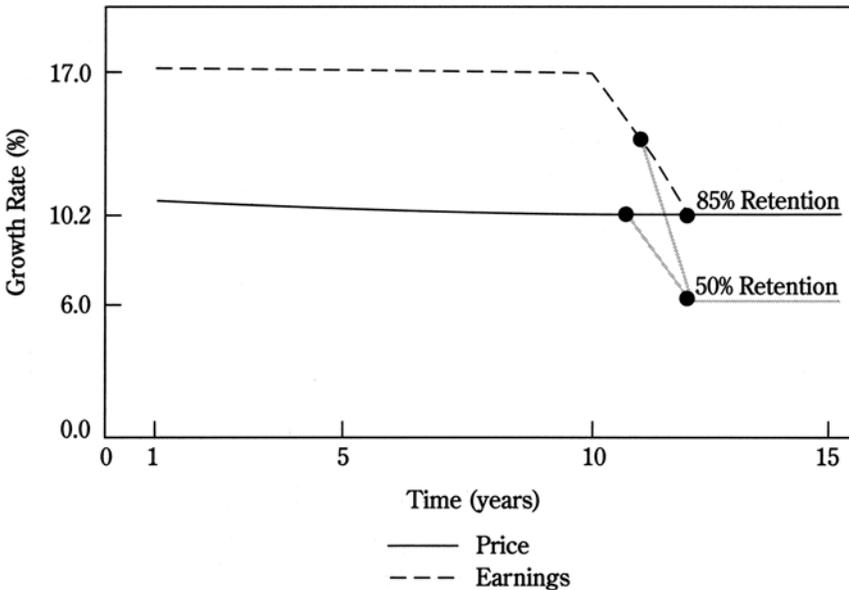


FIGURE 4.54 Price and Earnings Growth

Figure 4.54 also illustrates the case in which Firm A adopts a 50 percent retention rate in the postfranchise period, which leads to 6 percent earnings growth. With either retention rate, after franchise consumption, price appreciation coincides with the earnings growth rate.

The Myth of the Stable P/E

If a firm could count on homogeneous growth, its price/earnings ratio would remain stable over time, but in the context of the franchise model, the only stable P/E is the base P/E that characterizes pre- and postfranchise periods.³⁸ The FF model considers P/Es to be in continual flux—rising as future franchise opportunities approach and then declining as available franchise investments are funded and consumed. If the firm's franchise is consumed over some finite period of time, the P/E will ultimately decline at the end of that time to the base P/E. Consequently, high P/Es are intrinsically unsustainable.

In fact, in the franchise model, if high earnings growth is derived from franchise consumption: (1) the high earnings can be expected to come to an abrupt, not a gradual, end; (2) the P/E ratio will tend to erode, even during the period of high earnings growth; and (3) the price growth will likely be quite different from the earnings growth. The discrepancy between earnings growth and price growth has already been illustrated in Figure 4.54.

The gap between price appreciation and earnings growth over time that is illustrated in Figure 4.54 can be understood by examining the percentage change in the P/E. A general relationship holds among the earnings, price, and P/E growth rates:

$$g_p \cong g_E + g_{P/E}$$

This approximation does not depend on the franchise model.³⁹

In Figure 4.55, the three growth rates are plotted for the franchise and the postfranchise periods for Firm A with an 85 percent postfranchise retention rate and with a 50 percent postfranchise retention rate. These examples illustrate how the changing P/E affects price growth. As discussed earlier, the growth in earnings remains constant at 17 percent until it comes to a halt and declines to 10.2 percent or 6 percent, depending on the postfranchise retention rate. At the outset, the P/E growth rate is a negative 5.13 percent. When that rate is combined with the 17 percent earnings growth rate, the result is approximately equal to the 11 percent price growth. As time progresses, the growth rates in price and P/E fall moderately. When the P/E stabilizes during the postfranchise period, $g_{P/E}$ is zero, and the earnings and price growth rates then coincide.

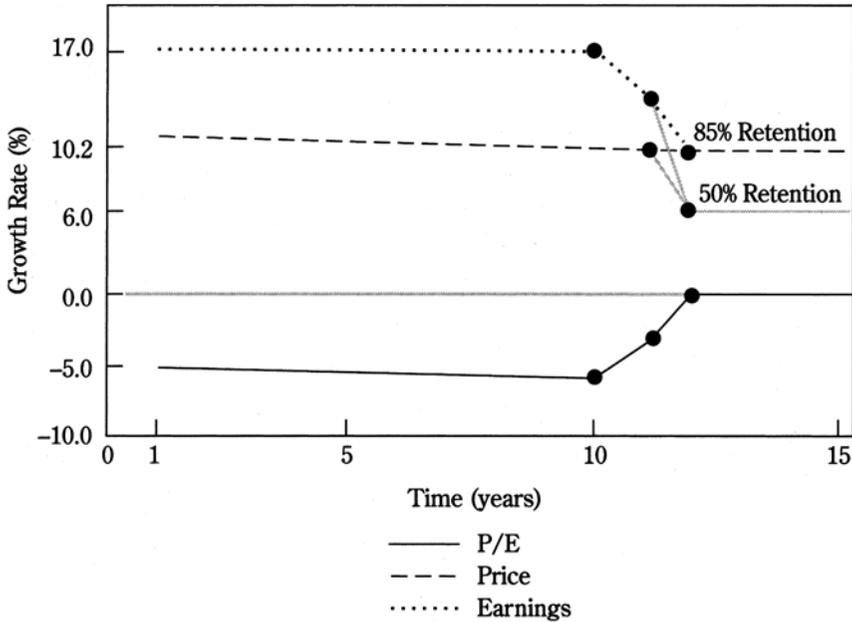


FIGURE 4.55 The P/E Growth Rate

Alternative Franchise Structures

To this point, the illustrations have focused on a simple pattern of franchise investment that gave rise to a 17 percent earnings growth rate over 11 years. This section will show that the same principle of growth operates when the FF model is applied to different franchise consumption patterns.

Figure 4.56 presents a comparison of Firm A with a firm, Firm B, that has a longer opportunity period. Firm B’s franchise opportunities can be funded by a 70 percent retention rate with corresponding earnings growth of 14 percent. At the outset, both firms have the same franchise value, tangible value, and P/E, but Firm B’s P/E follows a slower path of decline and reaches the base P/E of 8.33 at the end of its 15-year franchise period.

Now consider Firm C, which has the same initial franchise value as Firms A and B, but its franchise opportunity cannot begin to be realized for five years. Firm C also maintains the 85 percent retention rate before, during, and after the franchise is consumed. During Firm C’s five-year prefranchise period, the retained earnings are invested at the 12 percent market rate, resulting in a 10.2 percent earnings growth rate. When franchise consumption begins, the earnings growth rate jumps to the 17 percent level; in the postfranchise period, it drops back to 10.2 percent.

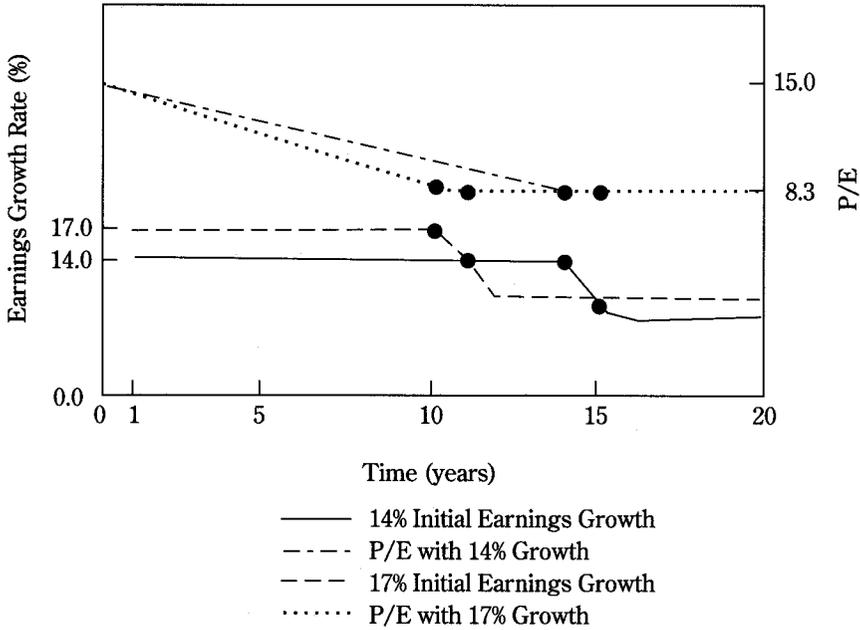


FIGURE 4.56 P/Es for Firms with Different Rates of Franchise Consumption

Figure 4.57 compares the P/Es and earnings growth rates of Firms B and C. Note how the P/E for the delayed-franchise Firm C rises slightly during the five-year prefranchise period. It then peaks and declines to reach the base P/E level at the end of the 17th year.

The explanation for the rising P/E can be found in the franchise-value buildup shown in Figure 4.58. Recall that both the franchise value and tangible value develop pseudo-interest at the market rate. Without franchise consumption, however, the franchise value’s pseudo-earnings are added to create the new franchise value. The tangible value grows at a somewhat slower rate because a portion of its earnings is being distributed in the form of dividends. Thus, during the prefranchise period, franchise value grows faster than tangible value, the ratio of these two quantities (that is, the *f*-ratio) increases, and the P/E rises (see Figure 4.59). In the fifth year, the onset of franchise consumption leads to slower franchise-value growth and more rapid increase in the tangible value. This consumption leads to a declining *f*-ratio. Consequently, the P/E peaks, erodes throughout the balance of the franchise investment period, and then settles at 8.33 when the franchise is depleted.

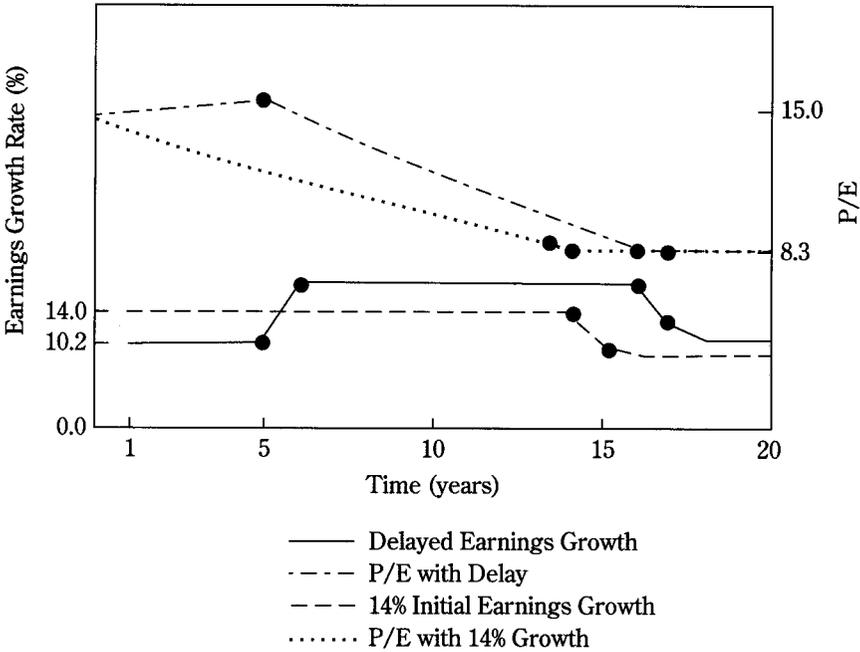


FIGURE 4.57 P/Es for Firms with (Firm C) and without (Firm B) Delayed Franchise Consumption

The Franchise Model and Surprise Events

The analysis thus far has been based on a franchise value that incorporates *anticipated* opportunities for investment at above-market rates. In practice, one cannot foresee all situations in which a firm’s size, distribution channels, capital, proprietary technology, patents, and strategic alliances will lead to above-market returns. Prospects will range from those that are immediate and clearly visible to those that are distant and only possible. Theoretically, this entire range of scenarios is incorporated in the firm’s franchise value, but surprises—both positive and negative—are frequent.

The *f*-ratio and P/E of a firm that encounters an unexpected positive jump in franchise value, Firm D, are shown in Figure 4.60. For the first five years, these quantities follow the same paths as they did for Firm A (see Figure 4.52). In the fifth year, however, Firm D makes a sudden discovery that creates an immediate increase in the firm’s prospects for that year. The firm now has the opportunity to invest an additional \$150 million (in present-value terms) in projects that provide a 20 percent return on equity in perpetuity. Thus, the new discovery adds another \$100 million

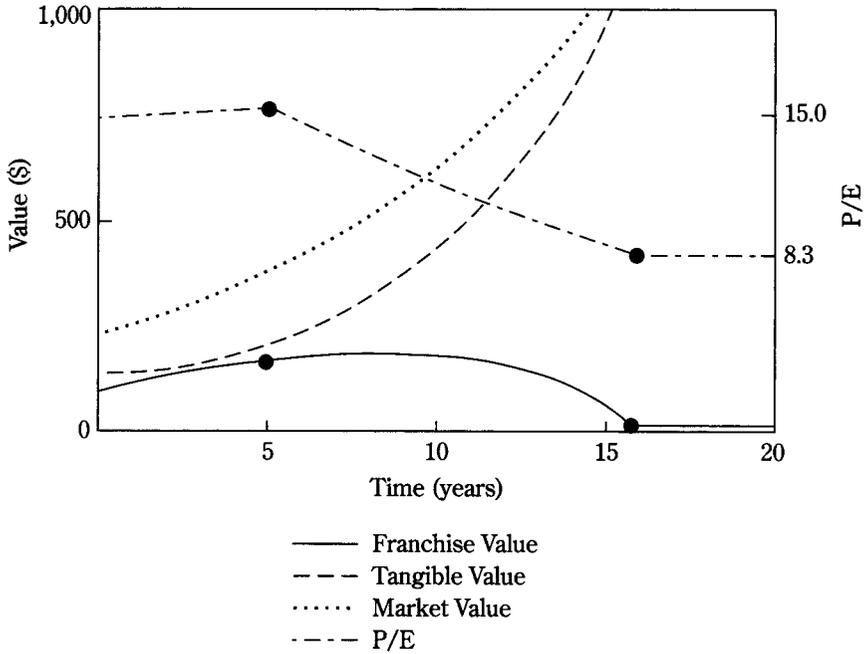


FIGURE 4.58 Components of Firm Value for the Delayed-Franchise Firm (Firm C) (dollars in millions)

in franchise value to the firm ($0.67 \times \$150$ million), and the jump in franchise value is transmitted directly to the firm’s market value.⁴⁰

The discovery does not affect the tangible value, because the surprise relates only to *future* earnings. Thus, the composition of total firm value—the relative magnitude of franchise value and tangible value—changes, and the value of the *f*-ratio will change accordingly. Figure 4.60 illustrates how the change in the *f*-ratio creates a sudden upward thrust in P/E. Once the surprise has occurred and been incorporated in the pricing structure of the firm, the consumption of franchise value and the decline in the P/E proceed in much the same manner as in the earlier examples. Figure 4.60 thus reinforces the central role of the *f*-ratio in determining both the magnitude and the underlying dynamics of changes in the P/E ratio.

Summary

In an idealized world without surprises, a firm’s prospective franchise investments would be well defined and the franchise value associated with

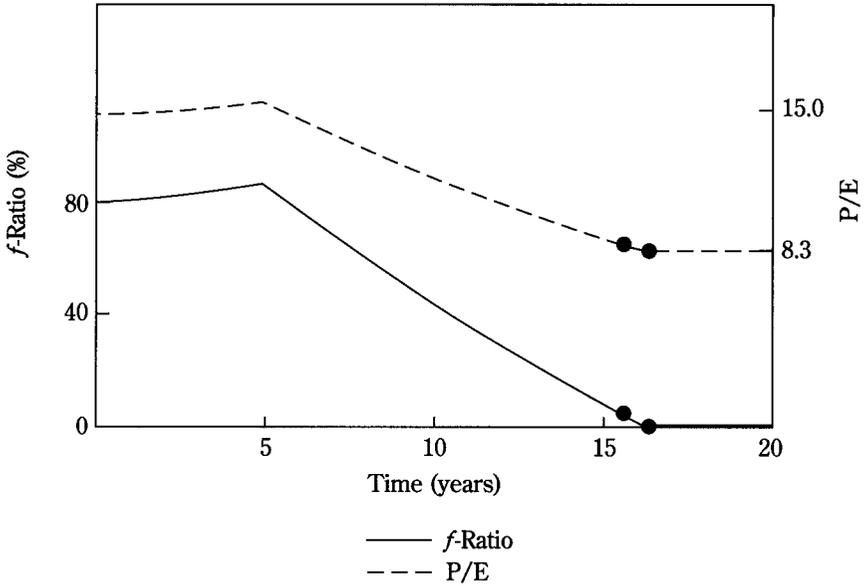


FIGURE 4.59 The f-Ratio and P/E for the Delayed-Franchise Firm (Firm C)

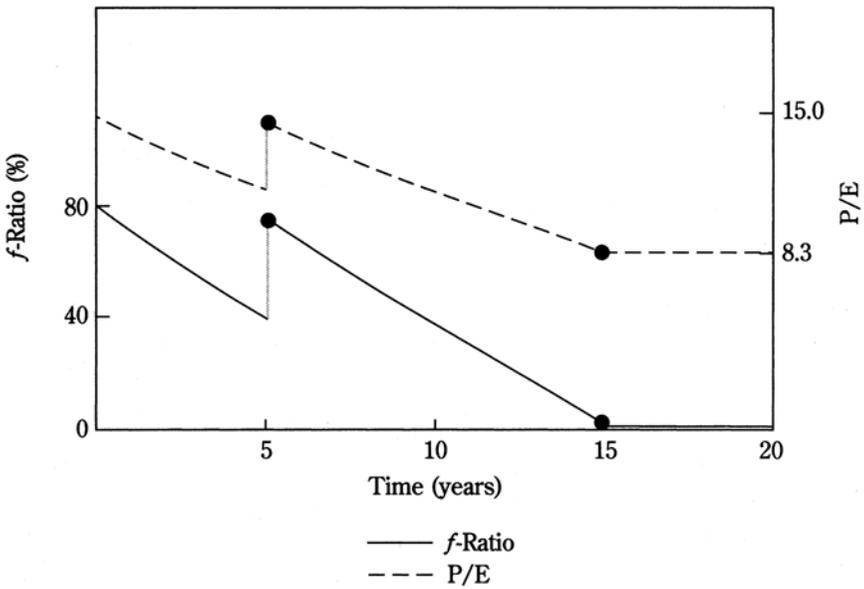


FIGURE 4.60 P/E Impact of an Unexpected Increase in Franchise Prospects (Firm D)

the franchise investments would completely determine the firm's price/earnings ratio. This theoretical P/E would be subject to "gravitational" forces pulling it down to the base P/E as the franchise was depleted. Just as nature abhors a vacuum, so economics abhors a franchise.

In the real world, of course, P/E multiples rise and P/E multiples fall. New information about companies and markets continually flows toward investors as fresh scenarios are uncovered, old scenarios are discarded, and probabilities are redefined. The combination of the revaluation of prior franchises and the discovery of new prospects is embedded in changing P/Es. Even when dealing with the real world in all of its complexity, however, the (admittedly idealized) framework of the franchise factor model can help in analyzing the various factors that shape the P/E behavior of different firms.

The Growth Illusion: The P/E "Cost" of Earnings Growth

This section shifts the focus from the prospective earnings used to compute a theoretical price/earnings ratio to the realized earnings that evolve over time. Once the P/E is set, high realized earnings growth represents a rapid depletion of the opportunities that composed the firm's prospects at the outset. This depletion leads to the surprising implication that an *inverse* relationship exists between *realized* earnings growth and the *realized* P/E over time. This relationship contrasts with the *positive* link between higher *prospective* earnings growth and the *prospective* P/E.

Historical earnings growth is commonly used as a baseline for estimating future earnings growth. Price appreciation is then assumed to follow the projected earnings growth. By tacitly assuming that the P/E will remain stable, investors elevate earnings growth to the central determinant of investment value.

A problem exists, however, with the stable-P/E assumption, which can be simply illustrated. Consider a corn farmer who owns two plots, each comprising 100 acres of prime land. The first plot is producing corn at its highest possible efficiency. The second plot is currently fallow while being nurtured and developed for maximum productivity next year. In placing a value on the farm, the farmer or the farmer's banker will surely take into account not only the current earnings from the productive plot but also the future earnings from the currently fallow second plot. Thus, today's price

is based on a projection of tomorrow's earnings. If the price/earnings ratio is based on the earnings from the currently producing plot, the farm will carry a high P/E multiple.

By the end of the next year, if the second plot has reached its full potential, the total realized earnings will show tremendous growth—essentially double the farm's visible earnings in the first year. This earnings growth provides no new information, however, because it simply reflects the realization into current earnings of the previously known prospective earnings. Consequently, the total value of the farm will have changed relatively little.

The net P/E change, however, will be dramatic: The P/E will drop by virtually half. Thus, the second-year earnings, although much higher than the first year's, are accompanied by a large P/E decline. The lowered P/E indicates that, even though putting the second plot into production may represent quite a significant achievement, the farmer's efforts were really only *value preserving*. No fundamental enhancement of the farm's initial value occurred.

This section will show that the price/earnings ratio plays a dynamic role in the evolution of firm value over time. The P/E is not merely a passive prop on a stage dominated by earnings growth. This finding raises questions about the common practice of assessing value by discounting a growing stream of dividends and then applying a stable P/E to the earnings rate achieved at the horizon.

The real world is, of course, more complicated than any closed theoretical system. As unforeseen (and unforeseeable) prospects and dangers ebb and flow and as uncertain potential becomes confirmed reality, the earnings signal and the P/E ratio interact in a more intricate fashion than can be captured in any analytical model. Nevertheless, in terms of a fundamental baseline for analysis, the central message still holds: Earnings growth alone cannot provide a valid gauge for assessing investment value.

The Substitution Effect in Tangible-Value Firms

To understand how firms create value requires a benchmark against which incremental gains (and losses) can be measured. To this end, consider the firm as a cash machine: At the end of each year, after paying all its bills, the firm will have some net amount of cash available for payment to investors or for reinvestment. If all such cash flows could be accurately predicted, the value (price) of the firm could be calculated by discounting the net cash flows at some "market" rate.

For simplicity, place this firm in an environment of no taxes and no debt. As in previous sections, the market rate (k) is a stable 12 percent, and that rate is assumed to be a fair compensation for the riskiness of eq-

uity. In addition, assume that investors have ample opportunity to invest in other firms that offer the same return and bear the same risk. Given the value of cash flows from all current and future businesses and the corresponding price per share, this analysis will show that there is a natural year-to-year evolution of price, earnings, and the P/E. The projected path of these variables can be used as the baseline against which actual changes can be measured.

As a first example, consider a tangible-value firm with a basic business producing earnings of \$100 annually. The firm has no opportunity to expand by investing in new businesses that provide returns greater than 12 percent. Therefore, although the firm may have an excellent business, it cannot create additional value for shareholders beyond that value represented by its “tangible” earnings stream (assuming that investors have the ability to achieve 12 percent returns on their own). The price of this TV firm is \$833, found by discounting the perpetual \$100 earnings stream at the 12 percent market rate.⁴¹

This firm does not have the potential to add incremental value, but it may have a retention policy that leads to growing earnings. For example, suppose that of the \$100 in first-year earnings, the firm pays out \$35 in dividends at year end and retains \$65 to reinvest at the 12 percent market rate. In the second year, the firm will earn an additional \$7.80 (12 percent of \$65) beyond the initial \$100 earnings. In exchange for giving up \$65 in dividends, investors will see total earnings grow by 7.80 percent. This realized growth in earnings (and the associated price increase) is simply a “substitution” that exactly compensates investors for the dividend payments they have forgone. That is, if the \$65 had been paid directly to investors, they also could have invested that amount at 12 percent and earned this same \$7.80. For the P/E at the outset, the initial \$833 price is simply divided by the \$100 earnings to obtain a P/E of 8.33 times earnings.

This example illustrates a well-known rule for calculating earnings growth: With b as the retention rate and with R as the return on retained earnings,

$$\begin{aligned} g_E &= \text{Earnings growth} \\ &= \text{Retention rate} \times \text{Return on retained earnings} \\ &= bR \end{aligned}$$

In this example, with a 65 percent retention rate and a 12 percent return, earnings growth equals 7.80 percent (that is, 0.65×12).

Because price appreciation for a TV firm arises solely from earnings increases, the price growth rate must equal the 7.80 percent earnings growth rate. As Figure 4.61 shows, this equality of price growth and earn-

ings growth holds for all retention rates. Moreover, because price and earnings grow at the same rate, their ratio (the P/E) does not change; it remains at 8.33.

In a stable 12 percent market, equity investors should earn 12 percent through a combination of price growth and dividend yield. Thus, one can view the price growth (i.e., the capital appreciation) as determined by the market rate and the dividend yield. With \$65 in earnings retained and the remaining \$35 paid as dividends (d), the dividend yield is 4.20 percent:

$$\begin{aligned}
 \text{Dividend yield} &= \frac{d}{P} \\
 &= \frac{(1-b)E}{P} \\
 &= (1-0.65) \times \frac{\$100}{\$833} \\
 &= 0.35 \times \frac{\$100}{\$833} \\
 &= 4.20 \text{ percent}
 \end{aligned}$$

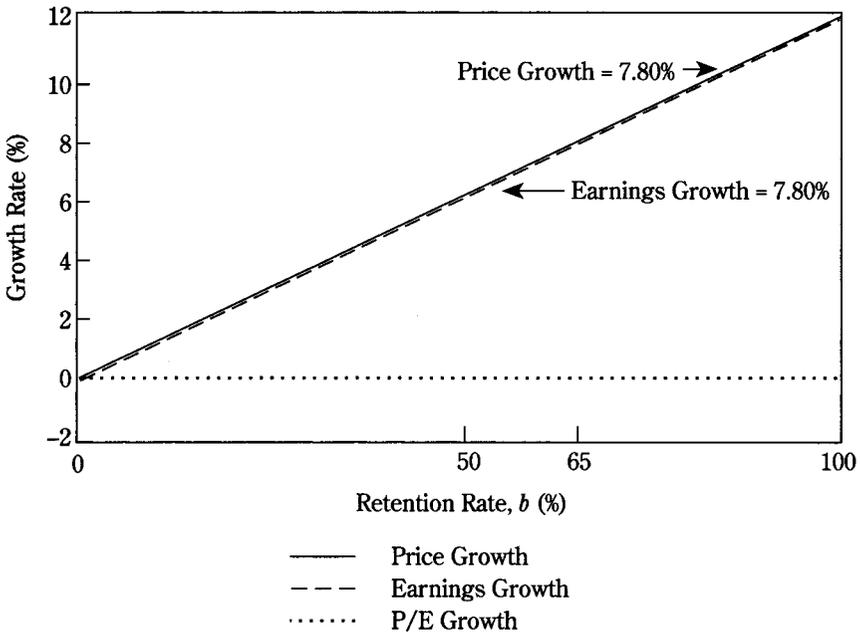


FIGURE 4.61 Price Growth, Earnings Growth, and P/E Growth for a Tangible-Value Firm (with initial P/E of 8.33 and investment at 12 percent)

That the investor's total return is 12 percent can now be verified by adding the dividend yield and the price growth:

$$\begin{aligned}\text{Total return} &= \text{Dividend yield} + \text{Price growth} \\ &= \frac{d}{P} + g_P \\ &= 4.20 \text{ percent} + 7.80 \text{ percent} \\ &= 12 \text{ percent}\end{aligned}$$

Because the total return is k , the general price-growth formula can be written as

$$\begin{aligned}g_P &= k - \frac{d}{P} \\ &= k - \frac{(1-b)E}{P} \\ &= k - \frac{1-b}{P/E}\end{aligned}$$

This formula shows that the dividend yield for a given year is determined by the initial P/E and the expected earnings retention rate. Because the price growth rate is simply the difference between the market rate (k) and the dividend yield, it follows that the retention rate (b) and the initial P/E establish the price growth. In the absence of surprises about the nature of a firm's business prospects, the price of any firm's common shares should, theoretically, rise at this predetermined rate.⁴²

The Substitution Effect in Franchise-Value Firms

Consider now the relationships among growth in price, growth in earnings, and growth in P/E for firms with initial P/Es that are greater than the 8.33 base level. Such firms have both tangible value and franchise value, which combine to produce the total value.

In the TV firm, FV was zero and all retained earnings were invested at 12 percent. Because any realized earnings growth is always capitalized into a higher TV, growth in earnings for the TV firm equaled price growth. In contrast, a firm for which the franchise value is greater than zero has an additional value term with a growth pattern that is likely to be quite different from g_E . Because price growth now results from a combination of TV growth and FV growth, price growth cannot be determined from g_E alone.

In this first franchise-firm example, suppose that a firm with \$100 in

earnings from current businesses is trading at a P/E of 15. Assume also, as before, that at the end of the first year, 65 percent of earnings is retained and reinvested at the 12 percent market rate. (In other words, the assumption is that this firm is not prepared to take advantage of the higher return franchise investment that will become available at some point in its future.) In this case, as Figure 4.62 illustrates, the realized g_E is 7.80 percent, just as it was for the TV firm. However, the dividend yield and g_P for the FV firm will both differ from what they were for the TV firm. According to the formula, for the FV firm,

$$\begin{aligned}
 g_P &= k - \frac{1-b}{P/E} \\
 &= 0.12 - \frac{1.00 - 0.65}{15.00} \\
 &= 9.67 \text{ percent}
 \end{aligned}$$

This increased price growth compensates for the lower dividend yield

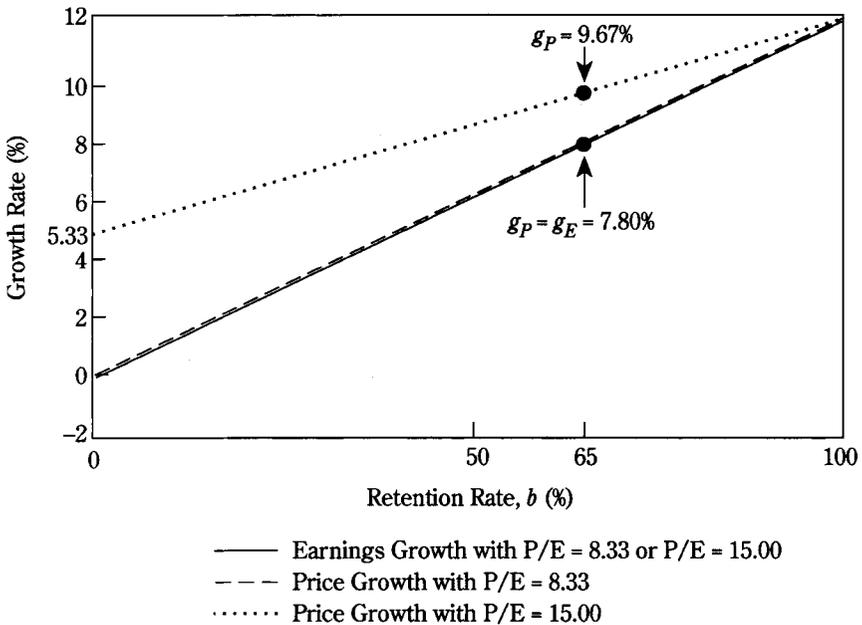


FIGURE 4.62 Price Growth for a Franchise-Value Firm and a Tangible-Value Firm (with initial P/E of 15 and investment at 12 percent)

of the FV firm; the lower dividend yield is the result of the higher price (that is, the higher P/E):

$$\begin{aligned}\frac{d}{P} &= \frac{\$35}{\$1,500} \\ &= 2.33 \text{ percent}\end{aligned}$$

At higher retention rates, the amount available for dividends decreases and, therefore, the dividend yield declines. In the limiting case of 100 percent retention, the dividend yield is zero; g_p is the only source of return, and its value must equal the required 12 percent return. At this 100 percent retention point, $g_p = g_E = k$ regardless of the P/E.

For all retention rates below 100 percent, the price growth for the firm with an initial P/E of 15 will always exceed the price growth for the firm with the lower P/E of 8.33 (see Figure 4.62). This result stems from the FV that gave rise to the higher P/E. In the example, the firm starts out with a P/E of 15 but invests its retained earnings at only 12 percent, thereby failing to use any of its franchise potential. Assuming that the franchise is not perishable (that is, that the opportunity to invest will continue to exist if available franchise investments are not made immediately), the franchise value will grow with time (at the 12 percent rate), and as discussed in “Franchise Value and the Growth Process,” this FV growth will be reflected in price growth.

This example shows that the 9.67 percent price growth for the FV firm can be interpreted as an average of the 12 percent “returns” on 100 percent of the franchise value and the 12 percent returns on the 65 percent of earnings that are retained. Specifically, g_p can be expressed as the weighted average of the TV growth rate—that is, g_E —and the FV growth rate, where the weights are the proportions of TV and FV.⁴³

$$\begin{aligned}g_p &= \left(\frac{\text{TV}}{P} g_{TV} \right) + \left(\frac{\text{FV}}{P} g_{FV} \right) \\ &= \left(\frac{\text{TV}}{P} g_E \right) + \left(\frac{\text{FV}}{P} g_{FV} \right)\end{aligned}$$

Applying the formula to the example firm results in

$$\begin{aligned}g_p &= \left(\frac{\$833}{\$1,500} \times 7.8 \text{ percent} \right) + \left(\frac{\$667}{\$1,500} \times 12 \text{ percent} \right) \\ &= 4.33 \text{ percent} + 5.33 \text{ percent} \\ &= 9.67 \text{ percent}\end{aligned}$$

With price and earnings growing at different rates, the stability of the price/earnings ratio is lost. The new P/E can always be found, however, by taking the ratio of the increased price to the increased earnings:

$$\begin{aligned}\text{New P/E} &= \frac{P(1+g_P)}{E(1+g_E)} \\ &= \text{Old P/E} \left(\frac{1+g_P}{1+g_E} \right)\end{aligned}$$

This general formula provides the P/E growth figure:

$$\begin{aligned}g_{P/E} &= \text{P/E growth rate} \\ &= \frac{\text{New P/E}}{\text{Old P/E}} - 1 \\ &= \frac{1+g_P}{1+g_E} - 1\end{aligned}$$

Substituting the example values of g_P and g_E results in

$$\begin{aligned}g_{P/E} &= \frac{1+0.0967}{1+0.0780} - 1 \\ &= 1.73 \text{ percent}\end{aligned}$$

Figure 4.63 illustrates this result for the example retention rate of 65 percent and also shows the effect at other retention rates. With zero retention, all earnings are paid out as dividends, g_E is zero, and g_P is entirely attributable to the growth of FV through the passage of time. As the retention rate increases, the realized g_E increases and the gap between price and earnings growth shrinks, with the result that $g_{P/E}$ declines, finally reaching zero at 100 percent retention.

The relationship among the three growth rates discussed here is quite general; it holds for any value for the return on new investments (refer to “Franchise Value and the Growth Process”). Moreover, an approximate $g_{P/E}$ can be obtained by taking the difference between g_P and g_E :

$$g_{P/E} \approx g_P - g_E$$

Applying this approximation to the preceding example results in

$$g_{P/E} \approx 9.67 \text{ percent} - 7.80 \text{ percent} = 1.87 \text{ percent}$$

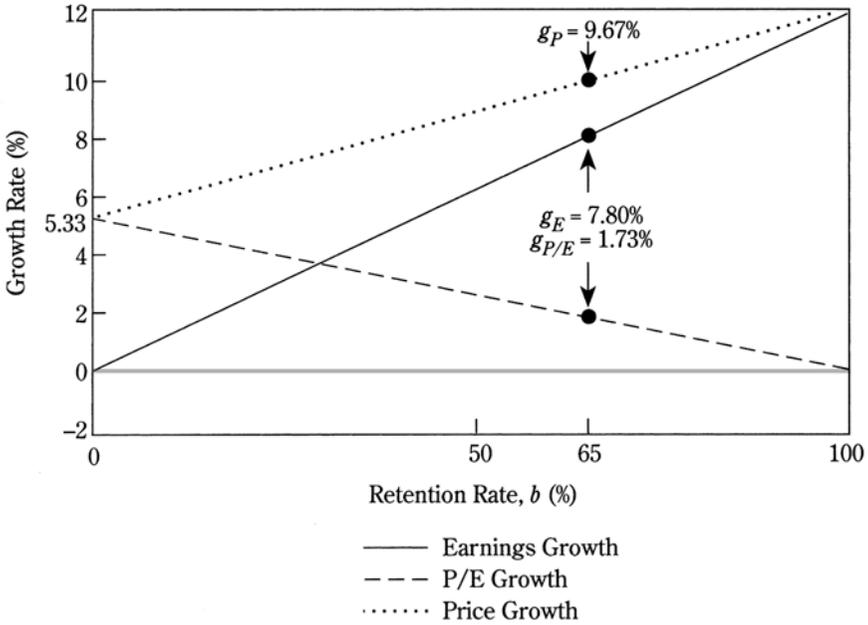


FIGURE 4.63 Price, Earnings, and P/E Growth versus Retention Rate (with initial P/E of 15 and investment at 12 percent)

rather than the precise 1.73 percent. The difference between these two values is to be expected from Figure 4.63, where careful scrutiny reveals a slight curvature in the representation of $g_{P/E}$.

The nature of price growth is clarified by rewriting the approximation formula:

$$g_P \approx g_E + g_{P/E}$$

Because g_P is determined by the firm's initial P/E and the retention policy, the left side of the approximation can be regarded as fixed for any single period. Therefore, a direct trade-off always exists between realized $g_{P/E}$ and realized g_E .

The Conversion Effect: Franchise Investment

This subsection focuses on the growth effects of realized franchise investments with returns in excess of 12 percent. Each such investment represents a *conversion* of a portion of the firm's franchise potential into incremental earnings and, hence, a higher tangible value.

When the firm makes franchise investments, earnings tend to grow rapidly, but when growth in earnings is greater than growth in share price, the result is a decline in the firm's P/E. At the outset, the firm's price implicitly reflects a fixed level of future franchise investments. Unless new opportunities are discovered, all of this franchise potential will ultimately be "used up," and the P/E will decline toward its base level.⁴⁴

To illustrate this franchise conversion process, consider again the franchise firm with the initial P/E of 15. The price-growth line for this firm was illustrated in Figure 4.63. If the firm maintains a 65 percent earnings retention policy and invests only at the 12 percent market rate, g_p will be 9.67 percent.

Suppose now that the firm is able to use its franchise potential and invest retained earnings in projects that return 15 percent. (Because the franchise firm's prospective P/E reflects a potential for above-market-rate investments, the availability of such 15 percent projects is no surprise.) As always, the value of g_p is determined by the market rate, the retention rate, and the P/E. Hence, with the same 65 percent retention rate and the (higher) 15 percent return on investment, g_p remains at 9.67 percent. In fact, the g_p line in Figure 4.63 applies regardless of the rate the firm can obtain on new investments. The 15 percent return does, however, alter the line that depicts *realized* earnings growth.

Figure 4.64 illustrates the realized growth in earnings over the full range of retention rates. For all retention rates, the 15 percent return results in a greater g_E than for the 12 percent return situation depicted in Figure 4.63. These enhanced earnings come at the expense, however, of growth in franchise value: When investments are made at 12 percent, no FV is used, so FV simply grows at 12 percent, but when franchise investments are made at 15 percent, a corresponding reduction in the FV results. At the same time, the "new business" provides an addition to earnings and becomes part of the firm's tangible value. This pattern is the essence of the franchise conversion process.

As illustrated in Figure 4.64, at a retention rate of 65 percent, g_p and g_E both happen to take on the same value of 9.67 percent. Consequently, the P/E will remain unchanged for this particular combination of parameters. For any other retention rate, however, g_p and g_E take different values, and the P/E stability is lost. The result is shown in Figure 4.65.

At all retention values other than 65 percent, $g_{P/E}$ is either greater than or less than zero and the P/E will change accordingly over the one-year period. With retention rates in excess of 65 percent, g_E is greater than g_p and the growth rate of P/E becomes negative, so the P/E begins to decrease. If this growth imbalance is sustained year after year, the P/E will continue to decline toward the base P/E of 8.33. In summary, when the balance between return and retention rate is altered in virtually any way, the stability of the price/earnings ratio is lost.

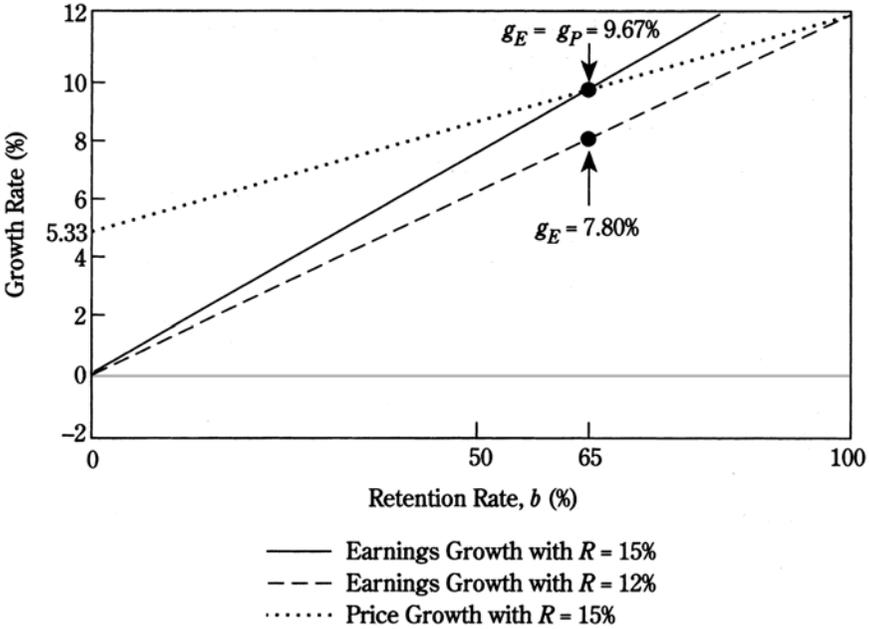


FIGURE 4.64 Earnings Growth Rates with Retained Earnings (R) Invested at 12 Percent and 15 Percent (with initial P/E of 15)

The Value-Preservation Line

So far, the discussion has generated two different combinations of realized growth in earnings and growth in P/E that can lead to the same growth in price. In both cases, the initial P/E is 15 and the retention rate is 65 percent. In turn, this combination establishes the dividend yield to be 2.33 (which is $[1 - 0.65/15]$) and an equivalent price growth of 9.67 percent (that is, $12 - 2.33$). In Figure 4.63, with a 12 percent return on investment, the g_p of 9.67 percent is associated with a g_E of 7.80 percent and a $g_{P/E}$ of 1.73 percent. In Figure 4.65, with a 15 percent return on investment, the same g_p of 9.67 percent is obtained with g_E equal to 9.67 percent and a zero $g_{P/E}$. In fact, a continuum of combinations of P/E growth and earnings growth exists that can lead to the same 9.67 percent price growth.

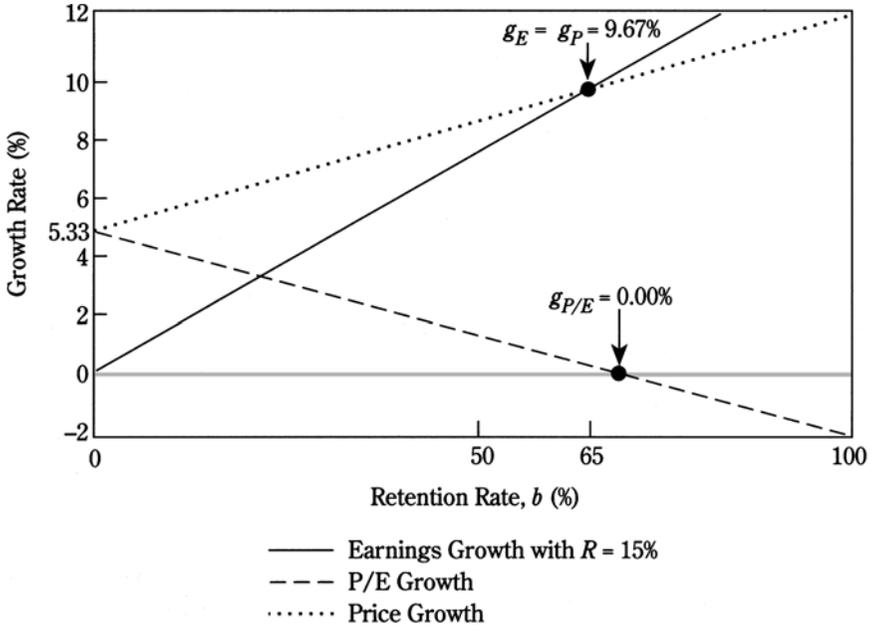


FIGURE 4.65 P/E Growth with Retained Earnings Invested at 15 Percent (with initial P/E of 15)

The explanation lies in the general P/E growth formula developed previously:

$$\begin{aligned}
 g_{P/E} &= \frac{1 + g_P}{1 + g_E} - 1 \\
 &= \frac{1.0967}{1 + g_E} - 1
 \end{aligned}$$

Figure 4.66 presents a “value-preservation line” (VPL) that illustrates the many combinations of g_E and $g_{P/E}$ that theoretically could provide the required first year’s g_P of 9.67 percent. Point A represents realized earnings growth with investment at 12 percent (corresponding to the example in Figure 4.63).⁴⁵ As the investment rate increases, so does the realized value of g_E . The “cost” of this growth is a reduction in $g_{P/E}$. Point B represents the 15 percent investment at which $g_{P/E}$ reduces to zero (as in the example in Figure 4.65).

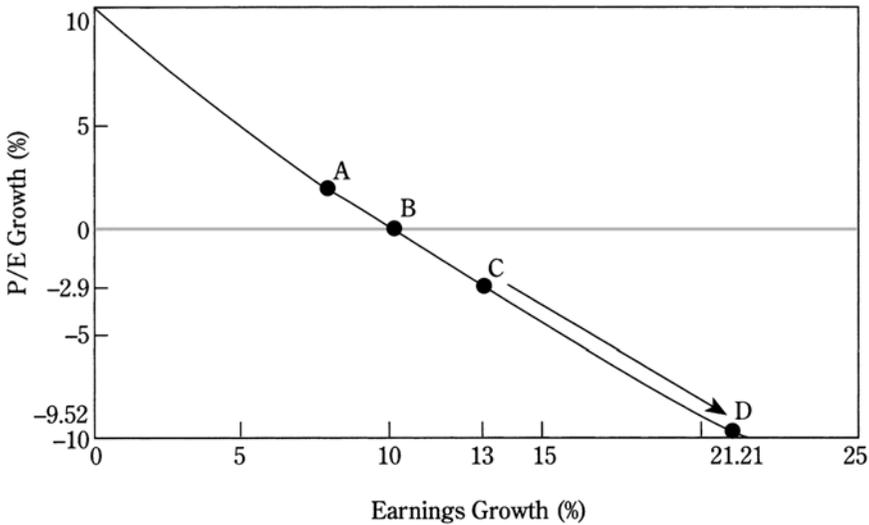
To understand the utility of the VPL, suppose now that at year end, the

firm invests \$65 in retained earnings in a franchise project returning 20 percent in subsequent years. This return brings additional earnings in the second and following years, and the realized growth in earnings increases from 9.67 percent to 13 percent (20 percent of \$65).

Figure 4.66 illustrates the movement down the VPL that this enhanced growth represents. Point C shows that the price/earnings ratio declines because $g_{P/E}$ falls to -2.9 percent:

$$\begin{aligned}
 g_{P/E} &= \frac{1.0967}{1 + g_E} - 1 \\
 &= \frac{1.0967}{1.13} - 1 \\
 &= -2.9 \text{ percent}
 \end{aligned}$$

At the end of one year, the P/E will have decreased from 15 to 14.6 (= 15 - 2.9 percent of 15). The decline in P/E with increasing franchise investment follows naturally from the fact that more franchise value is being used up when higher yielding projects are undertaken.



- A = 65% of Earnings Invested at 12%
- B = 65% of Earnings Invested at 15%
- C = 65% of Earnings Invested at 20%
- D = 130% of Earnings Invested at 20%

FIGURE 4.66 The Value-Preservation Line (with initial P/E of 15 and $b = 65$ percent)

The VPL is always determined by the forward P/E (the price at the beginning of the year divided by the year's anticipated earnings) and the retention rate (or dividend payout rate) that applies to those earnings. Investment (and financing) decisions taken at year end will determine the earnings for the subsequent year and will set the forward P/E that applies at the beginning of the subsequent year. Thereafter, the next year's VPL will be determined by the new price/earnings ratio and the new retention rate.

Accelerated Growth through External Funding

When a firm issues new shares, it receives cash in return for a proportional claim on the existing tangible and franchise value. If the new cash is used in investments that return more than 12 percent, some conversion of FV into earnings (that is, into TV) will occur. This conversion alters the distribution of FV and TV, which lowers the P/E. The outcome of these alterations, combined with the "dilution" of the original earnings, is a complex transformation of the firm's ownership and value structure. Fitting such external financing into the VPL framework is at first puzzling, but the surprising finding is that equity sales simply push the accelerated earnings growth farther down the same value-preservation line.

Suppose the firm can invest \$130 (that is, \$65 in addition to the \$65 in retained earnings) at 20 percent. With only \$65 in retained earnings, the firm must issue new shares to raise the additional \$65. A straightforward computation shows that, when the additional \$65 is invested at 20 percent, growth in earnings per share accelerates to 21.2 percent.⁴⁶

Point D in Figure 4.66 illustrates this new growth level. At this point, the FV is being taken down more quickly than the natural 12 percent rate at which it grows. The result is a 9.5 percent decline from the original P/E of 15 to a P/E of 13.6.

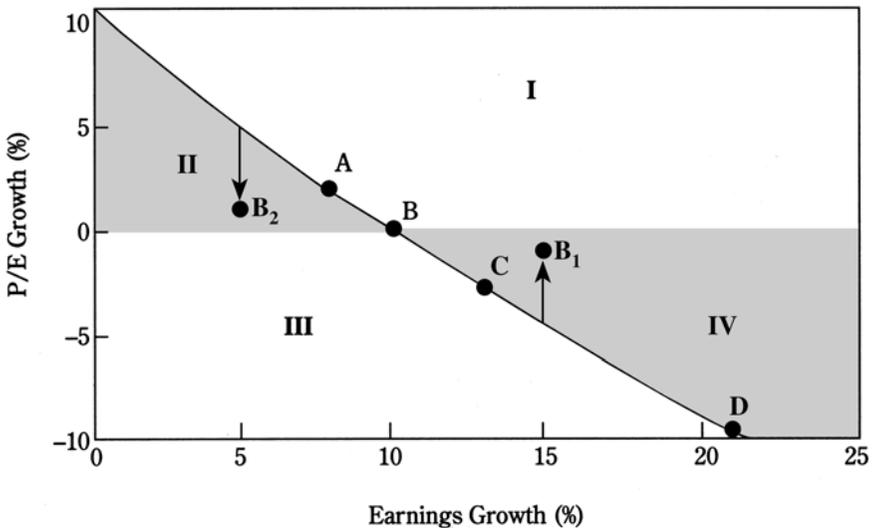
Growth Signals

The value-preservation line is useful for distinguishing value-generating growth from value-depleting growth. Recall that the line itself represents an expected level of price appreciation based on an estimated market capitalization rate of 12 percent, an earnings retention rate of 65 percent, and an initial theoretical P/E of 15. Each point on the line (such as A, B, C, and D in the previous examples) represents a combination of realized earnings and growth in price/earnings that is consistent with the required price growth (9.67 percent in the example).⁴⁷ No matter what the firm does—invests at 12 percent, 15 percent, or 20 percent; sells shares; buys back shares—the realized g_E and $g_{P/E}$ will counterbalance in such a way that the price grows at 9.67 percent.⁴⁸ In this sense, all actions that leave the firm

on the VPL can be viewed as merely value preserving; such actions only exploit the legacy of franchise opportunities that the marketplace has already anticipated. To bring about true *value enhancement*, management must create improvements in the firm's prospects that go beyond the embedded expectations.

This observation leads to the realization that the value-preservation line and the zero-P/E-growth line can be viewed as separating all possible pairings of year-to-year earnings growth and P/E growth into the four regions depicted in Figure 4.67:

- Region I lies above the VPL and above the zero-P/E-growth line. The properties of this region are consistent with intuition regarding the positive nature of growth. Each point represents both unexpected value-enhancing earnings growth and P/E growth.
- In Region II also, earnings and P/E growth are positive, but the P/E growth is insufficient to ensure that investors will receive a market-level return. Consequently, an unexpected value depletion occurs.



- I Value Enhancement and P/E Improvement
- II Value Depletion and P/E Improvement
- III Value Depletion and P/E Decline
- IV Value Enhancement and P/E Decline

FIGURE 4.67 The VPL as a Baseline for Interpreting Growth Signals

- In Region III, the P/E is declining and earnings growth is not sufficient to maintain value.
- Region IV shows that value enhancement can accompany a declining P/E. In this region, strong earnings growth places the firm above the VPL.

To investigate these regions, consider two examples:

Point B₁. Suppose a firm's realized earnings growth is 15 percent but its $g_{P/E}$ is -1 percent. With a realized g_E of 15 percent, the P/E should decline by about 5 percent to remain on the VPL. The firm's more modest P/E decline indicates that the firm has discovered unanticipated opportunities for future investment that will serve to replenish FV. Such new findings will result in a price growth in excess of 9.67 percent, that is, a windfall profit to current shareholders. (After the share price has adjusted to the new level of expectations, the P/E will change and a new VPL will result for the subsequent year.)

Point B₂. Suppose that the realized g_E for a firm is 5 percent and the $g_{P/E}$ is 1 percent. For the firm to be on the VPL, the (low) 5 percent earnings growth should be coupled with a P/E growth in excess of 4 percent. The observed P/E growth of only 1 percent may indicate an unexpected loss in FV. It could have come about by, for example, failing to take advantage of available, but perishable, opportunities, in which case, the firm may have lost the opportunities forever. Alternatively, the firm may be using cash flows from "good" businesses to subsidize the growth of marginal businesses. Such "covert reinvestment" can lead to earnings growth, but at a cost in terms of overall firm value. In either case, g_p will fall below 9.67 percent. Consequently, investors will fail to achieve the full 12 percent market return, even when dividends are considered.

As the preceding examples demonstrate, even positive levels of growth in both earnings and P/E do not always assure the price appreciation required for a fair return. Interpreting the significance of earnings growth is difficult in the absence of a base level of P/E growth.

In practice, the problem is, of course, considerably more complicated than in the examples. Year-to-year earnings growth may be visible in an accounting sense, but discovering true economic earnings growth is challenging. In a market of constantly changing interest rates and risk premiums, absolute and relative price/earnings ratios will also always be on the move. In this environment, it is not easy to determine how much of a realized P/E change is the result of new market conditions rather than changes in the firm's underlying franchise value. Without an analytical framework for identifying the baseline correspondence between earnings growth and P/E changes, one cannot even begin to follow meaningfully the path of a firm's P/E over time.

Summary

Equity analysts and investors must look to a variety of measures to gain insight into the prospects for current and future businesses. Intuitively, the temptation is to view firms with especially high earnings growth as offering special value. This intuition is supported by the standard DDM, which appears to equate price growth with earnings growth. Prospective growth must, however, be differentiated from realized growth.

Firms can show substantial earnings growth without creating a single dollar of extra value for shareholders. One path to this result is to increase earnings retention and reinvest at the market rate. To assess the significance of realized earnings growth properly, one must first consider the associated baseline level of P/E growth (or decline) that is consistent with the firm's initial prospects and valuation. Then, one must probe the limits of the firm's franchise to determine the source of any extraordinary realized earnings. The key is to ascertain whether such excess growth is a positive new signal or simply a drawdown of the franchise value that was already implicitly incorporated in the firm's price/earnings ratio.

These findings demonstrate that a corporate manager should not view high earnings growth as compelling evidence of a total job well done. High earnings derived from an embedded franchise may only indicate good performance in exploiting preexisting opportunities. Such growth is value preserving (and, accordingly, may represent a significant managerial achievement), but strictly speaking, it is not value enhancing. To add incremental value, managers must have the vision (and/or the good fortune) to extend the corporate reach to opportunities beyond those already embedded in the firm's valuation.

The Effects of Inflation

Even in today's low-inflation environment, pension fund sponsors, managers of endowment funds, and other long-term investors are under continual pressure to achieve positive real returns while avoiding excessive exposure to risk. Investors are compelled to take on some risk, however, because real returns on risk-free Treasury bills, which at all times tend to be small, are often negative. In fact, during the past 65 years, inflation has averaged about 3.2 percent annually, and real riskless annual returns on Treasury bills have been negative almost as often as they have been positive.⁴⁹ Inflation-adjusted intermediate- and long-term government bond returns have averaged about 2.0 percent, while inflation-adjusted

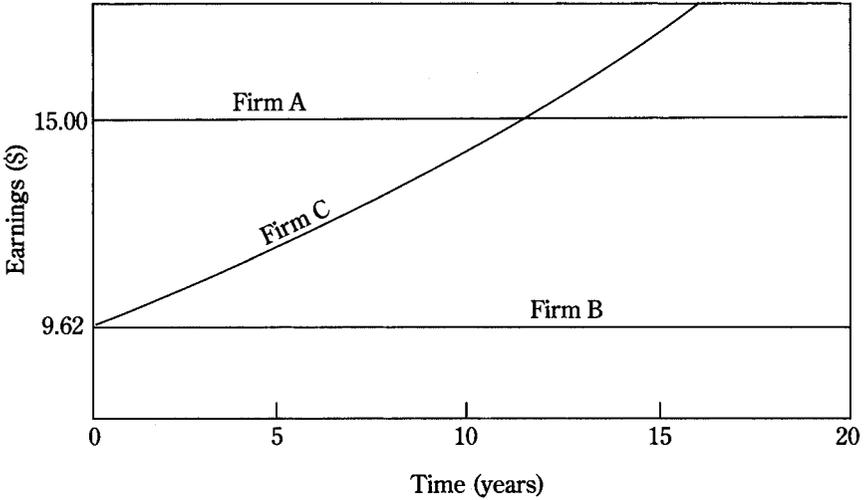


FIGURE 4.68 Time Path of Earnings for Firms A, B, and C
(dollars in millions)

returns on stocks have averaged 8.8 percent. The cost of these substantial real returns on equity, however, has been volatility on the order of 21 percent a year.

Because all companies do not perform equally well in the face of persistent inflation, investors must try to separate inflation effects from real growth. This task is not easy, however, because some inflation effects are almost always embedded in a firm's earnings statements and financial ratios. This section discusses how the franchise factor model can be used to ferret out the effects of expected inflation on the price/earnings ratios of unleveraged firms.

In general, companies that can increase earnings to keep pace with inflation tend to be more valuable than comparable firms without this flow-through capacity.⁵⁰ The underlying assumption is that the degree of flow-through capacity is known. At one extreme, a company actually may benefit from inflation if it can raise prices arbitrarily as costs increase. At the other extreme, companies that lack pricing flexibility may find that profits erode steadily as inflation persists. (The section does not consider the more realistic but complicated case of unexpected inflation changes.)

Earnings and Inflation

To begin the analysis of the impact of inflation on a firm's earnings and P/E, consider three firms that have the same \$100 million book values but the following different earnings patterns (depicted in Figure 4.68).⁵¹

- Firm A has stable earnings of \$15.00 million a year from existing businesses.
- Firm B has stable earnings of \$9.62 million a year.
- Firm C has earnings growing with inflation, starting from a base of \$9.62 million.

Assume a constant inflation rate (I) of 4 percent and a uniform discount rate, which is the equity capitalization rate of 12 percent (k). The current focus is each firm's existing business, not the earnings impact of new investment.

Firm A's current business is clearly more valuable than that of Firm B, because the former's earnings are 56 percent higher. We can compute the present value (PV) of the perpetual earnings streams of Firms A and B by dividing annual earnings by the discount rate. Thus, the PV of Firm A is \$125.0 million and the PV of Firm B is \$80.1 million.

Because Firm C's earnings are growing with inflation, its earnings will be \$10.00 million ($1.04 \times \9.62 million) after one year and \$10.40 million ($1.04 \times \10.00 million) after two years. After slightly more than 11 years, Firm C's earnings actually will exceed the unchanging \$15.00 million Firm A earns. Firm C is a *full-flow-through* firm, because its earnings fully reflect year-to-year inflation increases.⁵²

Comparing Firms C and B shows clearly that PV_C is greater than PV_B , because the earnings of both firms start at \$9.62 million, but Firm C's earnings grow and Firm B's do not. The contrast between Firms C and A is less obvious. The computation of PV_C uses the following formula for the discounted present value of an earnings stream that grows at annual rate I :

$$PV_C = (\text{Initial earnings}) \left(\frac{1+I}{k-I} \right)$$

With $I = 4$ percent and $k = 12$ percent, this formula shows that PV_C is \$125 million, the same as PV_A .

Because the \$45.9 million difference between PV_B and PV_C is entirely attributable to Firm C's flow-through capacity, this 56 percent increase can be considered to be the value of full flow-through. By the same token, when I is 4 percent, the constant earnings of Firm A can be viewed as "inflation equivalent" to Firm C's growing earnings. This equivalence concept is developed more fully in a later section.

The P/E attributable to earnings from the current businesses of the three firms is computed by dividing the price (or present value) by the base earnings. As in earlier sections, this portion of the firm's price/earnings ratio is the base P/E, which is 8.33 for Firms A and B, and 13 for Firm C.

Note that Firms A and B have the same base P/E, despite the difference in the level of these firms' earnings. The reason, as demonstrated in earlier sections, is that the share price for any firm with constant earnings adjusts upward in direct proportion to the level of earnings. Because Firms A and B have level earnings, their only sources of growth are new investments, the basic fuel of high P/Es. In contrast, Firm C's current earnings do not reflect the full value of even its current business. Firm C has the valuable ability to "grow" its earnings with inflation, and this special growth capacity brings the base P/E up from 8.33 to 13.

Inflation-Equivalent Returns

Because the earnings generated by Firms A and C have the same present value under a 4 percent inflation rate, those earnings can be termed inflation equivalent according to the following definition:

Inflation-equivalent earnings (E^).* If a firm's earnings grow at a rate that is proportional to the anticipated inflation rate, some stream of level earnings (E^*) will have the same present value as the growing stream.

The same type of definition can be applied to a firm's return on equity. Because Firms A, B, and C all have a \$100 million book value, the initial value of their earnings immediately translates into a percentage return. Thus, Firm A's 15 percent ROE can be viewed as inflation equivalent to the combination of Firm C's initial 9.62 percent return and the growth of its earnings at a 4 percent annual rate. This example suggests the following definition:

Inflation-equivalent ROE (r^).* If a firm's earnings grow with inflation, the ROE associated with the inflation-equivalent level earnings (E^*) can be regarded as a standardized inflation-equivalent ROE (r^*) for the growing earnings stream.

Therefore, although Firm C has an initial ROE of 9.62 percent, its earnings growth pattern leads to an inflation-equivalent ROE equal to Firm A's 15 percent.

As a second example of inflation equivalence, consider Firm D, which has the same book value and inflation flow-through capacity as Firm C but initial earnings that start from a base level of \$10.58 million (that is, 10 percent higher than C's \$9.62 million). Applying the formula used to compute PV_C shows that PV_D is \$137.5 million.

The inflation-equivalent firm (Firm D^{*}) is found by requiring that D^{*} have constant earnings (E_D^*) and that PV_D be \$137.5 million. The inflation-equivalent earnings are calculated by setting the present value of the constant earnings (E_D^*/k) equal to PV_D and multiplying the nominal rate (k). That is,

$$\begin{aligned} E_D^* &= kPV_D \\ &= k \times \$137,500,000 \end{aligned}$$

With $k = 12$ percent,

$$\begin{aligned} E_D^* &= 0.12 \times \$137,500,000 \\ &= \$16,500,000 \end{aligned}$$

and

$$\begin{aligned} r_D^* &= \frac{\$16,500,000}{\$100,000,000} \\ &= 16.50 \text{ percent} \end{aligned}$$

Note that in this particular example, the computations could have been avoided by observing that r_D^* should be 10 percent higher than Firm A's 15 percent ROE. For comparative purposes, Figure 4.69 adds the time path of earnings for Firms D and D* to the other firms' earnings graphs in Figure 4.68.

Consider now the base P/Es of Firms D and D*. When their common present values of \$137.5 million are divided by their respective initial earnings, the P/Es are 13 for D and 8.33 for D*. Thus, the base P/E rises to 13

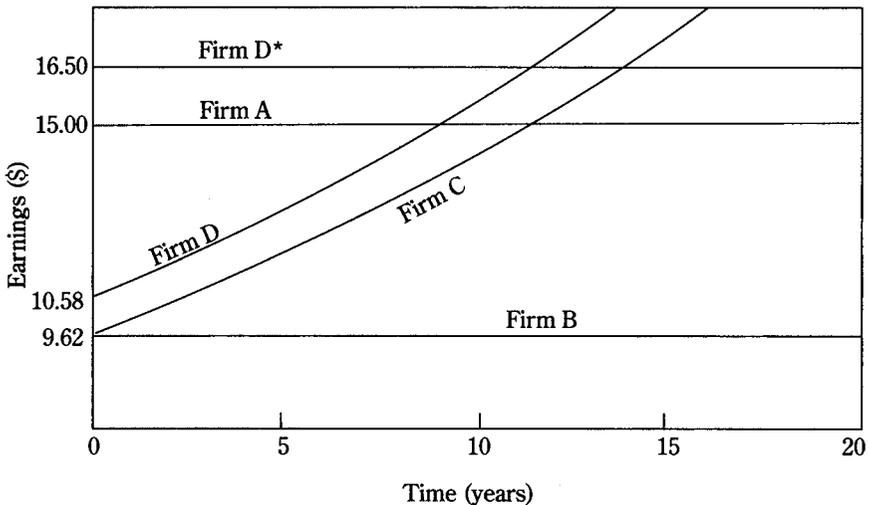


FIGURE 4.69 Time Paths of Earnings for the Five Firms (dollars in millions)

for Firms C and D, each of which has earnings that grow at the inflation rate. As these examples indicate, all full-flow-through firms will have the same base P/E.

The computation of the base P/E for Firms C and D discounted their growing streams of *nominal* earnings at the *nominal* discount rates, and that present value was then divided by the starting earnings. It can also be shown that another approach to finding the base P/E for all full-flow-through firms is to take the reciprocal of the real rate of return on equity capital.⁵³ An intuitive explanation of this result is that, because the inflation rate is incorporated into the 12 percent discount rate, any inflation-related increase in the value of earnings (as reflected in the P/E numerator) should be offset precisely by the inflation component of the 12 percent discount rate (reflected in the denominator). This offset reduces the effective discount rate to the real rate. For Firms C and D, the real rate of 7.69 percent results in a base P/E of 13 (that is, $1/0.0769$). In contrast, because Firm D* is a constant-earnings firm, it should have the same 8.33 base P/E as constant-earnings Firms A and B.

The Inflation Adjustment Factor for Full-Flow-Through Firms

This subsection introduces an inflation adjustment factor (γ) that can be used to determine the inflation-equivalent ROE (r^*) from the initial ROE (r) of a firm whose earnings grow at the inflation rate. The formula for the inflation adjustment factor can be shown to be⁵⁴

$$\gamma = \frac{k(1+I)}{k-I}$$

When this formula is applied to Firms D and D* with $I = 4$ percent and $k = 12$ percent, γ equals 1.56. With this value of γ and r_D at 10.58 percent, r_D^* is computed as follows:

$$\begin{aligned} r_D^* &= \gamma r_D \\ &= 1.56 \times 10.58 \text{ percent} \\ &= 16.50 \text{ percent} \end{aligned}$$

This value is the same as in the earlier computations. This result means that an initial ROE of 10.58 percent and earnings that grow fully with inflation are equivalent (in present-value terms) to a standardized level ROE of 16.50 percent. Such is the power of inflation flow-through.

The relationship between r^* and r can be plotted in general as a

straight line emanating from the origin and having slope γ (see Figure 4.70). Note that although this subsection deals only with firms without debt, leverage will significantly enhance the positive benefits of inflation flow-through.

The P/E Effect of Partial Inflation Flow-Through

To this point, only two extremes of inflation flow-through have been considered—zero and 100 percent.⁵⁵ This subsection develops the inflation-equivalence concept by studying the effects of partial inflation flow-through. Consider Firm F, which has the same \$100 million initial book value as the other example firms but a 50 percent inflation flow-through. Firm F’s earnings start from the same \$9.62 million base as those of Firms C and D, and with a 4 percent inflation rate, its earnings grow at a 2 percent annual rate (50 percent of 4 percent, see Figure 4.71).

Because Firm F’s earnings grow at a slower rate than Firm C’s earnings, Firm F’s inflation-equivalent ROE would be expected to fall somewhere below 15 percent. The inflation adjustment factor (γ) can be used to adjust for partial flow-through if I is replaced by λI . Thus,

$$\gamma = \frac{k(1 + \lambda I)}{k - \lambda I}$$

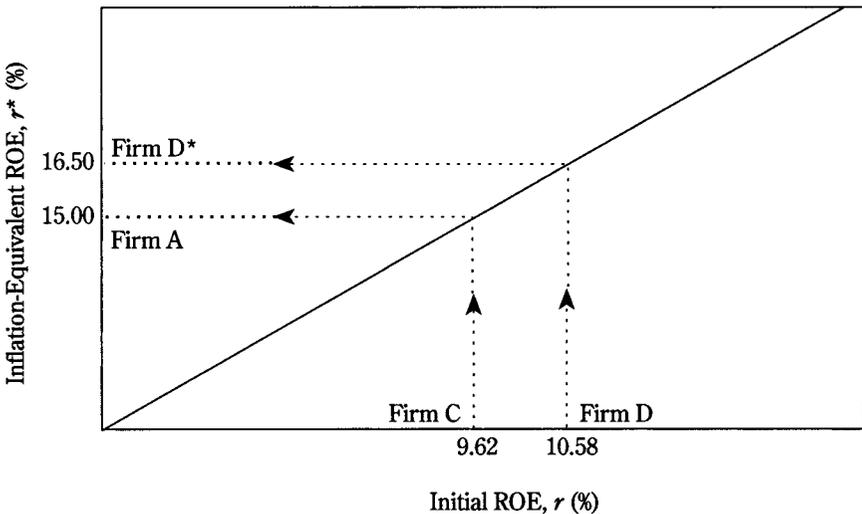


FIGURE 4.70 Inflation-Equivalent ROE versus Initial ROE with Full Inflation Flow-Through (inflation rate = 4 percent)

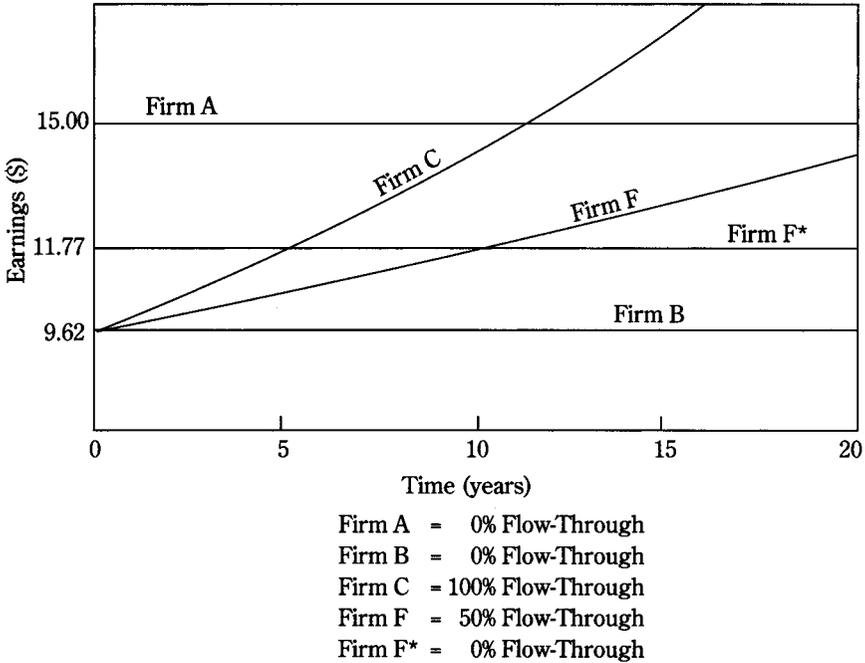


FIGURE 4.71 Time Paths of Earnings: Firm F with 50 Percent Inflation Flow-Through Compared with Firms A, B, and C (dollars in millions)

where λ is the inflation-flow-through rate and I is the inflation rate. Applying this formula to Firm F’s earnings reveals that, with a 50 percent flow-through rate, γ falls to 1.224 and r_F^* is 11.77 percent (note the inflation-equivalent Firm F* in Figure 4.71):

$$\begin{aligned}
 E_F^* &= \$9,620,000\gamma \\
 &= \$9,620,000 \times 0.12 \times \left[\frac{1 + (0.50 \times 0.04)}{0.12 - (0.50 \times 0.04)} \right] \\
 &= \$9,620,000 \times 1.224 \\
 &= \$11,774,880
 \end{aligned}$$

Figure 4.72 illustrates how γ varies with the flow-through rate. With zero flow-through, no inflation adjustment is necessary and $\gamma = 1$. As the flow-through rate increases, so does γ , with the most rapid rise occurring as full flow-through nears.

As indicated in Figure 4.70, γ can be interpreted as the slope of the line

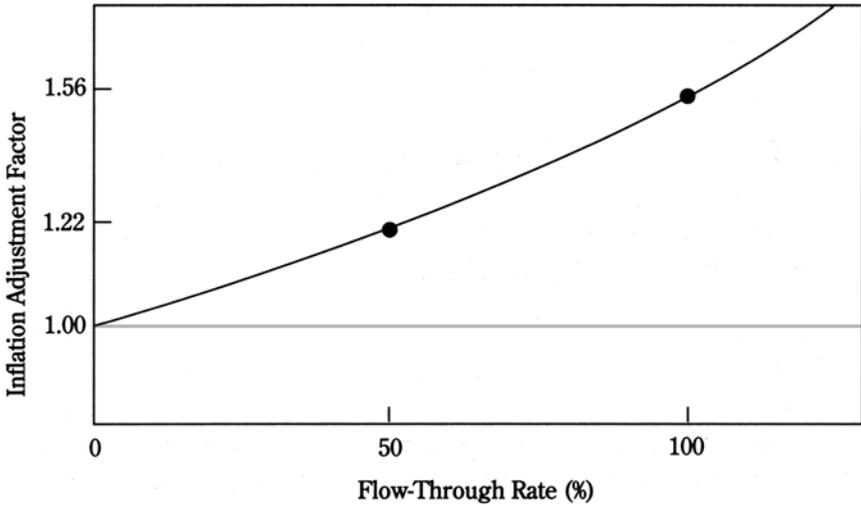


FIGURE 4.72 Variation of Inflation Adjustment Factor with Flow-Through Rate (inflation rate = 4 percent; nominal rate = 12 percent)

that represents the relationship between an initial ROE and its inflation equivalent. Thus, the greater the flow-through rate, the greater the value-multiplication effect. Figure 4.73 shows this effect with inflation-equivalence lines corresponding to zero, 50 percent, and 100 percent flow-through. Note that a return that appears to be below the assumed 12 percent nominal rate actually can represent an above-market ROE on an inflation-equivalent basis. For example, with full flow-through, a base ROE of only 7.69 percent is sufficient to provide a return equal to the 12 percent market rate. With 50 percent flow-through, that required base-level ROE rises to 9.80 percent.

The Base-P/E Inflation Adjustment The inflation adjustment factor can be used to express the dependence of the base P/E on the inflation-flow-through rate. Because all level-earnings firms have a base P/E of $1/k$, the following relationship exists (see Figure 4.73).⁵⁶

$$\text{Base P/E (inflation-flow-through firm)} = \gamma \left(\frac{1}{k} \right)$$

For example, in the case of Firm F, γ was 1.224, so with $k = 12$ percent, the base P/E for Firm F is 10.2 (or, 1.224×8.33).

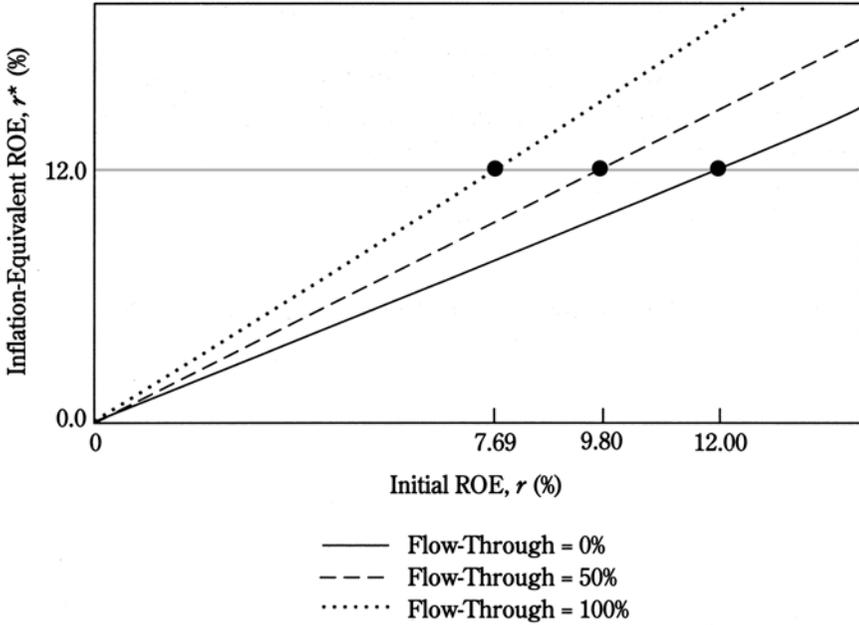


FIGURE 4.73 Inflation-Equivalent ROEs with Zero, 50 Percent, and 100 Percent Flow-Through Rates

Figure 4.74 shows how the base P/Es of all the example firms are related to the inflation-flow-through rate. Because Firms A, B, D*, and F* are constant-earnings firms, they all have 8.33 as their base P/Es. As the flow-through rate increases, γ and the base P/E rise at an ever-increasing rate. At 100 percent flow-through, γ rises to 1.56 and the base P/E reaches 13.

Inflation and the Earnings Horizon

The convenient and simplified concept of a perpetual earnings stream does not result in any loss of generality, because one can always find a perpetual stream with the same present value as a projected pattern of changing earnings. When exploring the effects of inflation flow-through, however, the required inflation adjustments have a definite sensitivity to the length of the earnings stream. Obviously, a 100 percent flow-through capacity will have a much more dramatic impact on the value of a 20-year constant earnings stream than it will on a 5-year stream.

Table 4.8 illustrates the magnitude of the inflation adjustment factor

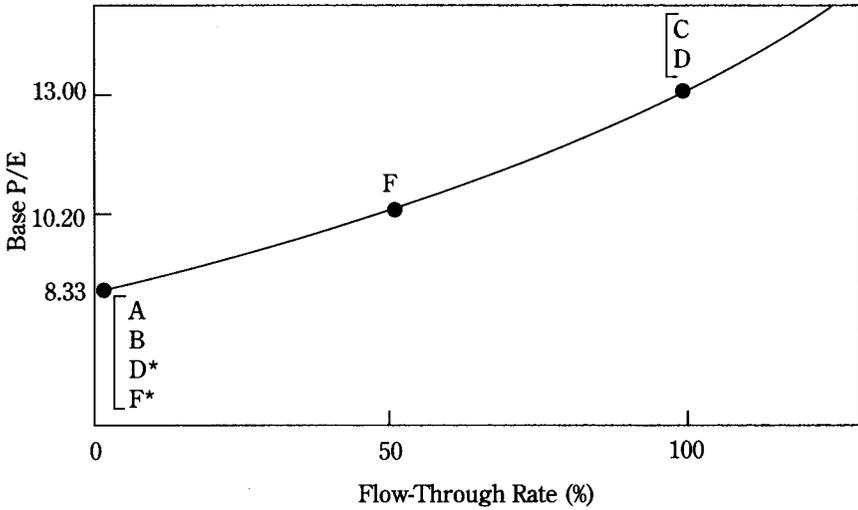


FIGURE 4.74 Base P/E versus Inflation-Flow-Through Rate

(γ) for level earnings streams that persist for specified horizon periods.⁵⁷ For example, a 20-year earnings stream that starts from a base level of \$10.00 million and grows at the inflation rate (100 percent flow-through) can be shown to have a present value of \$100.50 million. This \$100.50 million is also the present value of 20 years of level annual earnings of \$13.45 million. The inflation adjustment factor of 1.345 is the ratio of the \$13.45 million in constant earnings to the initial \$10.00 million of the growing earnings stream. As might have been anticipated, this value of γ for the 20-year earnings horizon is lower than the 1.56 value for the perpetual stream. As the horizon period shortens, so does the adjustment factor. For example, with 100 percent flow-through and only five years of earnings, the adjustment factor drops to 1.12.

TABLE 4.8 Inflation Adjustment Factor for Different Earnings Horizons (earnings horizon in years)

Flow-Through Rate	∞	20	15	10	5
0%	1.00	1.00	1.00	1.00	1.00
50	1.22	1.16	1.13	1.10	1.06
100	1.56	1.35	1.28	1.20	1.12
150	2.12	1.58	1.46	1.32	1.18

Note: Assumed inflation rate is 4 percent.

Because the base P/E for perpetual-earnings firms is $\gamma(1/k)$, the perpetual base P/E rises, as shown in Table 4.9, from 8.33 (that is, $1 \times [1/0.12]$) when the flow-through is zero to 17.67 when the flow-through is 150 percent (2.12×8.33). As the horizon period shortens, the present value of the earnings stream decreases (for any flow-through rate); consequently, the base P/E declines. With only a finite number of years of earnings, the effect of flow-through is muted. For example, Table 4.9 shows that, with a 20-year horizon, the base P/E ranges from only 7.47 to 11.79 for flow-through rates of zero to 150 percent. This relatively narrow range of base P/Es reflects the smaller adjustment factors that apply in the 20-year case.

New Investment and Inflation Flow-Through

To complete the characterization of the firm under the FF model, the value of the franchise P/E must now be added to the base P/E. Recall that the franchise P/E is derived from the firm's franchise value—the total net present value attributable to all prospective investments. The NPV is determined from the spread of each investment's return over the cost of capital and the magnitude of investments that can earn this positive spread.

For simplicity, assume that all new investments have a return (R) that has an inflation-equivalent perpetual return (R^*). If γ_{NEW} is the value of the inflation adjustment factor for new investments, then

$$R^* = \gamma_{NEW}R$$

Using the market discount rate (k) defined as a level annual rate, the following expression can be written:

$$\text{Return spread on new investment} = R^* - k$$

TABLE 4.9 Inflation-Adjusted Base P/E for Different Earnings Horizons (earnings horizon in years)

Flow-Through Rate	∞	20	15	10	5
0%	8.33	7.47	6.81	5.65	3.60
50	10.20	8.63	7.69	6.20	3.81
100	13.00	10.05	8.72	6.80	4.03
150	17.67	11.79	9.93	7.48	4.25

The total extent of new investment is measured by the growth equivalent (G)—the sum of the present values of future investments expressed as a percentage of the current book value (B_0). Assume that all forecast capital expenditures are measured in today's dollars. Finally, assume also that, at the time actual outlays occur, costs will have risen at the same rate as inflation.

Under these assumptions, the present value of new investments (that is, the value of G) will be unaffected by inflation. Consequently, all inflationary effects will be embedded in the return spread. Because the return spread is perpetual by assumption, the FV is computed as follows:⁵⁸

$$\begin{aligned} \text{FV} &= \frac{(R^* - k)GB_0}{k} \\ &= \left(\frac{R^* - k}{k} \right) GB_0 \end{aligned}$$

The franchise P/E is found by dividing this expression for FV by the initial earnings (rB_0):

$$\begin{aligned} \text{Franchise P/E} &= \frac{\text{FV}}{rB_0} \\ &= \left(\frac{R^* - k}{rk} \right) G \end{aligned}$$

The first term on the right side ($[R^* - k]/rk$) is the franchise factor (FF^*); it measures the P/E gain that results from each unit of prospective investment.⁵⁹ Using the terminology of the FF model,

$$\text{Franchise P/E} = \text{FF} \times G$$

where

$$\begin{aligned} \text{FF}^* &= \frac{R^* - k}{rk} \\ &= \frac{\gamma_{NEW}R - k}{rk} \end{aligned}$$

This definition of FF^* is the same as for the FF developed earlier in this monograph except that here the future return is R^* .

The General P/E Formula with a Steady Inflation Rate

The inflation adjustments made to the base-P/E and franchise-P/E formulas can now be combined to obtain the following general P/E formula:

$$P/E = \gamma_{CUR} \left(\frac{1}{k} \right) + (FF^* \times G)$$

where γ_{CUR} is the inflation adjustment factor for current business.

As a first example of a franchise firm, return to Firm C and assume that, in addition to maintaining its current business, it can invest in new businesses for which earnings grow with inflation. If the initial return on the new investment (R) is 12 percent and new investments have 100 percent flow-through, then

$$\begin{aligned} \gamma_{NEW} &= \gamma_{CUR} \\ &= 1.56 \end{aligned}$$

and

$$\begin{aligned} R^* &= \gamma_{NEW} R \\ &= 1.56 \times 12 \text{ percent} \\ &= 18.72 \text{ percent} \end{aligned}$$

By using this value of R^* and an initial ROE of 9.62 percent, FF_C^* can be computed as follows:

$$\begin{aligned} FF_C^* &= \frac{R^* - k}{rk} \\ &= \frac{0.1872 - 0.12}{0.0962 \times 0.12} \\ &= 5.82 \end{aligned}$$

This result allows specification of the relationship between the P/E and the magnitude of new investment opportunities, as measured by G :

$$\begin{aligned} P/E_C &= \gamma_{CUR} \left(\frac{1}{k} \right) + (FF_C^* \times G) \\ &= 1.56 \times \left(\frac{1}{0.12} \right) + 5.82G \\ &= 13.00 + 5.82G \end{aligned}$$

The graph of this relationship is a straight line emanating from the inflation-adjusted base P/E of 13. Figure 4.75 shows that a G value of only 86 percent is sufficient to bring the P/E to a level of 18.

The value of FF^* (and, consequently, the P/E) is highly sensitive to the extent of flow-through on new investments. To clarify the relationship between FF^* and the flow-through rates, consider two additional firms, C' and C'' , which are identical to Firm C in all respects except that their flow-through rates for new investments are 50 percent and zero, respectively. The values of γ_{NEW} , R^* , and FF^* for Firms C' and C'' are shown in Table 4.10. Note that FF^* (for Firm C') is zero, because $R^* = k = 12$ percent. Without inflation flow-through, future investments with a 12 percent base return do not provide incremental P/E value.

Figure 4.76 generalizes the preceding results by showing how the value of R affects FF^* for each of the three flow-through rates. Because Firm C'' does not have any flow-through capacity, it must achieve an R greater than the 12 percent market rate to ensure a positive FF . Firm C, however, can achieve an R^* of 12 percent with an R of only 7.69 percent, because it provides 100 percent inflation flow-through ($\gamma \times 7.69$ percent = 1.56×7.69 percent = 12.00 percent). For firms with inflation flow-through, a below-market initial return on new investments can still lead to a positive franchise value. The increasing steepness of the FF^* lines with higher flow-through rates reflects the growing inflation-adjusted spread on new investments. The higher the value of the FF^* , the less investment is re-

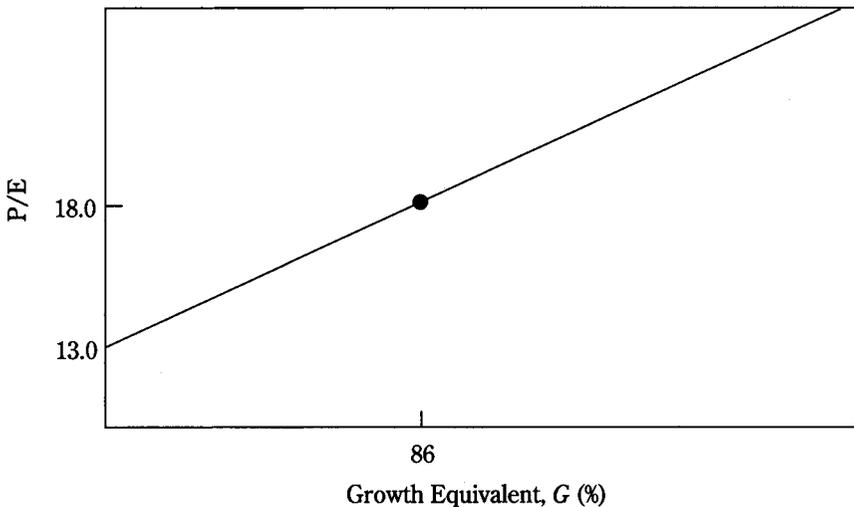


FIGURE 4.75 P/E versus Growth Equivalent for Firm C

TABLE 4.10 Summary of Current and Future Returns for Firms C, C', and C''

Firm	Initial ROE (r)	Inflation-Equivalent ROE (r^*)	Base Return on New Investment (R)	Inflation Flow-Through Rate on New Investment (λ_{NEW})	Inflation Adjustment Factor (γ_{NEW})	Inflation-Equivalent Return (R^*)	FF*
C	9.62%	15.00%	12.00%	100.00%	1.56	18.72%	5.82
C'	9.62	15.00	12.00	50.00	1.22	14.69	2.32
C''	9.62	15.00	12.00	0.00	1.00	12.00	0.00

quired to raise the P/E by one unit. Thus, firms with inflation flow-through for both current and future businesses have higher base P/Es and an enhanced responsiveness to new investment.

Figure 4.77 plots P/E against the growth equivalent for Firms C, C', and C''. Observe that all the P/E lines emanate from the same inflation-adjusted base P/E of 13 (that is, 1.56×8.33) but the lines have different

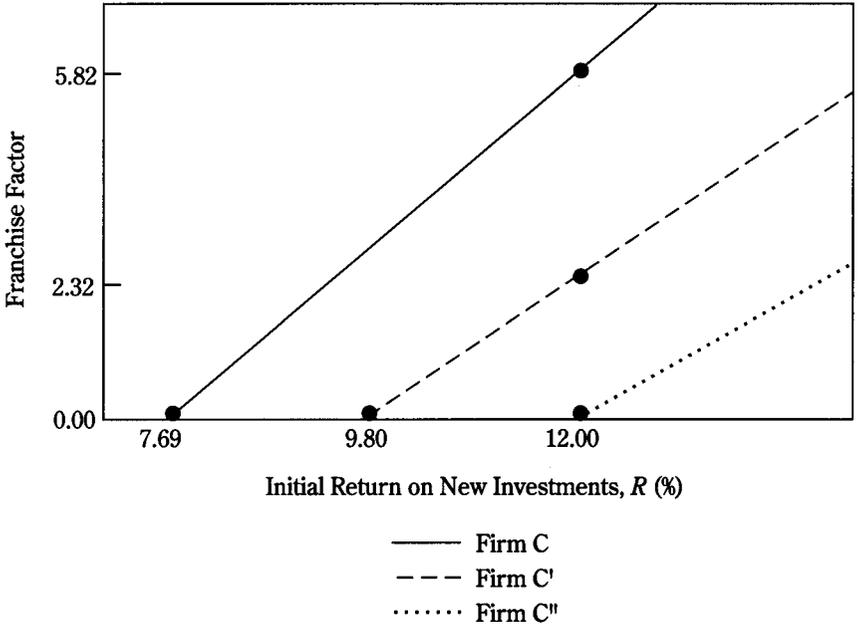


FIGURE 4.76 Franchise Factor versus Initial Return on New Investment for Firms with Different Degrees of Inflation Flow-Through

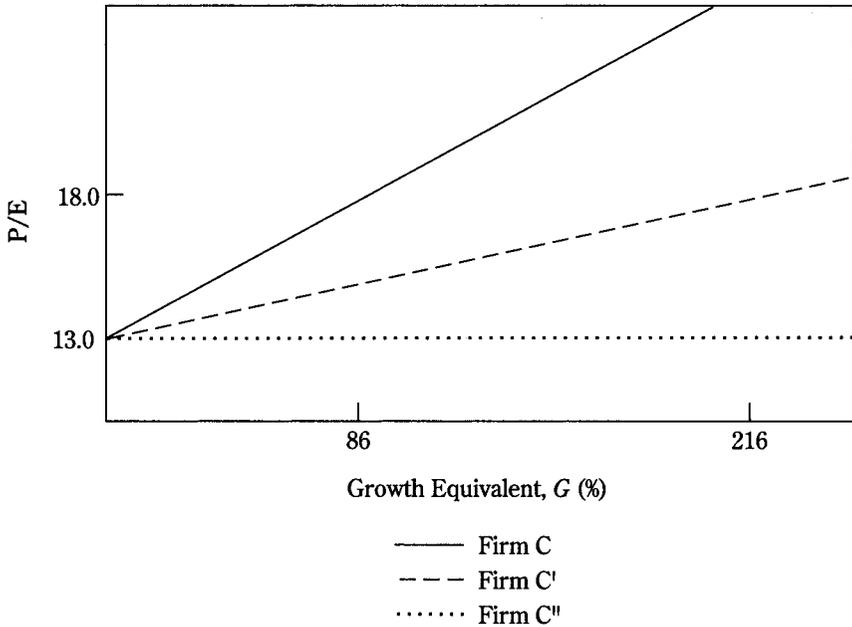


FIGURE 4.77 P/E versus Growth Equivalent for Firms C, C', and C''

slopes reflecting the different values of FF^* . For C'', the P/E line is horizontal because, without inflation flow-through, new investments with a 12 percent return cannot raise the P/E above the base level of 13. In contrast, Firm C' can achieve a P/E of 18 by making new investments with a G value of 216 percent. Finally, as already noted, Firm C with 100 percent flow-through achieves a P/E multiple of 18 with a far smaller growth equivalent (86 percent) than Firm C'.

In general, the inflation-flow-through character of a firm's current business is assumed to be a given. In contrast, the selection of future investment opportunities may be strongly influenced by the potential of new businesses to generate earnings that grow with inflation.⁶⁰

Summary

The franchise factor model allows separation of a firm's price/earnings ratio into two components: a base P/E that is attributable to a firm's current businesses and a franchise P/E that is derived from the firm's future investment opportunities. Earlier sections demonstrated how the FF model can be modified to incorporate tax and leverage effects; this section added inflation adjustments that must be applied to the simplified theoretical P/E

when inflation is steady and predictable. The inflation adjustment factor can be used to modify both ROEs and the base P/E in accordance with a firm's inflation-flow-through capacity. With these modifications, the theoretical P/E model shows that, even in a low-inflation environment, a firm's ability to increase earnings with inflation is valuable, because it materially enhances both the base P/E and the franchise P/E.

Resolving the Equity Duration Paradox

Estimates of equity duration are particularly important when investment managers or pension plan sponsors allocate assets and seek to control the overall interest rate risk of their portfolios.⁶¹ When the theoretical stock price is based on a standard dividend discount model, the result is a duration of 20 to 50 years, with the longer duration being associated with high-growth firms. Such long DDM durations are, however, grossly inconsistent with the observed market behavior of equities.⁶² Empirical studies show that equities generally have low durations—on the order of 2 to 6 years (see Figure 4.78). Thus arises the “equity duration paradox.” The analysis in this section shows how the separation of value into a tangible and a franchise component can help resolve this paradox.

The section begins by demonstrating that the DDM price can be decomposed into an implicit tangible value and franchise value. Because the standard DDM is based on perpetual growth at a constant rate, the implicit FV reflects the value of a continuing stream of investments from retained earnings. In this context, the FV, similar to a deep-discount bond, tends to have a very long duration. In addition, the magnitude and duration of the FV increase dramatically as the assumed perpetual growth rate rises. When combined with the more moderate duration of the DDM's implicit TV, the super-long FV duration leads to the high overall duration associated with the standard DDM. Moreover, higher growth rates result in even longer durations.

The inflation-adjusted form of the franchise factor model (the FF* model) is then used to explain the lower observed market duration of equity. This model shows that the TV and FV respond differently to changes in the expected inflation rate. On the one hand, the firm's TV is based on an earnings stream that is relatively predictable, because these earnings are generated by existing businesses. This cash flow certainly gives the TV “bondlike” characteristics and results in a TV duration that is comparable to that of long-maturity bonds. On the other hand, because the FV is based

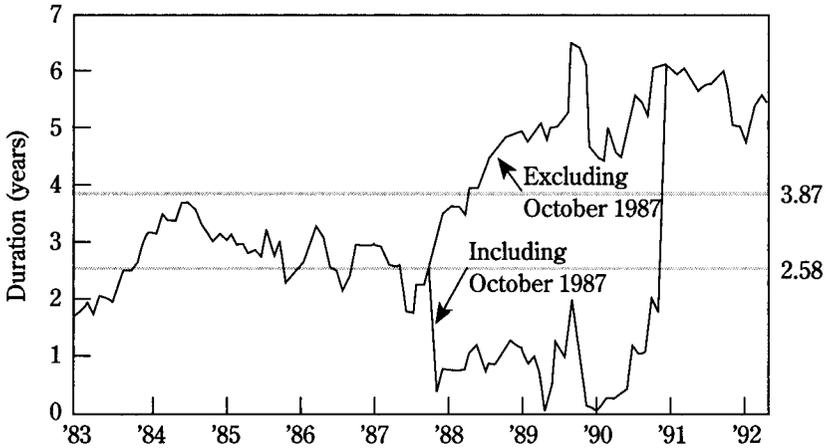


FIGURE 4.78 Equity Duration, January 1983 to February 1992
(using rolling 36-month correlations)

on future investment, its very nature suggests that it should be relatively *insensitive* to future inflation effects. For discount rate changes driven by inflation, the general FF* model argues for a low FV duration—comparable to a short-duration floating-rate note—just the opposite of the long duration implied by the DDM. Thus, the inflation-adjusted FF* model naturally leads to low duration values that *are* consistent with the observed behavior of equity markets.

Decomposing the Dividend Discount Model

The DDM assumes that the theoretical value of a company's stock (P) can be obtained by summing the present values of all future dividend payments.⁶³ The standard DDM price formula is $P = d/(k - g)$ (see Table 4.11 for symbol definitions).

In the absence of growth (that is, with g equal to zero), the fixed annual earnings are paid out as dividends. Price P is simply the value of a perpetual annuity discounted at a nominal market rate (k). More generally, when g is greater than zero, the investor's return will be derived from a growing stream of dividends (d) and the associated appreciation in share price.⁶⁴

For example, when $k = 12$ percent, $g = 8$ percent, and $d = \$8$ million, the stock price is \$200 million and the dividend yield is 4 percent. Thus, over a one-year period, the 12 percent return comprises a 4 percent dividend yield and an 8 percent growth rate.

TABLE 4.11 DDM Assumptions
(dollars in millions)

Variable Name	Symbol or Formula	Example Value
Initial book value	B	\$100
Return on book equity	r	16%
Initial earnings	$E = rB$	\$ 16
Earnings retention ratio	b	0.50
Dividend payout ratio	$1 - b$	0.50
Initial dividend	$d = (1 - b)E$	\$ 8
Dividend growth rate	$g = rb$	8%
Nominal discount rate	k	12%
Stock price	$P = d/(k - g)$	\$200

To see the sensitivity of P to rate changes, assume that earnings and dividends do not change. Now, consider the effect of a decline of 1 basis point in the value of k , from 2 percent to 11.99 percent. Then,

$$\begin{aligned}
 P &= \frac{\$8,000,000}{0.1199 - 0.0800} \\
 &= \$200,501,253
 \end{aligned}$$

The \$0.50 million price change represents a 0.25 percent increase to the base price level of \$200 million. This computation shows that the duration of the stock price (D_p , the ratio of the percentage change in price to the change in rates) is 25 (the 0.25 percent increase derived from the 0.01 percent rate move).⁶⁵ This straightforward computation is the cornerstone for the belief that equity duration is very long, but that belief is not supported by the observed statistical duration of equity, which tends to be between 2 and 6 years.

Figure 4.79 plots the DDM price (left scale) and duration (right scale) for a wide range of nominal rates under the assumptions given in Table 4.11. The sensitivity of P to nominal rate changes is reflected in the steepness of the price curve. This steepness (sensitivity) increases at low rate levels and decreases at higher rate levels. Note that the duration curve follows a path similar to that of the price curve.

The Standard DDM as a Special Case of the Franchise Factor Model

Because equity flows are by their nature uncertain, any attempt to analyze equity value via a strictly bondlike model will probably produce some un-

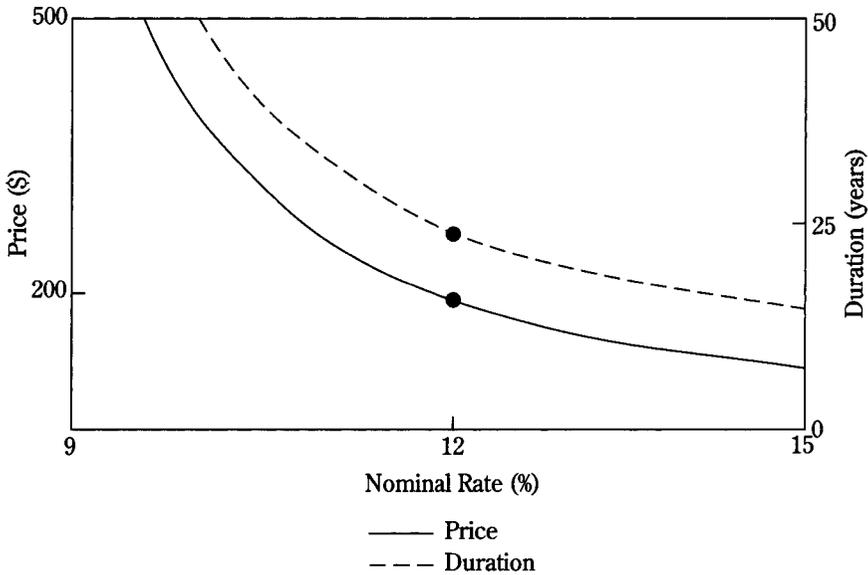


FIGURE 4.79 Price and Duration in the DDM
(dollars in millions)

realistic results. In fact, a key finding of this study is that the disparity between the DDM duration and market results reflects primarily the implicit DDM assumption that earnings streams are completely fixed under all circumstances. The FF model can be used to reconcile the disparity between duration and market results by first recasting the standard DDM into FF-model terms.

Recall that the DDM implicitly assumes that new and current businesses provide the same return on equity. Next, consider the DDM constant-growth assumption as a special case for the time path of all new investments. As demonstrated in Appendix 4A, these assumptions lead to the growth-equivalent formula ($G = g/[k - g]$).

To verify that the FF model gives the same value of P as the DDM, the values from Table 4.11 are used in the formulas for TV and FV:

$$\begin{aligned}
 \text{TV} &= \frac{E}{k} \\
 &= \frac{\$16,000,000}{0.12} \\
 &= \$133,333,333
 \end{aligned}$$

$$\begin{aligned}
 FV &= FF \times G \times E \\
 &= \left(\frac{r-k}{rk} \right) \left(\frac{g}{k-g} \right) E \\
 &= \left(\frac{0.16-0.12}{0.16 \times 0.12} \right) \times \left(\frac{0.08}{0.12-0.08} \right) \times \$16,000,000 \\
 &= 2.08 \times 2.00 \times \$16,000,000 \\
 &= \$66,666,667
 \end{aligned}$$

and

$$\begin{aligned}
 P &= TV + FV \\
 &= \$133,333,333 + \$66,666,667 \\
 &= \$200,000,000
 \end{aligned}$$

The calculations show that TV accounts for 66.7 percent of the price when $k = 12$ percent and the ratio of FV to TV is 0.50.

The relative proportion of tangible value to franchise value is extremely sensitive to the level of nominal rates (see Figure 4.80). For example, if k is 13 percent, TV falls only slightly, but FV drops by almost 50 percent, and the ratio of FV to TV falls to 0.30. Similarly, when k is 11 percent, FV rises by much more than TV in both absolute and relative terms. A further decline in k to 10 percent leads to a franchise value that is substantially greater than the tangible value. The extreme rate sensitivity of FV and the modest sensitivity of TV imply that FV duration (D_{FV}) is significantly greater than TV duration (D_{TV}).⁶⁶ (The reasons for these duration differences are the subject of the next subsection.)

Next, the overall equity duration is calculated by taking the weighted average of the two durations, using as weights the relative proportions of tangible value and franchise value. When k is 12 percent, then D_{TV} is 8.33 and D_{FV} is 58.33; so

$$\begin{aligned}
 D_p &= (66.67 \text{ percent of } 8.33) + (33.33 \text{ percent of } 58.33) \\
 &= 5.56 + 19.44 \\
 &= 25
 \end{aligned}$$

Because this special case of the FF model is equivalent to the standard DDM, the duration is the same 25 years computed earlier for the DDM. The decomposition makes visible, however, that most of the rate sensitivity (19.44 years) reflects changes in the franchise value, even though the franchise value is only a third of the price. The tangible value contributes only 5.56 years to the stock price duration.

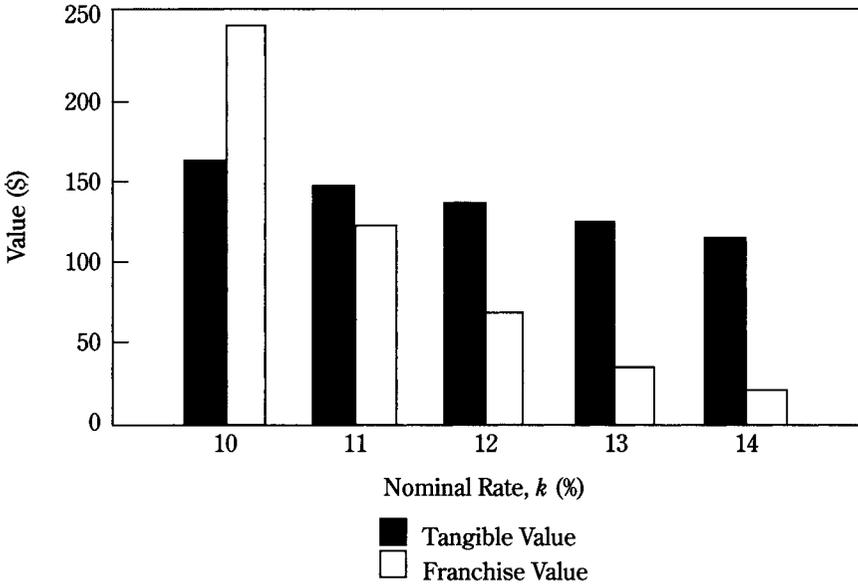


FIGURE 4.80 Tangible Value and Franchise Value for the DDM under Changing Nominal Discount Rates (dollars in millions)

Figure 4.81 shows how the three durations vary with the nominal market rate.⁶⁷ As k rises, D_{FV} becomes increasingly extreme, but the proportion of franchise value declines rapidly. Consequently, at high nominal rates, D_{TV} becomes the primary determinant of D_p . At low nominal rates, D_{FV} is extremely high and FV/TV is very large, which results in ever-greater values of D_p .

Inflation and Tangible Value in the FF Model

“The Effects of Inflation” demonstrated how steady inflation affects the components of the general FF* model.⁶⁸ This subsection extends the inflation-adjustment approach to the case of *changes* in expected inflation. The analysis assumes that the flow-through characteristics of a business remain roughly comparable in an environment of either steady inflation or changing expected inflation.

The first step is to show how nominal rate movements driven by changes in expected inflation affect a firm’s tangible value. The nominal rate comprises: (1) the real rate of return for riskless bonds, (2) a real risk premium that is characteristic of the equity market (or a particular subsec-

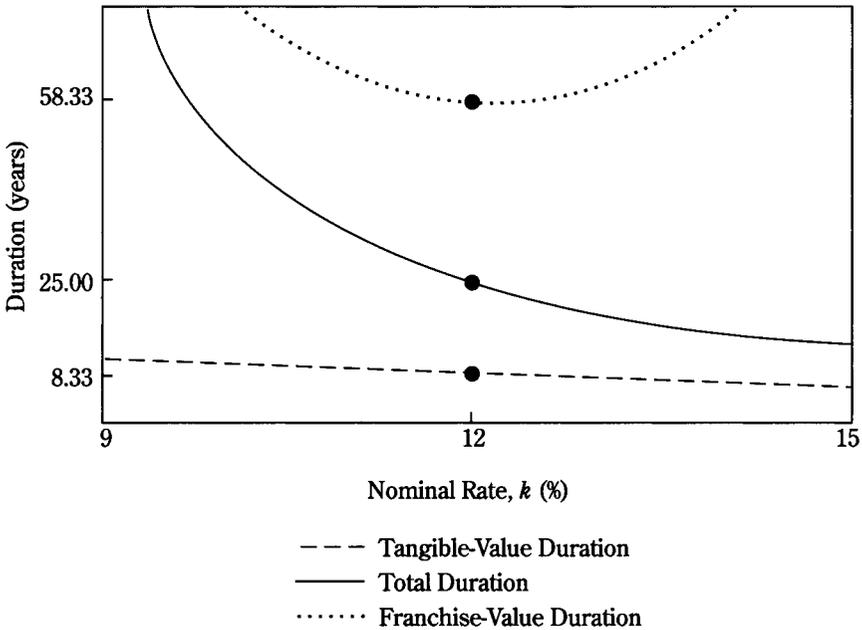


FIGURE 4.81 Tangible Value, Franchise Value, and DDM Duration versus Changes in Nominal Rates

tor of that market), and (3) the expected inflation rate. The basic assumptions about these rates are as follows:

Real riskless rate	=	4.19 percent
Equity risk premium	=	3.50 percent
Real equity return (k_r)	=	7.69 percent
Inflation rate (I)	=	4.00 percent
Nominal rate (k)	=	12.00 percent

Note that the real equity return (k_r) is simply the sum of the riskless rate and the equity risk premium. The nominal rate (k) is derived from the compound effect of inflation and the real return; that is, $k = (1 + k_r)(1 + I) - 1$.

Figure 4.82 illustrates the relationship between the nominal rate and the expected inflation rate (with the real rate held constant) by an upwardly sloping line emanating from the point on the vertical axis that represents the real equity return. The slope of this line is $(1 + k_r)$, or 1.0769, because in this nominal rate model, any change in I is multiplied by $(1 + k_r)$. For example, a 100-basis-point increase in inflation, from 4 percent to 5 percent, raises the nominal rate by 107.69 basis points.

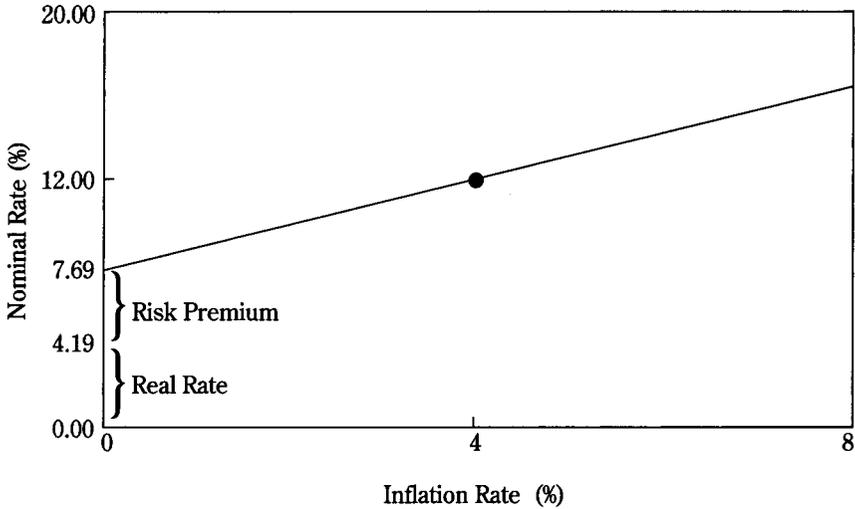


FIGURE 4.82 Nominal Interest Rate versus Inflation Rate

Three Earnings Time Paths To trace how the tangible value is affected by changes in expected inflation, consider the following three time paths for earnings when the inflation rate is constant at 4 percent (see Figure 4.83).⁶⁹

1. Steady earnings of \$16 million a year (*no inflation flow-through*)
2. Initial earnings of \$16 million that grow at the 4 percent inflation rate (*100 percent inflation flow-through*)
3. Initial earnings of \$16 million that grow 2 percent a year (*50 percent inflation flow-through*)

Zero inflation flow-through. In the first example, the firm's earnings are represented by a level, perpetual payment stream unaffected by inflation. In this case, the tangible value is the present value of a perpetuity, which is found by dividing the steady earnings (E) by the nominal rate. As in the DDM example, if $k = 12$ percent (that is, $I = 4$ percent), tangible value is \$133.33 million (that is, \$16 million/0.12).

Because high inflation rates lead to high nominal rates but leave earnings unchanged, TV will decline as I increases (see Figure 4.84). At a 4 percent inflation rate, the TV duration has the same 8.33 value found in the DDM example.

100 percent inflation flow-through. With 100 percent flow-through, the effects of inflation on earnings and the discount rate precisely counterbalance, so the tangible value is the same at all inflation rates and the TV duration is zero. To grasp this counterbalance, consider the contribution of

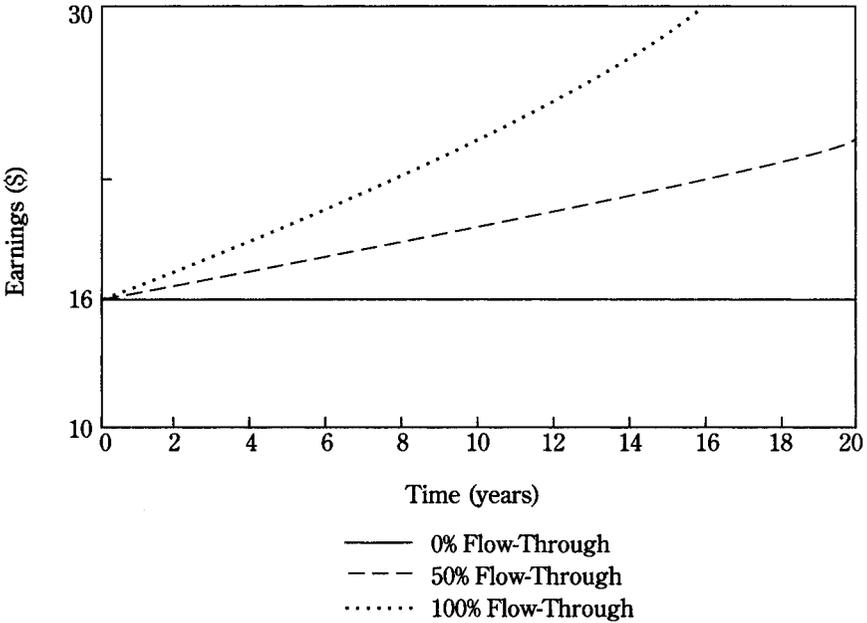


FIGURE 4.83 Time Paths of Earnings with Three Inflation-Flow-Through Rates (inflation rate = 4 percent; dollars in millions)

10th-year earnings to the tangible value. Because earnings grow at the inflation rate, when $I = 4$ percent,

$$\begin{aligned} \text{10th-year earnings} &= \$16,000,000 \times (1.04)^{10} \\ &= \$23,683,909 \end{aligned}$$

When I is 4 percent, k is 12 percent and

$$\begin{aligned} \text{Present value of 10th-year earnings} &= \frac{\$23,683,909}{(1.12)^{10}} \\ &= \$7,625,585 \end{aligned}$$

Summing the present values of each year’s earnings reveals that the tangible value is \$208 million.

Now suppose that the expected inflation rate increases to 5 percent; each year’s earnings rise, as does the corresponding discount rate:

$$\begin{aligned} \text{10th-year earnings} &= \$16,000,000 \times (1.05)^{10} \\ &= \$26,062,314 \end{aligned}$$

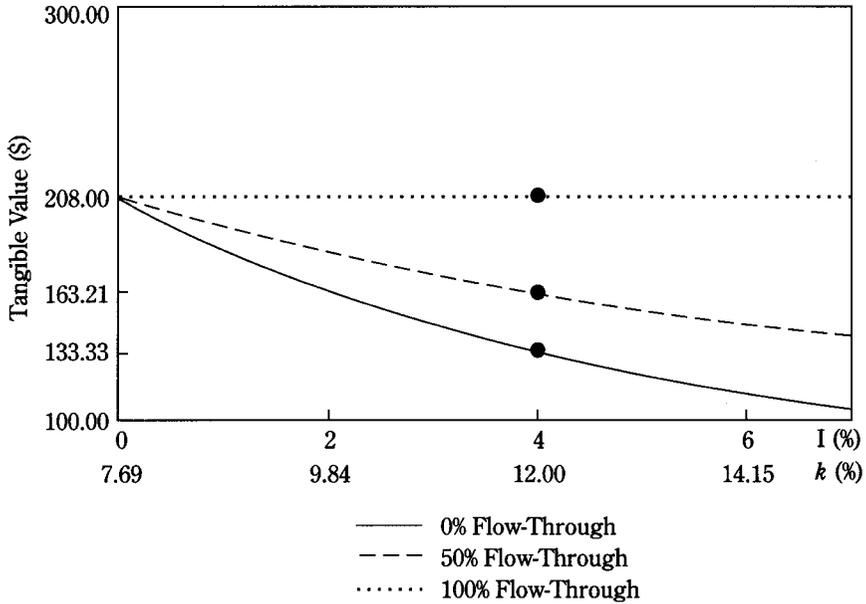


FIGURE 4.84 Tangible Value versus Inflation Rate with Different Degrees of Inflation Flow-Through (dollars in millions)

To find the present value of the earnings, first compute the new nominal rate:

$$\begin{aligned}
 k &= (1 + k_r)(1 + I) - 1 \\
 &= (1.0769) \times (1.05) - 1 \\
 &= 13.1 \text{ percent}
 \end{aligned}$$

With this value of k , 10th-year earnings turn out to have the same present value (PV) as they did when I was 4 percent.⁷⁰

$$\begin{aligned}
 \text{PV of 10th-year earnings} &= \frac{\$26,062,314}{(1.131)^{10}} \\
 &= \$7,625,585
 \end{aligned}$$

Because the present value of earnings in each year is the same whether the inflation rate is 4 percent or 5 percent, the tangible value must still be \$208 million. Thus, for 100 percent flow-through, the tangible value is independent of the expected inflation rate. At zero inflation, earnings will be constant over time and the nominal and real rates will coincide. Then, the

initial earnings (E_0) form a perpetuity that must be discounted at the 7.69 percent *real return* on equity in order to find the tangible value, which is \$208 million (that is, \$16 million/0.0769).⁷¹

This result implies that, as noted in “The Effects of Inflation,” for 100 percent flow-through, one can obtain the same TV value either by discounting the nominal earnings stream at the nominal rate *or* by discounting the initial earnings at the real rate.

50 percent inflation flow-through. In the intermediate case of 50 percent inflation flow-through, the tangible value declines with increasing inflation, but not as quickly as in the case of zero flow-through. Thus, the TV duration will be positive, but not as large as it is with zero flow-through. Note also that, when the inflation rate of zero drives the nominal discount rate down to where it coincides with the 7.69 percent real rate, the tangible value will be \$208 million for all flow-through rates.

Tangible-Value Duration Figure 4.85 illustrates that, for a reasonable range of nonzero inflation assumptions, D_{TV} can vary from zero to about 10 years, depending on the rate of inflation flow-through. Thus, even on a purely analytical basis, the value of D_{TV} is constrained. One caveat is in order, however: In these examples, D_{TV} is computed under the equivalency

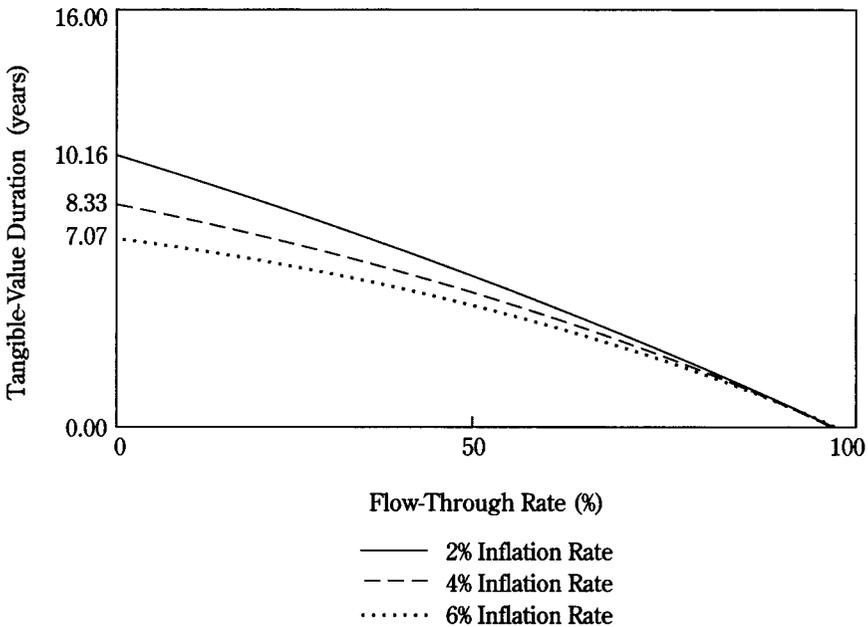


FIGURE 4.85 Tangible-Value Duration versus Inflation-Flow-Through Rate

assumption of either level annual earnings in perpetuity or earnings that grow steadily with inflation. In actuality, the duration will be related to more complicated underlying physical flows. A later subsection considers general examples in which existing investments generate substantial earnings growth, but even with such an expansion of potential earnings patterns, D_{TV} is constrained in value, just as in the case of coupon bonds.

The inflation-flow-through examples show that, under general conditions, the value of D_{TV} remains consistent with observed levels of the statistical duration. Thus, D_{FV} must be the source of discrepancy between actual market behavior and the high theoretical durations of 25 to 50 years implied by the standard DDM.

Inflation and Franchise Value

Because the franchise value is computed from the franchise factor and the growth equivalent (G), the rate sensitivity of each of these factors is considered separately in this subsection. First, recall that G measures the total dollars that will be expended on new enterprises. These expenditures include investments that reflect the firm's current franchise, expansions into new businesses through acquisitions or direct investment, and all other future capital projects.

Inflation and the Growth Equivalent Calculation of G requires the rather heroic assumption that the time path of future investments can be foreseen correctly. All forecast future investments are measured in present-value terms. Furthermore, at the time capital expenditures are made, costs are assumed to have risen at the expected inflation rate.

These assumptions are equivalent to 100 percent inflation flow-through in the value of new investments. Thus, the effects of inflation should cancel out in computing G (as in the case of a TV with 100 percent flow-through). Consequently, if variations in the nominal rate are solely the result of changes in expected inflation, the duration of G should be zero. Thus, G is being treated as a floating-rate note that resets to par at fairly short time intervals.

Inflation and the Franchise Factor The effect of the assumptions about G is to load all of the rate sensitivity of franchise value into the franchise factor. If the assumption is maintained that all rate changes are solely the result of changes in expected inflation, the extent of the FF's rate sensitivity will be determined by the flow-through capacity of new businesses.

Recall from "The Effects of Inflation" that the relationship between inflation flow-through and the value of FF can be captured in an inflation adjustment factor (γ). In essence, γ converts an initial ROE into an equivalent level return (R^*) that reflects the extent to which earnings grow

with inflation. Next, the “inflation-adjusted” R^* is used to calculate an inflation-adjusted franchise factor:

$$FF^* = \frac{R^* - k}{rk}$$

where $R^* = \gamma R$. The inflation adjustment factor is

$$\gamma = \frac{k(1 + \lambda I)}{k - \lambda I}$$

where λ is the inflation-flow-through rate.

For comparing with the DDM example, assume that $R = r = 16$ percent. Figure 4.86 illustrates the resulting FF^* values for inflation-flow-through rates (λ) of zero, 50 percent, and 100 percent. The similarity between Figures 4.84 and 4.86 underscores the fact that the FF^* -inflation relationship is mathematically similar to the TV-inflation relationship. When new investments have 100 percent flow-through, the FF^* is insensitive to inflation, because the FF^* depends only on the level of real returns

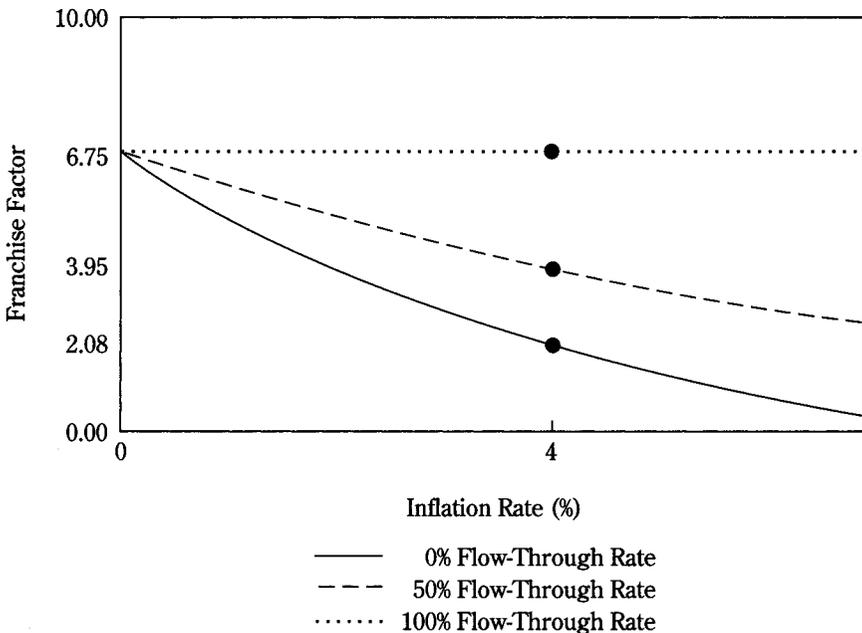


FIGURE 4.86 The Franchise Factor versus the Inflation Rate

(assumed fixed). Hence, for 100 percent flow-through, the FF* duration (D_{FF}) is zero. With zero flow-through, $R^* = r$ and the spread between R^* and k (that is, $R^* - k = r - k$) narrows sharply as inflation increases. This narrowing spread results from the fact that inflation increases are immediately reflected in higher nominal rates without any counterbalancing increase in R^* . Thus, for $\lambda = 0$, FF* declines rapidly with increasing inflation. This rapid decline represents a high sensitivity to rate changes and a correspondingly high D_{FF} value.

Duration of the Franchise Value Because G has been assumed insensitive to rate changes, the duration of the franchise value is determined solely by the duration of FF*; that is, $D_{FV} = D_{FF}$. This equality leads to an FV duration that depends solely on the flow-through level associated with FF*. Figure 4.87 shows how D_{FV} falls with increasing flow-through rates for FF*.

Because the franchise value deals with future investments, FV presumably reflects more closely than TV the choices that management is free to make at a later date. In general, management will not choose to make new investments having earnings that could be seriously eroded by inflation. Therefore, when a firm is entering new businesses, inflation-flow-through capability is likely to be an important consideration and the FV based on these investments will have low sensitivity to inflation.⁷²

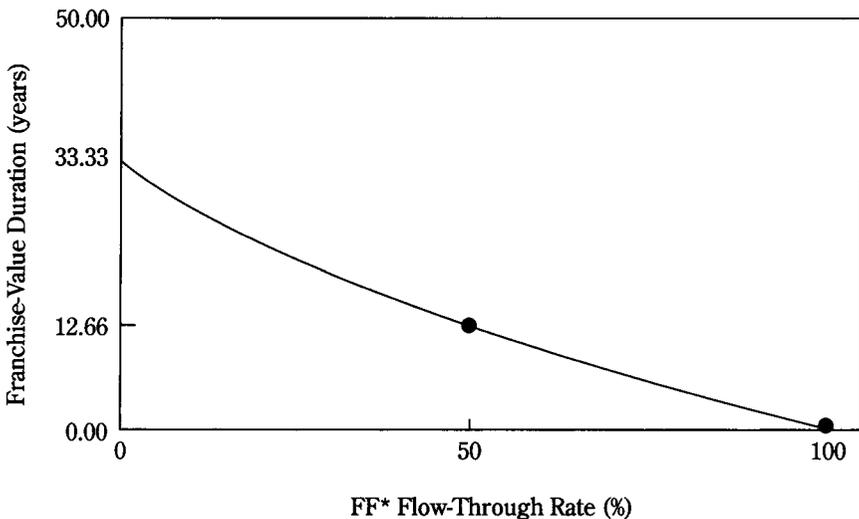


FIGURE 4.87 Franchise-Value Duration versus Flow-Through Rate (inflation rate = 4 percent)

The Spread Effect The argument in favor of a low duration of franchise value can also be based on the nature of FF^* . On the surface, FF^* appears to be essentially a nominal net investment spread ($R^* - k$) discounted at a nominal rate and then divided by the fixed value of r . In the full-flow-through case, it can be shown that

$$\frac{R^* - k}{k} = \frac{R - k_r}{k_r}$$

where R is the *initial* return on new investment.⁷³ The numerator ($R - k_r$) may be viewed as a net investment spread (NIS) that has a fixed value in *real* terms. The value of FF^* then is proportional to this real NIS discounted by the real rate (k_r). This formulation of FF^* is based completely on *fixed* initial return values (r and R) and the real rate (k_r). Hence, for $\lambda = 100$ percent, FF^* must be insensitive to changes in expected inflation.

In summary, new investments with inflation flow-through of 100 percent may be viewed in two (mathematically equivalent) ways: (1) They can be seen as providing a real net investment spread that is fixed for all time and across all inflation rates, with the real rate then being the appropriate discounting mechanism, or (2) they can be seen as providing a sequence of net investment earnings that grow with inflation. This growing stream of nominal earnings can then be discounted at the nominal rate, with the result that inflation cancels out (as it did with the tangible value). From either viewpoint, the franchise factor will not be affected by inflation changes, and the FV duration will be zero.

A New Model of Equity Price Duration

This subsection combines the analysis of TV duration and FV duration to model the overall rate sensitivity, D_p , of a firm's stock. The value of D_p is simply the weighted average of D_{TV} and D_{FV} :

$$D_p = \left(\frac{TV}{P} \right) D_{TV} + \left(\frac{FV}{P} \right) D_{FV}$$

As an application of this formula, consider the extreme case of a firm for which the tangible value has zero flow-through and the franchise value has 100 percent flow-through. In this case, FV is the same at all levels of expected inflation, but TV will decline as the inflation rate increases. To

allow a comparison of the results of the FF* model with those of the DDM example, assume the same initial inputs: r is 16 percent, and the initial book value is \$100 million. Thus,

$$\begin{aligned} E &= rB_0 \\ &= \$16,000,000 \end{aligned}$$

and

$$\begin{aligned} \text{TV} &= \frac{E}{k} \\ &= \frac{\$16,000,000}{k} \end{aligned}$$

When $k = 12$ percent, therefore, TV is \$133 million.

Now consider the franchise value. In the DDM example, the growth equivalent was 200 percent of the firm's initial book value (based on a 12 percent nominal rate) and the value of G was highly sensitive to the assumed discount rate. This sensitivity of G contributed greatly to D_{FV} in the DDM example. This section argues that the value of G , in sharp contrast to the DDM, should be insensitive to changes in expected inflation. Therefore, assume that the growth equivalent is 200 percent for all inflation rates.

To facilitate a comparison of the DDM and the FF* model, the chosen value of R must lead to the same value of FF* as in the DDM. The previous subsection showed that, with 100 percent flow-through on new investments, the calculations of FF* can be based on the real net investment spread ($R - k_r$). If the initial new investment return (R) is 10.256 percent and k_r is 7.690 percent, the real net investment spread is 2.570 percent (10.256 percent - 7.690 percent). This real NIS corresponds to the nominal 4 percent spread used in the DDM example.⁷⁴

Applying the real discount rate to this NIS leads to the same value of the franchise factor as in the DDM example:

$$\begin{aligned} \text{FF}^* &= \frac{R - k_r}{rk_r} \\ &= \frac{0.0257}{0.1600 \times 0.0769} \\ &= 2.08 \end{aligned}$$

Thus, the values of FF^* , G , and E are identical to those used in the DDM example, as is the resulting franchise value:

$$\begin{aligned} FV &= FF^* \times G \times E \\ &= 2.08 \times 2.00 \times \$16,000,000 \\ &= \$66,666,667 \end{aligned}$$

Although these *initial* values for franchise value and tangible value are the same for both the DDM and the FF^* model, as inflation expectations change, the values respond in vastly different ways in the two models. Recall that FV exhibited great sensitivity to rate changes in the DDM. In the FF^* model, however, with its focus on a real NIS, franchise value is invariant under changing inflation levels. For TV , under the extreme assumption of zero flow-through, the nominal flows are fixed in the FF^* model. Hence, tangible-value duration is identical in the two models; D_{TV} is 8.33 at $k = 12$ percent (see Figure 4.88).

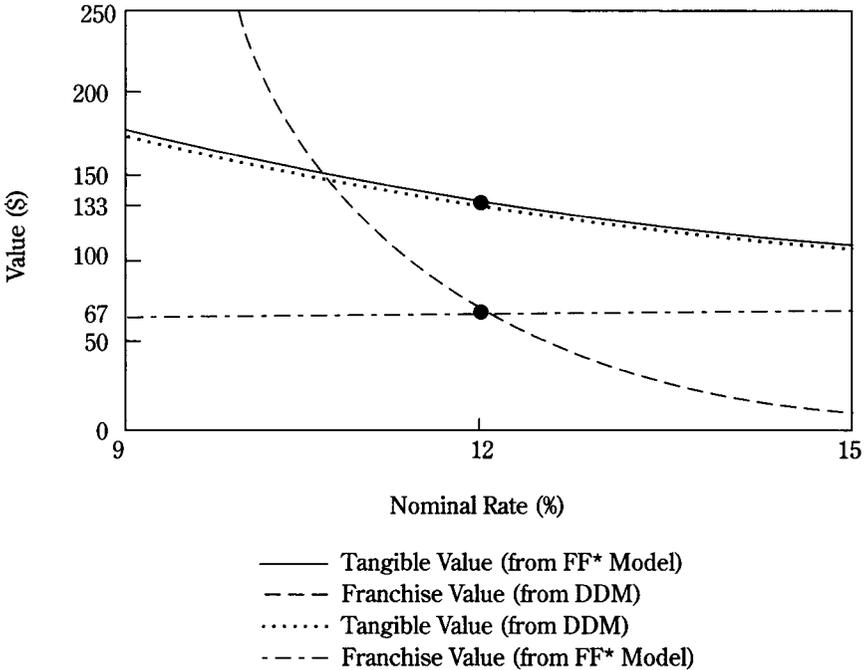


FIGURE 4.88 Components of Price for a Firm with 100 Percent Flow-Through on New Investments and Zero Flow-Through on Existing Businesses: DDM versus FF^* Model (dollars in millions)

Equity Duration in the FF* Model The total price duration for the extreme example of the FF* model can now be determined. Because D_{FV} is zero, the firm derives its rate sensitivity solely from tangible value. The tangible value represents only 66.67 percent of the firm's value, however, so the overall equity duration is much lower than 8.33: $D_p = 0.6667 \times 8.33 = 5.56$.

This finding implies that, if the value of a firm's current business is modest compared with the estimated value of its future investment opportunities, its stock price should have a fairly low duration. In the language of the FF* model, when franchise value is large, the weight of D_{TV} will be small. In contrast, a firm with few investment opportunities and fairly predictable cash flows has a primary weighting on D_{TV} ; hence, its equity price duration will be similar to the duration of a long bond.

Figure 4.89 shows how the equity duration, assuming that current earnings persist indefinitely, varies with the ratio of franchise value to tangible value. In essence, D_p is pulled down from a D_{TV} of 8.33 toward a D_{FV} of zero as the proportion of franchise value increases.

Duration at Varying Growth Rates For an example of the effect of changes in the proportion of the franchise value, return to the assumption of a uniform growth rate. Figure 4.90 shows that, while the tangible value remains fixed at \$133.33 million, the franchise value increases from zero when g is

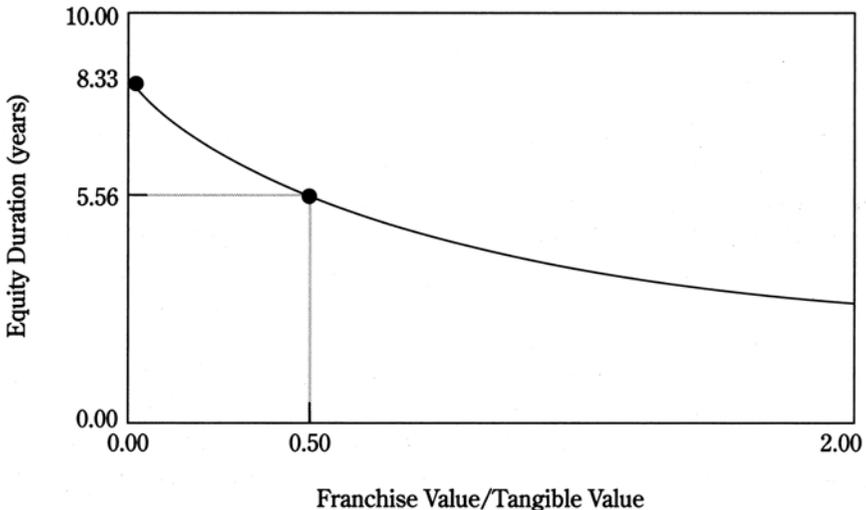


FIGURE 4.89 Equity Duration versus Proportion of Franchise Value (franchise-value duration = 0)

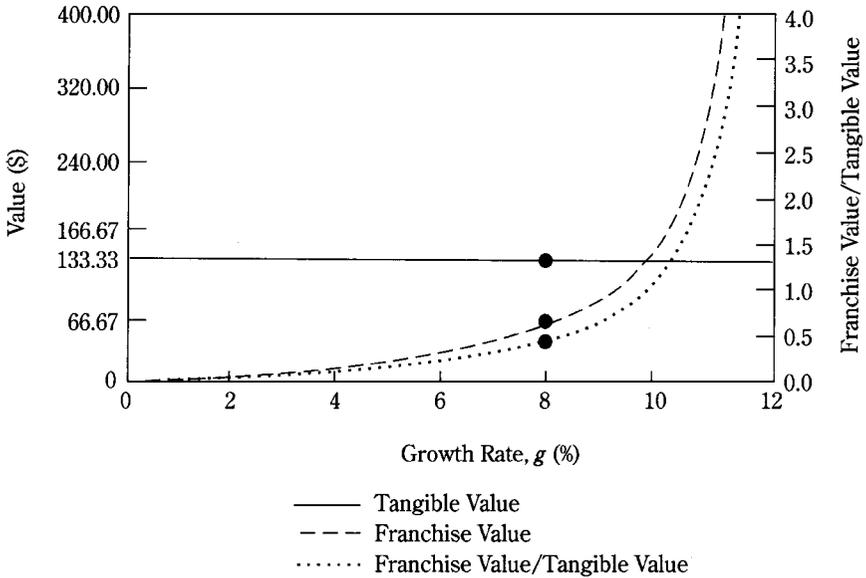


FIGURE 4.90 Tangible Value and Franchise Value versus Growth Rate (12 percent nominal rate)

zero, to \$66.67 million when g is 8 percent, and to \$166.67 million when g is 10 percent. At the same time, the proportion of franchise value to tangible value increases from zero to 1.25.

The FF^* model example and DDM example were calibrated to have the same TV, FV, and FV/TV values at the 4 percent inflation rate, but the models' very different responses to changing inflation lead to dramatically different duration values. When g is zero, there is no franchise value, and both the DDM and the FF^* model predict an equity duration equal to the TV duration of 8.33. As g increases, the DDM predicts that D_{FV} will also grow. Thus, D_p rises, because both the duration and the weight of franchise value increase. For example, as shown previously, at an 8 percent growth rate, the DDM predicts a D_{FV} of 58.3 and D_p of 25 (see Figure 4.91).

The FF^* model takes a completely opposite view to that of the DDM. According to the FF^* model, high flow-through should be embedded in the franchise value and D_{FV} should remain low even as g increases. This low value of D_{FV} leads to a total duration (D_p) that decreases as g values increase (see Figure 4.92). Thus, the FF^* model resolves the paradox of equity duration: Lower duration values are consistent with overall market behavior.

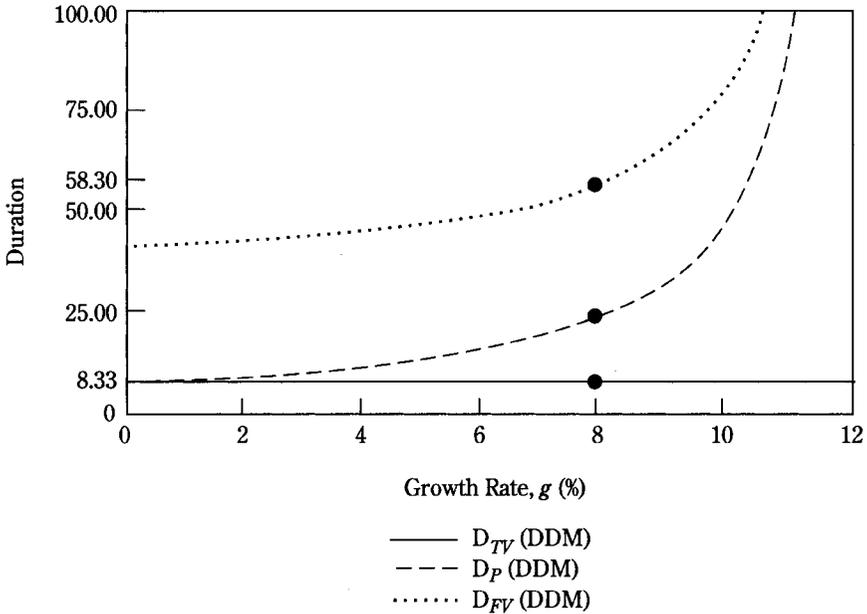


FIGURE 4.91 DDM Duration versus Growth Rate
(12 percent nominal rate)

Earnings Growth and Tangible Value

To this point, the assumption has been that all earnings growth results from incremental earnings from new businesses. Consequently, the value of high-growth firms was dominated by franchise value. In actuality, of course, the existing investments of many companies will experience high earnings growth for some extended period of time. New physical investments often lead to earnings that build slowly at first, then accelerate rapidly before leveling off and, ultimately, declining. Consequently, a future earnings pattern will depend on the stage at which it is viewed. The FF model assumes that all future earnings from *existing* businesses contribute to the tangible value; thus, some firms may be characterized as “growth” companies based on the deferred realization patterns in their tangible-value earnings.

The time path of TV earnings does not affect the base P/E (which remains at $1/k$ when earnings are normalized), but it does change the tangible value’s sensitivity to rate changes. For an illustration of this effect, consider several firms with no new investment opportunities (that is, with

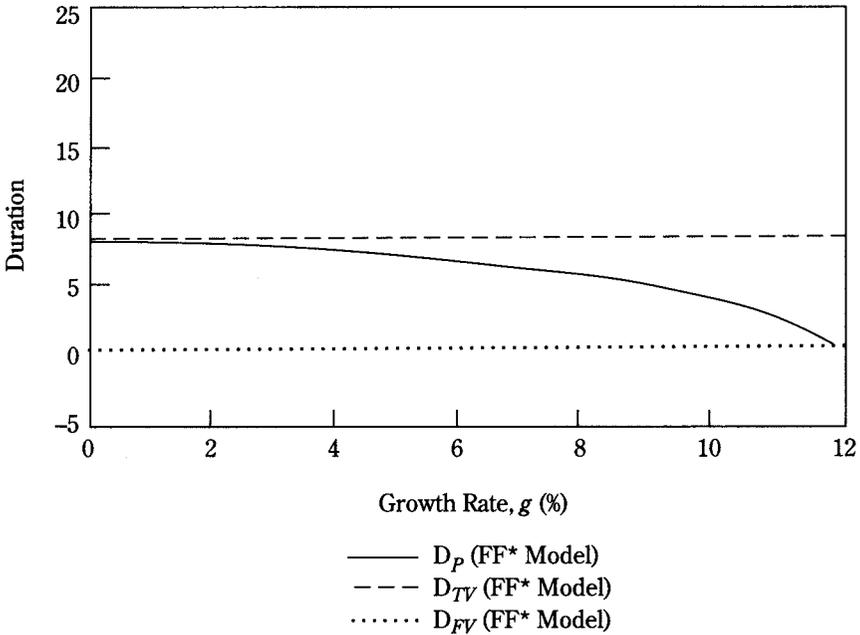


FIGURE 4.92 FF* Model Duration versus Growth Rate

no franchise value) but with earnings that change over time (as shown in Table 4.12). For comparison with earlier examples, Firm A is defined to have level earnings, zero flow-through, and a tangible-value duration of 8.33. Firms B and C both have earnings that first grow by 10 percent annually (for 5 and 10 years, respectively) and then level off and remain at their terminal values forever. These earnings paths are assumed to reflect

TABLE 4.12 Example TV Firms with Changing Earnings

Firm	Years of Growth	Earnings Growth Rate	Subsequent Rate of Earnings Decline	TV Duration
A	0	0%	0%	8.33
B	5	10	0	8.90
C	10	10	0	10.20
D	0	0	10	4.55
E	5	10	10	5.45
F	10	10	10	7.16

all earnings changes fully, regardless of the level of expected inflation (that is, the flow-through rate is zero). Under these conditions, D_{TV} rises from Firm A's 8.33 to 8.90 for Firm B and to 10.20 for Firm C.

Figure 4.93 illustrates the relationship between the earnings growth rate and the TV duration for firms with 5 or 10 years of growth followed by level earnings. If high growth rates (greater than 10 percent) are viewed as sustainable for only 10 or fewer years, durations higher than 12 or 13 years are probably not attainable. Figure 4.93 shows, for example, that a 20 percent growth rate for 10 years leads to D_{TV} of only 11.66. This result indicates that durations of a level predicted by the DDM cannot be achieved even if a firm enjoys high levels of earnings growth from existing investments.

In reality, the earnings generated solely by existing investments are likely to peak and then begin to decline. Firms D, E, and F in Table 4.12 illustrate the TV duration of firms with peaking earnings. Firm D's earnings begin to decline immediately at a 10 percent annual rate, which results in a TV duration of 4.55. Firms E and F fare much better; their earnings first rise by 10 percent annually (for 5 and 10 years, respectively) and then decline at a 10 percent annual rate. Such rising-and-falling earn-

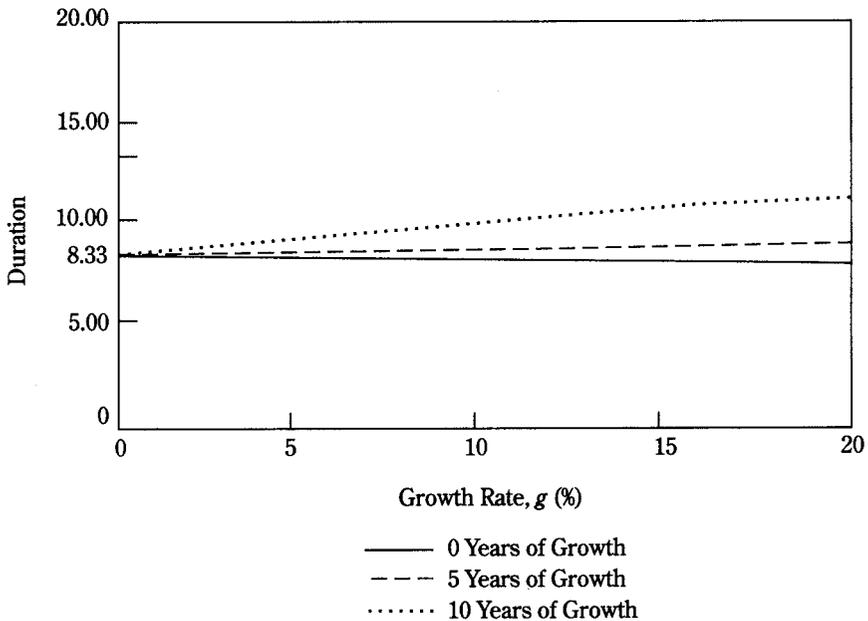


FIGURE 4.93 Tangible-Value Duration versus Earnings Growth Rates (0, 10, or 20 years of growth)

ings paths lead to durations that are substantially short of the base 8.33. Figure 4.94 illustrates this result for a range of growth rates and subsequent rates of decline.

The preceding duration values were based on the assumption of zero flow-through; that is, the TV-generated earnings stream was completely insensitive to inflation. In practice, if a period of sustained earnings growth is significantly long, some capacity for inflation adjustment would be expected (especially in the later years). Any such flow-through flexibility would lead to a material reduction in the duration values shown in Table 4.12 and Figures 4.93 and 4.94.

The label “growth company” tends to be applied to firms that exhibit earnings growth from a variety of sources, not from current businesses alone. These sources, in various combinations, are the tangible-value growth derived from existing investments, the franchise-value growth associated with new franchise investments, and earnings boosts from new but nonfranchise (and, hence, theoretically unproductive) investments. At the extreme of growth derived primarily from new investments, the high flow-through should result in a low duration. At the other extreme, for firms in

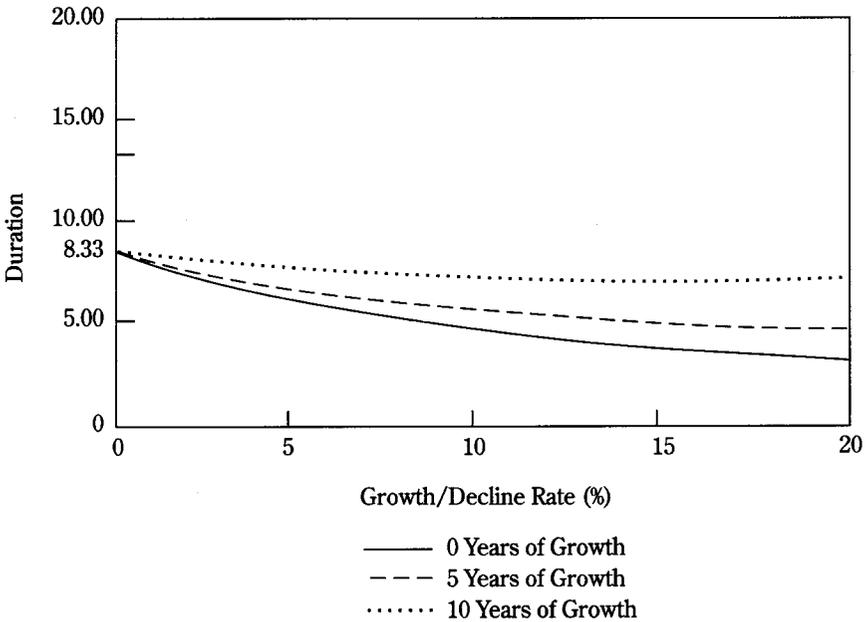


FIGURE 4.94 Tangible-Value Durations for Firms with Rising-and-Falling Earnings (0, 5, or 10 years of growth before decline)

which the TV growth of old investments is dominant, the duration will not likely exceed eight or nine years. Thus, the duration of “growth firms” spans a wide spectrum that depends on the sources of the growth.⁷⁵ Even in the most extreme case, however, the FF* model duration will be significantly lower than the high levels predicted by the DDM.

The Effect of Changes in Real Rates

To this point, the tacit assumption has been that all nominal rate changes reflect changes in expected inflation. In actuality, of course, real rates and risk-premium spreads will also change. Although a complete analysis of the impact of such rate changes is beyond the scope of this text, the separation of firm value into the tangible value and the franchise value can be used to gain some insights into the nature of this impact.

Because tangible value has bondlike characteristics, its sensitivity to rate changes, regardless of their source, is likely to be comparable to the sensitivity of coupon bonds. In contrast, the sensitivity of franchise value to rate changes is likely to depend on the source of those changes. Although the franchise value may exhibit high flow-through for (hence, low sensitivity to) inflation changes, there is little reason to expect any such protection when nominal rate changes are caused by movements in real rates and/or risk premiums. Thus, fluctuations in real rates or risk premiums may produce FV changes that are comparable to those predicted by the DDM. Then, the overall price sensitivity could reach some of the very high duration levels implied by the DDM. In summary, when evaluating the net impact of interest rate movements on equity prices, one must be careful to distinguish between ordinary inflation effects and the more dramatic impact of changes in real rates and real risk premiums.

Summary

The traditional dividend discount model blends earnings from current and prospective businesses and predicts an extremely high equity duration. The franchise factor model can be used to separate current businesses from future businesses and reveals that inflation changes are likely to have vastly different effects on these two components of firm value. In particular, the franchise value should be rather insensitive to changes in expected inflation. A key finding, therefore, is that the duration of franchise value should be quite low. The standard DDM does not account for such inflation effects; hence, it implicitly assumes a very long duration for franchise value. As a result, the DDM overstates the duration of all firms, while the FF model leads to equity durations that are consistent with observed statistical durations.

Theoretical Price/Earnings Ratios and Accounting Variables

The theoretical price/earnings ratio produced by the franchise factor model, to this point, has been based implicitly on an estimate of the firm's value divided by a normalized value for the current *economic* earnings. The marketplace, however, addresses P/E values by dividing the market price by some measure of *accounting* earnings. This "market P/E" is then subject to daily price volatility and to the nature of accounting charges and conventions.

This section begins by clarifying the distinctions between the accounting and the economic values for earnings, book value, and return on equity. A "blended P/E" computed from the theoretical price and the reported accounting earnings is then introduced. This blended P/E should be closer to the market multiple than a purely theoretical P/E.

The blended P/E multiple can be analyzed according to four sources of value:

1. Accounting book value
2. Incremental value attributable to the difference between the market-based and accounting book values
3. Incremental going-concern value associated with the existing book of business
4. Future franchise value derived from new investments

The first two sources are directly related to the value of a firm's assets, and the final two reflect the creation of added value from the firm's franchise. The section concludes by discussing what is necessary for a firm to raise its blended P/E.

Economic versus Accounting Variables

The first step in disentangling the components of value is to assess the level of economic earnings associated with the current book of business. For example, consider two standard accounting values that are widely reported: the book value of equity and the return on book value, the ROE. In the aggregate, for the Standard & Poor's (S&P) Industrials, the ROE has ranged from 9.7 percent to 19.1 percent with an average level of 13.1 percent. The S&P Industrials book value has grown over time in rough correspondence with the ROE levels (see Figure 4.95). The ROE and book value provide

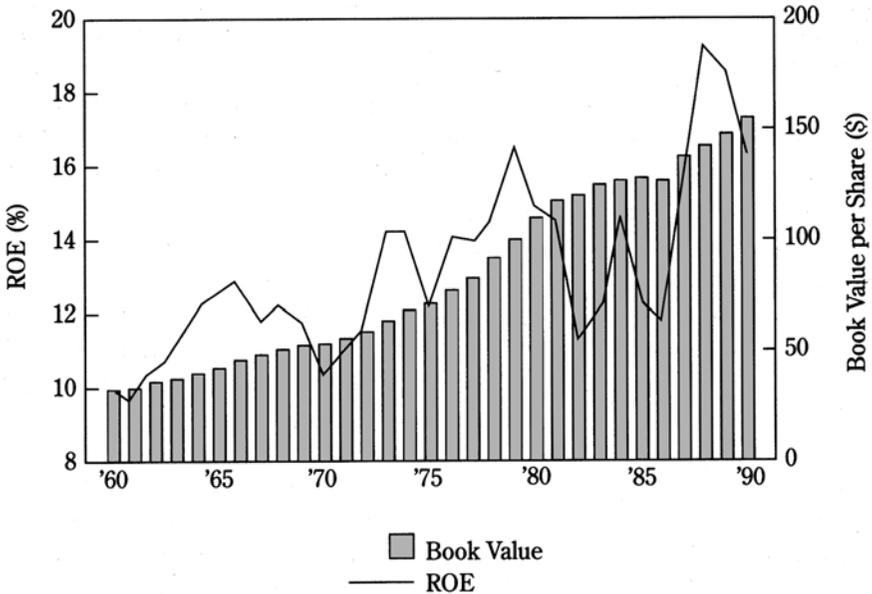


FIGURE 4.95 Book Value per Share and Return on Equity for the S&P Industrials
 Source: Standard & Poor's, *Analysts's Handbook* (New York: McGraw-Hill, 1992).

only limited insight, however, into the determinants of a firm's P/E ratio at a given point in time. A key ingredient in understanding the P/E is the projection of the firm's *economic* earnings.⁷⁶ Unfortunately, the subject of economic earnings entails moving from the "precise" world of accounting principles into the realm of estimation.

One useful route to calculating economic earnings is first to estimate the ratio of the market value of existing assets to the accounting value (q_B). For example, if the accounting value is \$100 million and the market value is \$200 million, $q_B = 2.0$. This book-value ratio can be used to find the economic earnings if a reasonable assessment of the sustainable economic return (r_T) is made.

Because r_T relates to the market value of assets, it is not a totally free variable. For example, suppose the market value of assets is derived solely from a firm's ability to extract a 12 percent market rate of return. By definition, the firm's r_T would be 12 percent. An r_T of 15 percent suggests that the firm's going-concern value is adding 300 basis points beyond the general market return. An r_T of 7.5 percent would imply that, for whatever reasons, the firm is locked into underperforming assets that could earn an additional 450 basis points if they were redeployed in the general market-

place. These r_T variations make a general statement about the nature and quality of the existing business.

This simple method of analysis has clear-cut implications when the market value of book equity is understated. For example, consider a firm with \$13 million in properly reported earnings. If the accounting book value is \$100 million, the result is an accounting ROE of 13 percent. This 13 percent ROE—which is generally consistent with historical experience (see Figure 4.95)—may appear to be a satisfactory level of return. If the book value happens to be understated, however, and the true economic book value is \$200 million, the true economic ROE slides to the dismal level of 6.5 percent. Thus, when the book value is understated, a proportionately higher accounting ROE is clearly needed for the firm to reach an acceptable level of market return.

The book value will be understated whenever the economic value of assets exceeds their accounting costs and/or whenever debt liabilities are overstated. This liability overstatement may occur with some frequency under traditional assumptions because debt with a below-market coupon will remain on the books but high-coupon debt tends to be refinanced.⁷⁷ Two companies with the same accounting structure may appear very different in terms of their economic variables. Moreover, this difference may be exacerbated when the comparison is between identical companies domiciled in different countries with disparate accounting conventions.

P/E in Theory and Practice

Two fundamental ingredients are required to produce a P/E—the “P” and the “E.” The price can be either a market value (P_M) or a theoretical value (P_T) (see Table 4.13). In the FF model, computation of P_T is basically the same as in most standard models in which P_T depends on the time path of economic earnings.⁷⁸ P_T is usually derived in two steps. The first is to make a set of assumptions regarding future earnings and growth. The second is to calculate the price as the present value of the future flows discounted at a capitalization rate (k) appropriate to the firm’s risk class.

The earnings base may be built on either theoretical (E_T) or accounting (E_A) considerations. In previous sections, the variability of economic earnings was smoothed out by replacing the projected earnings stream with a sustainable, level stream (E_T). By their very nature, economic earnings will differ significantly from any measure of accounting earnings. In fact, equity analysts make a practice of looking beyond reported earnings to make corrections for anomalies such as special charges and reserves.

Various combinations of theoretical, market, and accounting quantities

TABLE 4.13 Theoretical and Practical Measures of Price and Earnings

Type of Measure	Price	Earnings
Theoretical	P_T Discounted present value of projected future economic earnings from current and future investments	E_T Normalized Expected value Sustainable “Discountable” into a price value
Practical	P_M Market value	E_A Visible (reported or accounting values) 12-month trailing earnings Estimated future earnings

can be used to compute a variety of P/Es. A *theoretical* P/E is found as follows:

$$(P/E)_T = \frac{P_T}{E_T}$$

The reported or market P/E is

$$(P/E)_M = \frac{P_M}{E_A}$$

Because the earnings base is simply a *numeraire* for measuring relative price levels, one can combine theory with market practice by using E_A rather than E_T to compute a blended price/earnings ratio—that is, P_T/E_A (see Figure 4.96). The advantage to denominating P_T in terms of accounting earnings is that P_T/E_A can be viewed as a target level against which the market value (P_M/E_A) can be measured. In time, P_M/E_A might tend toward P_T/E_A , but projected economic earnings are incorporated in the determination of P_T regardless of the earnings used in the P/E denominator.

Theoretical P/Es

The two principal components of the theoretical value of a firm are tangible value and franchise value. Although tangible value is easy to describe, it is difficult to compute because it requires some heroic suppositions regard-

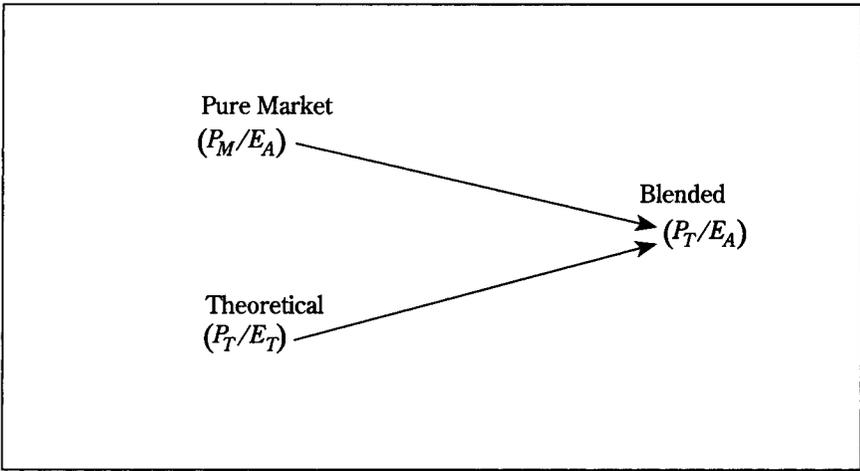


FIGURE 4.96 Blending Theoretical and Practical P/E Measures

ing today's book value, depreciation, capital expenditures, and myriad other factors. To simplify, the analysis here assumes a normalized level of sustainable economic earnings (E_T). The tangible value can then be computed simply as the present value of a perpetuity,

$$TV = \frac{E_T}{k}$$

FV is, as in previous sections, derived from prospective earnings associated with future franchise investments.

The theoretical price is

$$P_T = TV + FV$$

Dividing P_T by E_T results in

$$\frac{P_T}{E_T} = \frac{TV}{E_T} + \frac{FV}{E_T}$$

Figure 4.97 illustrates schematically the dynamic relationships among TV, FV, earnings, and the theoretical P/E.

In previous sections, the earnings and price were implicitly assumed to be E_T and P_T . The first term in the formula for P_T/E_T is the base P/E (computed by dividing TV by E_T), or the inverse of the capitalization rate. The

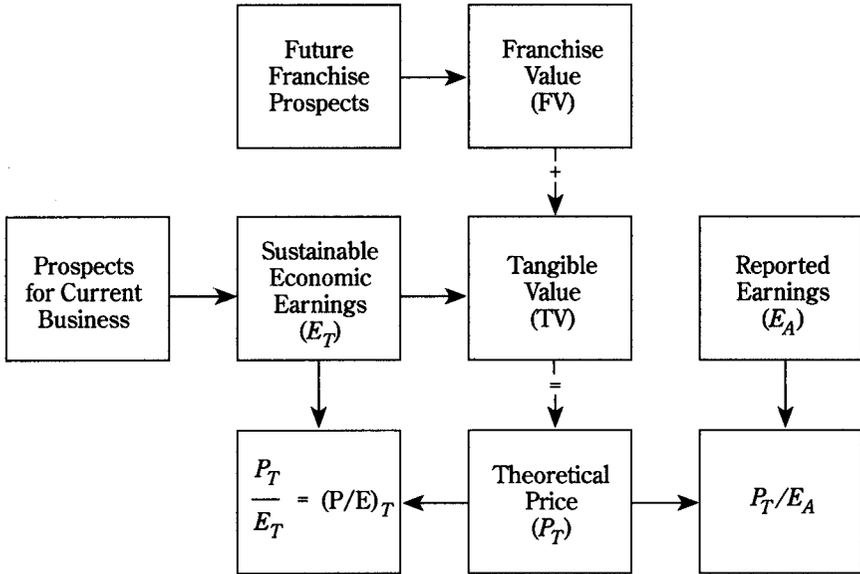


FIGURE 4.97 Tangible Value, Franchise Value, and Theoretical P/E

second term is the franchise P/E, computed as the product of the franchise factor and the growth equivalent. Recall that FF is a unit profitability measure based on economic returns on book equity (r) and the return on new investment (R) and that G , the growth equivalent, is the present value of all new investments expressed as a percentage of current book value. In summary,

$$\frac{P_T}{E_T} = \frac{1}{k} + (FF \times G)$$

where

$$FF = \frac{R - k}{rk}$$

For an example of the use of this formula, assume the following: k is 12 percent, r is 12 percent, and R is 16 percent. Under these assumptions,

$$\begin{aligned}\text{Base P/E} &= \frac{1}{k} \\ &= \frac{1}{0.12} \\ &= 8.33\end{aligned}$$

$$\begin{aligned}\text{FF} &= \frac{R - k}{rk} \\ &= \frac{0.16 - 0.12}{0.12 \times 0.12} \\ &= 2.78\end{aligned}$$

$$\begin{aligned}\text{Franchise P/E} &= \text{FF} \times G \\ &= 2.78G\end{aligned}$$

Using these values in the formula for P_T/E_T results in the following relationship between the P/E and G :

$$\frac{P_T}{E_T} = 8.33 + 2.78G$$

Thus, a graph of the relationship between P_T/E_T and the growth equivalent is a straight line with a slope of 2.78 emanating from the base P/E value of 8.33. Consequently, each unit increase in growth equivalent, representing a new investment level equivalent to 100 percent of the current book value, results in 2.78 units of additional P/E (see Figure 4.98). For example, if the growth equivalent is 105 percent,

$$\begin{aligned}\frac{P_T}{E_T} &= 8.33 + (2.78 \times 1.05) \\ &= 11.25\end{aligned}$$

Relative Value of Economic and Accounting Variables

In general, the economic and accounting values of earnings, book value, and returns will exhibit considerable time variability. For example,

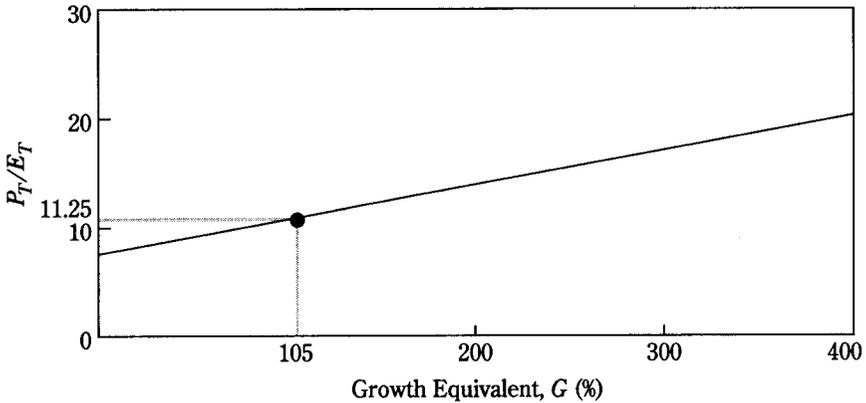


FIGURE 4.98 Theoretical P/E versus Growth Equivalent

Figure 4.99 illustrates two firms that have the same economic earnings of \$24 million annually. Firm A's accounting earnings, which range from a high of \$17.1 million to a low of \$13.9 million, consistently understate its economic earnings. Firm B's earnings have a more variable character than Firm A's, and its accounting earnings often dominate its economic earnings.

The relative value of E_T and E_A is given by q_E , which is defined as E_T/E_A . A value of q_E greater than 1 indicates the common situation in which E_A understates E_T . If q_E is less than 1, E_A is overstating E_T . The time paths of q_E for the two example firms are given in Figure 4.100.

The accounting book value (B_A) is based on the historical value of the firm, accumulated retained earnings, depreciation, and a variety of other factors. The economic book value is defined here to be the true market value of assets (B_T).⁷⁹ As in the case of earnings, the relative magnitude of B_T and B_A will change over time. For mature firms with long-term holdings of real estate and substantial physical plants subject to rapid depreciation, the market value of assets may dwarf the book value. Thus, the book-value ratio ($q_B = B_T/B_A$) is likely to be considerably greater than 1.

The economic ROE (r_T) and the accounting ROE (r_A) are found by taking the appropriate ratios of earnings to book values $r_T = E_T/B_T$ and $r_A = E_A/B_A$. The ratio of ROEs is computed as $q_r = r_T/r_A$.

Based on these relationships, $q_E = q_r q_B$. Thus, once q_E has been determined, q_r and q_B are inversely proportional.

Consider Firm C, for which B_A is \$100 million and B_T is \$200 million, so

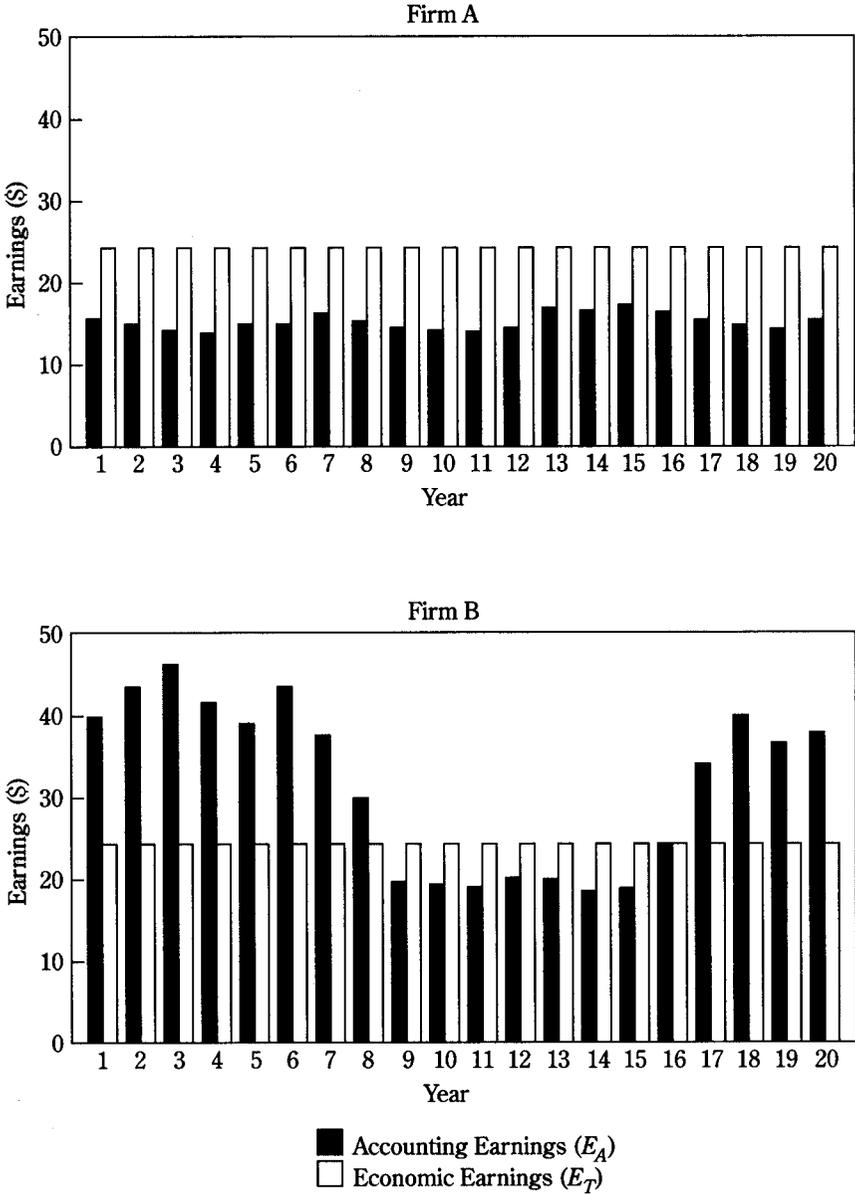


FIGURE 4.99 Firm A (Accounting Earnings Understate Economic Earnings) and Firm B (Variable Pattern of Understated and Overstated Earnings) (dollars in millions)

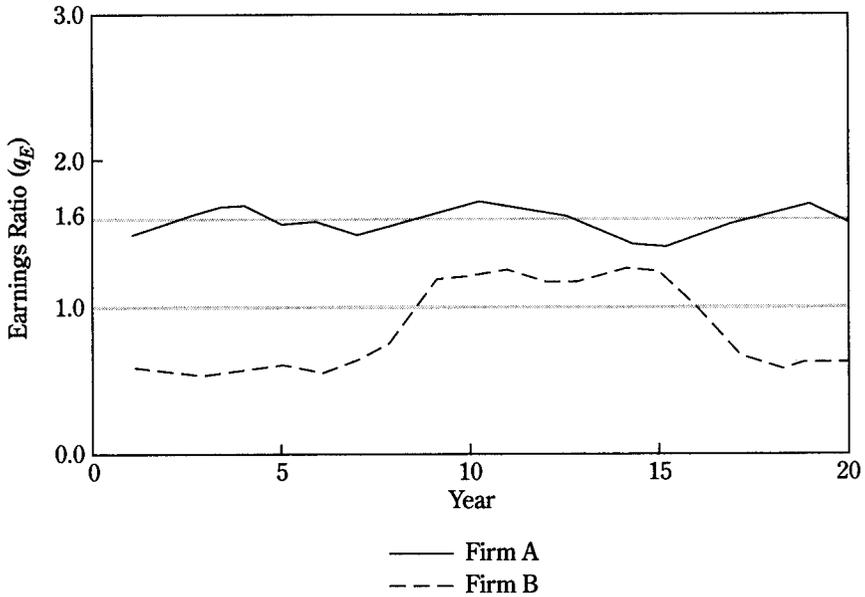


FIGURE 4.100 The Earnings Ratio (q_E) for Firms A and B

$$q_B = \frac{B_T}{B_A} = 2$$

In addition, assume that r_A is 300 basis points above the market rate—that is, with k at 12 percent, r_A is 15 percent—and r_T is the 12 percent market rate. Then, E_A is \$15 million ($0.15 \times \100 million) and E_T is \$24 million ($0.12 \times \200 million). Therefore,

$$q_E = \frac{E_T}{E_A} = 1.6$$

and

$$q_r = \frac{r_T}{r_A} = 0.8$$

The example of Firm C shows how accounting earnings can understate economic earnings even if the accounting return is greater than the economic return.⁸⁰ The key ingredient is the extent to which economic and accounting book values differ.

Now consider the impact of r_A on q_E by assuming that r_T and q_B are fixed at 12 percent and 2, respectively. Because

$$\begin{aligned} q_E &= \frac{E_T}{E_A} \\ &= \frac{r_T B_T}{r_A B_A} \end{aligned}$$

it follows that

$$\begin{aligned} q_E &= \frac{r_T q_B}{r_A} \\ &= \frac{0.12 \times 2.00}{r_A} \\ &= \frac{0.24}{r_A} \end{aligned}$$

This formula shows that the earnings understatement increases with low accounting ROEs. In the Firm C example, in which r_A was 15 percent, q_E was shown to be equal to 1.6, the point marked with a diamond in Figure 4.101. When r_A is only 10 percent, however, q_E is 2.4. Thus, a significant earnings understatement results when the accounting book value is only half the economic value of assets.

In contrast, when q_B is 1, the degree of earnings understatement at any level of r_A decreases. For example, when r_A is 10 percent, q_E is only 1.2, compared with 2.4 when q_B is 2.

Figure 4.101 assumes that r_T is fixed at 12 percent. Consider now how r_T varies with q_E . From the earlier formulas, it follows that r_T is $(q_E/q_B)r_A$. For example, if q_B remains at 2, and if economic and accounting earnings are both \$15 million, then q_E is 1 and r_T is half of r_A . When r_A is 15 percent, r_T is 7.5 percent and q_r is 0.5.

This little example raises some big questions, because it implies an economic return that can be significantly less than the market rate—for example, when high exit costs trap a firm in an unproductive business or when some of a firm's assets are worth more to a third party than to the firm itself. The basic message is obvious: If the accounting ROE appears satisfac-

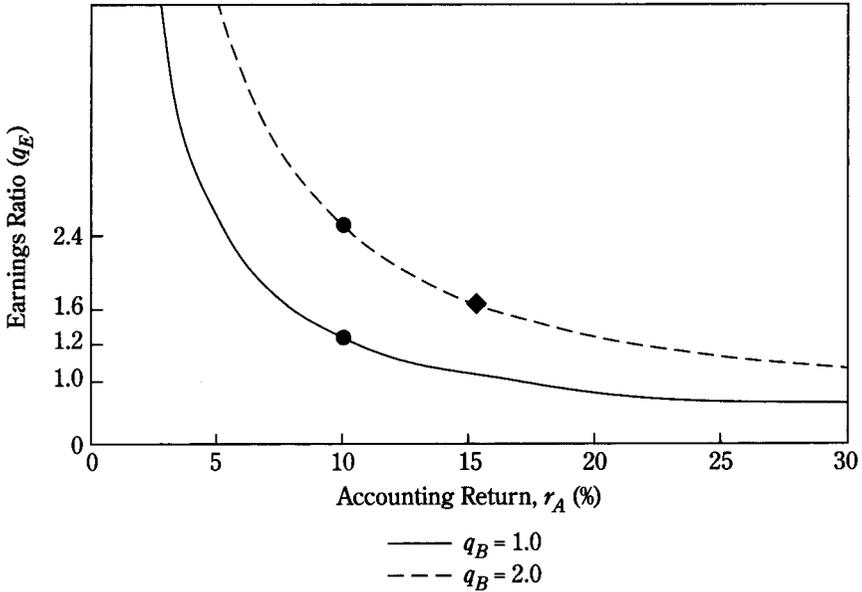


FIGURE 4.101 Earnings Ratio (q_E) versus Accounting Return (r_A) when the Economic Return (r_T) is the 12 Percent Market Rate

tory but the book value greatly understates the market value of a firm’s assets, the economic ROE may well be unacceptable.

The Blended P/E

Turn now to the formulation of a blended price/earnings ratio. The basic relationship between the theoretical and blended P/E is simple:

$$\begin{aligned} \frac{P_T}{E_A} &= \frac{E_T}{E_A} \left(\frac{P_T}{E_T} \right) \\ &= q_E \left(\frac{P_T}{E_T} \right) \end{aligned}$$

For Firm C, if the economic return on new investment (R_T) is 16 percent, then as in the earlier generic example, P_T/E_T is 11.25 but

$$\begin{aligned}\frac{P_T}{E_A} &= q_E \left(\frac{P_T}{E_T} \right) \\ &= 1.60 \times 11.25 \\ &= 18.00\end{aligned}$$

The understated accounting earnings in the denominator lead to a blended P_T/E_A that is greater than the theoretical P_T/E_T .

To gain a better understanding of the factors that influence the blended P/E, it is necessary to delve more deeply into the two factors that capture future growth—the franchise factor and the growth equivalent. The FF is essentially an economic profitability factor for new investments. Hence, it should not be subject to the volatility, conventions, and special charges that are integral to accounting considerations. Based purely on economic values, the theoretical FF could be expressed as

$$FF_T = \frac{R_T - k}{r_T k}$$

In contrast to FF, G is always expressed as a percentage of the firm's current book equity (B_A). An accounting growth equivalent (G_A) is chosen rather than a market-value-based growth equivalent (G_T), because B_A is a well-defined number against which growth can be measured.

With these definitions, the blended P/E can be expressed as follows:⁸¹

$$\frac{P_T}{E_A} = q_E(\text{Base P/E}) + q_r FF_T G_A$$

This shows that the influence of the base P/E expands or contracts depending on whether earnings are understated ($q_E > 1$) or overstated ($q_E < 1$).

Measurement of the effect of growth opportunities (G_A , the accounting growth equivalent) is slightly more complicated for the blended P/E than for the theoretical P/E. When computing P_T/E_A , the value of $FF_T G_A$ must be multiplied by the return ratio (q_r). For a given value of FF_T , this scaling amplifies the P/E impact of new investments when $q_r > 1$ and diminishes that impact when $q_r < 1$. For Firm C, for example, when economic variables are used throughout,

$$\frac{P_T}{E_T} = 8.33 + 2.78G_T$$

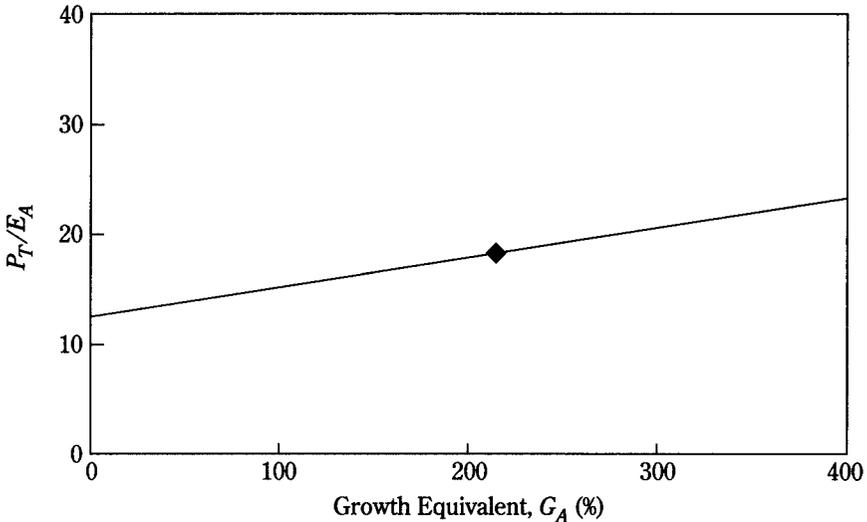


FIGURE 4.102 P_T/E_A versus Accounting Growth Equivalent
(FF = 2.22; $q_E = 1.60$; $q_B = 2.00$)

In contrast, the blended P/E for Firm C (with $q_E = 1.6$, $q_B = 2.0$, and $q_r = 1.6/2.0 = 0.8$) is

$$\frac{P_T}{E_A} = 13.33 + 2.22G_A$$

(see Figure 4.102).

Because q_B is 2.0, G_A is $2.0G_T$, and when G_T is 105 percent, G_A is 210 percent. Hence, for exactly the same firm, the blended $P_T/E_A = 18$ while the economic $P_T/E_T = 13.33$.

This example shows how accounting adjustments can change our perception of a firm. The two P/E values are equivalent reflections of the same firm, but they obviously have different connotations, and the blended P_T/E_A , because it is probably the closer to intuition, is likely to be the better basis for evaluation.

Note that even in this context, a P_T/E_A of 18 requires a surprising \$210 million (210 percent of the \$100 million accounting book value) in new investments with an economic return of 16 percent, 400 basis points above the market rate. Moreover, lower investment returns would require proportionately greater dollar investments to “justify” a multiple of 18. Figure 4.103 shows that, if the return spread falls from 400 basis points to 200

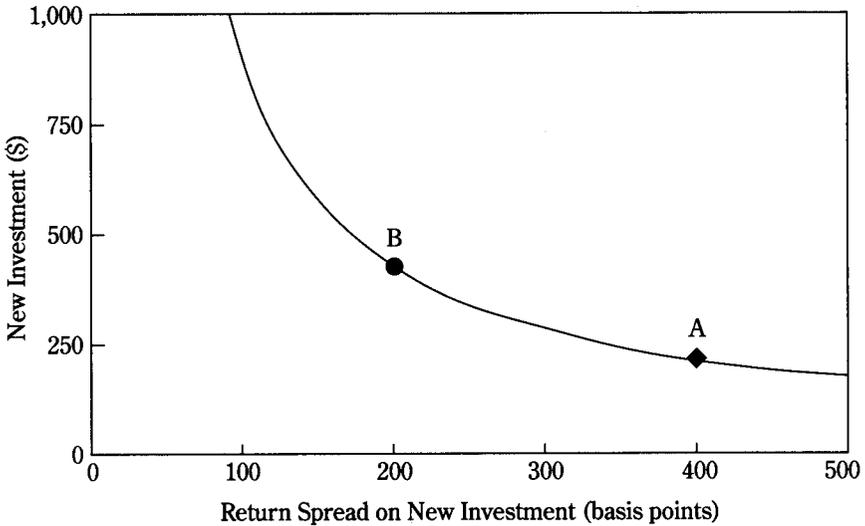


FIGURE 4.103 New Investment versus Return Spread Required for Blended P/E of 18 ($r_T = 12$ percent; $q_E = 1.6$; dollars in millions)

basis points, the present value of new investments must rise from \$210 million (Point A) to \$420 million (Point B).⁸²

Earnings and Book-Value Effects

As discussed, when accounting earnings understate economic earnings, the effective base P/E rises in proportion to the degree of understatement (as measured by q_E). The rise in P/E means that the proportion of the total P_T/E_A accounted for by the firm's current business is greater than when accounting and economic earnings coincide. The effective base P/E is represented graphically by the level at which the (P_T/E_A) -versus- G_A line emanates from the vertical axis; as Figure 4.104 illustrates, a higher q_E results in a higher starting point for the P_T/E_A line.

The response of P_T/E_A to new investment is reflected in the slope of the P_T/E_A line. As Figure 4.104 also shows, for a given value of q_E , the slope is smaller when $q_B = 2.0$ than when $q_B = 1.0$. The smaller slope means that, when the book value is understated, the G_A needed to reach a given P/E is greater than when the economic and accounting book values are the same. This increase in G_A can be explained by the change in the book-value base against which investment is measured; that is, the same dollars of investment loom much larger when measured against a smaller base.

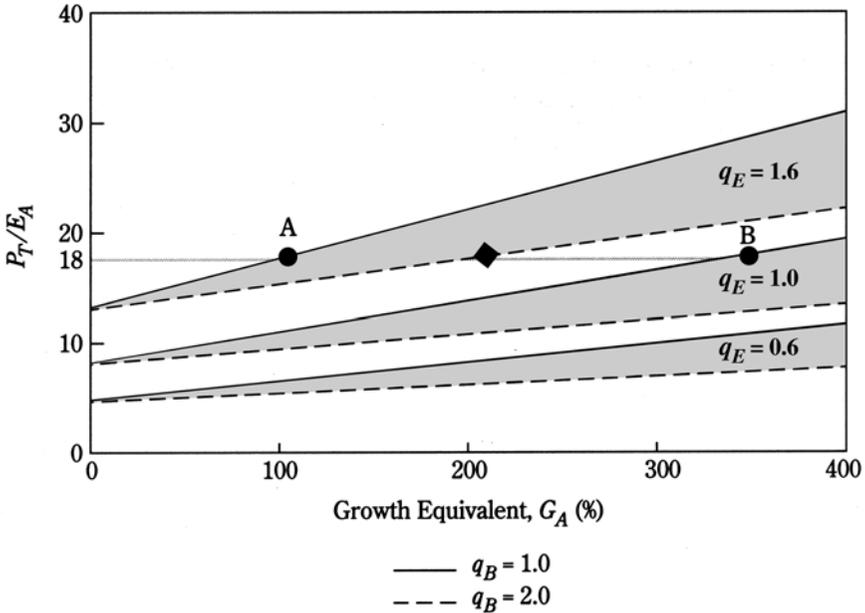


FIGURE 4.104 P_T/E_A versus Growth Equivalent at Various Levels of q_E and q_B (with $r_T = 12$ percent and $FF_T = 2.78$)

Depending on the levels of q_E and q_B , a strikingly wide spectrum of G_A may be needed to support a P_T/E_A of 18. For example, the values of G_A range from 105 percent for $q_B = 1.0$ and $q_E = 1.6$ (Point A in Figure 1.104) to 210 percent for Firm C (indicated by the diamond). When economic and accounting values coincide (that is, $q_B = 1.0$ and $q_E = 1.0$), G_A rises to 348 percent (Point B). More dramatic still is the case in which $q_B = 2.0$ and $q_E = 0.6$ (not shown on graph). Then, the required G_A rises to 1,560 percent!

Economic Return on Equity and the Blended P/E

In most of the preceding examples, the economic return (r_T) has been fixed at the 12 percent market rate. In this section, q_B is fixed at 2.0 and r_A at 15 percent in order to see how raising or lowering r_T alters the new investment required to justify a P_T/E_A of 18.

Because the contribution of the current book of business to P_T/E_A rises with the current economic return, when the economic return is high, only modest future investments are needed to justify a blended P/E of 18. Figure 4.105 illustrates the relationship between required dollar investment and the return spread on new investment for three different values of r_T .

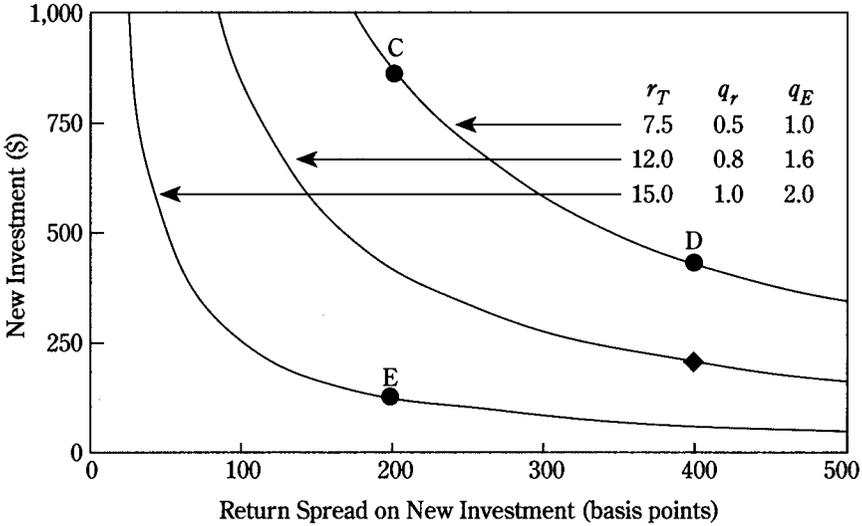


FIGURE 4.105 New Investment versus Return Spread with Varying Economic Returns

(blended P/E = 18; r_A = 15 percent; q_B = 2; dollars in millions)

For the base case of R_T = 16 percent (a 400-basis-point spread) and r_T = 12 percent, the required investment of \$210 million is indicated by the diamond on the middle curve (which corresponds to the 210 percent G value at the diamond in Figure 4.104). At any given spread, higher economic returns on current assets lead to smaller required future investments.

For each curve in Figure 4.105, q_r and q_E are totally determined by the value of r_T . When r_T = 7.5 percent, no understatement of earnings occurs (q_E = 1.0) and a 14.0 percent return (12.0 percent + 200 basis points) requires \$870 million of new investment (Point C) to support the P_T/E_A of 18. At a return on new investment of 16.0 percent (a 400-basis-point spread), the required investment level drops to \$435 million (Point D). In contrast, if the current economic return (r_T) is 15.0 percent, accounting earnings understate economic earnings by 50.0 percent, and with a 14.0 percent return on new investment, only \$120 million of new investment (Point E) is needed for a P_T/E_A of 18. Thus, the combinations of new return spread and magnitude of new investment that can justify a prescribed P/E multiple are endless.

The Price-to-Book Ratio

“A Franchise Factor Model for Spread Banking” demonstrated that, when accounting and economic variables are indistinguishable, the premium to

book value is attributable to two sources: the capitalized value of excess earnings on current book equity, and the net present value of all anticipated future earnings from new investments. In the more realistic case in which accounting and economic values differ, however, the premium of the market value of assets over the accounting value also adds to the price-to-book ratio.

The ratio of the theoretical price to the accounting book value can be expressed as follows:

$$\frac{P_T}{B_A} = 1 + \text{Market book premium} \\ + \text{Going-concern return premium} \\ + \text{Future franchise premium}$$

or more precisely,⁸³

$$\frac{P_T}{B_A} = 1 + (q_B - 1) + \frac{q_B(r_T - k)}{k} + \frac{G_A(R_T - k)}{k}$$

To clarify how this formula works, it will be applied to some of the examples from the previous subsection.

Generally, the previous examples assumed that $q_B = 2$; therefore, the second term adds 1 additional unit to P_T/B_A . (This addition simply reflects the ratio of the \$200 million market value of assets to the \$100 million book value.) The third term in the P_T/B_A formula is zero when the economic return is the same as the market rate. Firms with above-market economic returns offer an additional premium to book value (weighted by the book ratio); firms with below-market economic returns suffer a penalty. The last term in the P_T/B_A formula reflects the effect of above-market returns on new investments, with the magnitude of those investments expressed relative to the accounting book value.

First, assume Firm D has an r_T of 13 percent, an R_T of 14 percent, a B_A of \$100 million, and new investments of \$320 million. Then,

$$G_A = \frac{\text{New investment}}{B_A} \\ = \frac{\$320,000,000}{\$100,000,000} \\ = 3.2$$

properly valued assets. This franchise-based value is obtained by capitalizing the incremental earnings. Therefore,

$$\begin{aligned}
 \text{Incremental going-concern value} &= \frac{B_T r_T}{k} - B_T \\
 &= B_T \left(\frac{r_T - k}{k} \right) \\
 &= \$200,000,000 \times \left(\frac{0.13 - 0.12}{0.12} \right) \\
 &= \$16,666,667
 \end{aligned}$$

The going-concern value adds 0.17 units to P_T/B_A , because it is 16.7 percent of B_A . (Note the corresponding numbers in the third and fourth columns of Figure 4.106.)

Finally, the franchise value is obtained by capitalizing incremental earnings from new investments:

$$\begin{aligned}
 \text{FV} &= \text{New investment} \times \left(\frac{R - k}{k} \right) \\
 &= \$320,000,000 \times \left(\frac{0.14 - 0.12}{0.12} \right) \\
 &= \$53,333,333
 \end{aligned}$$

This franchise value adds a final 0.53 units to the P_T/B_A .

The correspondence between the components of value and the components of the P_T/B_A also applies to P_T/E_A . Because P_T/E_A is simply P_T/B_A divided by r_A , when r_A is 15 percent, the four components of firm value shown in Figure 4.106 contribute 6.67 units, 6.67 units, 1.11 units, and 3.56 units, respectively, to the blended P/E of 18.

Note that if r_T had been 7.5 percent and the new investment had been \$870 million, with R_T at 16.0 percent, P_T/B_A also would have been 2.7 (that is, $1.00 + 1.00 - 0.75 + 1.45$). In this case, the below-market r_T would have reduced firm value, necessitating a substantial new investment to maintain the same price-to-book multiple.

In general, when $r_T < k$, the incremental going-concern value is negative and tends to drag P_T/B_A below q_B . The FV, however, tends to be positive (or, at least, not negative), because the firm probably would not invest intentionally in new projects unless those projects were expected to offer an economic return premium. The extent to which P_T/B_A deviates from q_B re-

fects the net balance between the current asset-based value and franchise-based value.

The Total Franchise Factor

The separation of P_T/B_A into asset-based value and franchise-based value suggests a new formulation for the blended P_T/E_A . First, rewrite the price-to-book ratio as follows:

$$\begin{aligned}\frac{P_T}{B_A} &= \text{Asset-based value} + \text{Franchise-based value} \\ &= q_B + \frac{q_B(r_T - k)}{k} + \frac{G_A(R_T - k)}{k} \\ &= q_B + \frac{q_B(r_T - k)}{k} + \frac{G_A(R_T - k)}{k}\end{aligned}$$

Then, because $E_A = r_A B_A$, the blended P_T/E_A can be found by dividing P_T/B_A by r_A . Thus,

$$\begin{aligned}\frac{P_T}{E_A} &= \text{Asset-based P/E} + \text{Franchise-based P/E} \\ &= \frac{q_B}{r_A} + \frac{q_B(r_T - k)}{r_A k} + \frac{G_A(R_T - k)}{r_A k} \\ &= \frac{q_B}{r_A} + q_r \left[\frac{q_B(r_T - k)}{r_T k} + \frac{G_A(R_T - k)}{r_T k} \right]\end{aligned}$$

The first term simplifies to

$$\begin{aligned}\frac{q_B}{r_A} &= \frac{\left(\frac{B_T}{B_A} \right)}{r_A} \\ &= \frac{B_T}{E_A} \\ &= \frac{1}{r_{AT}}\end{aligned}$$

where r_{AT} is defined to be a “blended ROE” consisting of the reported earnings as a percentage of the economic book value.

The determination of r_{AT} requires only a projection of B_T . By separating out this asset-based $1/r_{AT}$ term, the remaining franchise-based P/E is able to subsume many of the more fragile estimates—namely, the

economic ROEs (r_T and R_T), the capitalization rate (k), and the growth equivalent (G_A).

The franchise P/E incorporates both the going-concern value of current book assets and the prospects associated with new investment programs. In this sense, it represents a total franchise value. The two terms of this franchise P/E are similar in form. Note that $(r_T - k)/r_T k$ and $(R_T - k)/r_T k$ have the look of franchise factors applied to q_B (the size of the economic book value denominated in units of accounting book value) and to G_A . Specifically, the “current” and “new” franchise factors are defined as follows:

$$FF_{CUR} = \frac{r_T - k}{r_T k}$$

and

$$FF_{NEW} = \frac{R_T - k}{r_T k}$$

These definitions suggest that the franchise factors might be combined into a weighted-average franchise factor applied to the total of all firm investments. In fact, the franchise-based P/E terms can be rewritten as $(FF_{TOT} \times G_{TOT})$ where FF_{TOT} is viewed as a weighted-average *total* franchise factor applied to a *total* growth equivalent that represents the present-value magnitude of all firm investments—past and future.⁸⁴

Combining the preceding results gives

$$\frac{P_T}{E_A} = \frac{1}{r_{AT}} + q_r FF_{TOT} G_{TOT}$$

For Firm D, r_A was 15 percent and q_B was 2. Thus,

$$\begin{aligned} r_{AT} &= \frac{r_A}{q_B} \\ &= 7.5 \text{ percent} \end{aligned}$$

and

$$\frac{1}{r_{AT}} = 13.33$$

This value (13.33) is the asset-based component of the blended P/E (see Figure 4.106). To achieve a blended P/E of 18, the firm’s franchise must provide the remaining 4.67 units of P/E.

In the new, total franchise framework, this incremental P/E is derived from r_T , R , and G_A , which permits calculation of q_r , FF_{TOT} , and G_{TOT} . For example, if r_T is 13 percent, R_T is 14 percent, and G_A is 3.2, then,

$$\begin{aligned} q_r &= \frac{r_T}{r_A} \\ &= \frac{0.13}{0.15} \\ &= 0.87 \end{aligned}$$

The present value of the firm's current and future investments can be expressed as

$$\begin{aligned} G_{TOT} &= q_B + G_A \\ &= 2.0 + 3.2 \\ &= 5.2 \end{aligned}$$

The weighted-average return across all of these investments is

$$\begin{aligned} R_{TOT} &= \frac{q_B r_T + G_A R}{G_{TOT}} \\ &= \frac{(2.0 \times 0.13) + (3.2 \times 0.14)}{5.2} \\ &= 13.6 \text{ percent} \end{aligned}$$

Using this value of R_{TOT} results in

$$\begin{aligned} FF_{TOT} &= \frac{R_{TOT} - k}{r_T k} \\ &= \frac{0.136 - 0.12}{0.13 \times 0.12} \\ &= 1.04 \end{aligned}$$

Finally, this franchise factor (1.04) can be applied to the total investment base of 5.2 and adjusted by the return ratio to reveal the required additional units of franchise-based P/E:

$$\begin{aligned} \text{Franchise-based P/E} &= q_r FF_{TOT} G_{TOT} \\ &= 0.87 \times 1.04 \times 5.20 \\ &= 4.67 \end{aligned}$$

Thus, the firm's overall P/E of 18 can now be viewed as derived from two distinct sources: the asset-based P/E of 13.33 and the franchise-based P/E of 4.67.

Figure 4.107 shows that, of these 4.67 units, 1.11 units are attributable to the going-concern franchise and 3.56 units are from new investments. The dotted line in Figure 4.107 illustrates how the first 2 units of G_{TOT} (that is, q_B) bring the blended P_T/E_A up from 13.33 ($1/r_{AT}$) to 14.44. Observe that the slope of the line is q_rFF_{TOT} .⁸⁵ The next 3.2 units of G_{TOT} (that is, G_A) bring P_T/E_A up to 18. The slope of the final line segment is q_rFF_{NEW} .⁸⁶

Summary

Because of the nature of accounting conventions, price/earnings ratios based purely on reported earnings and market prices can lead to misperceptions of true value. This section has shown how appropriate adjustments for the differences between economic and accounting variables can lead to insights into the conventional P/E. When earnings are significantly understated, a high P/E may simply reflect that understatement. In contrast, overstated accounting earnings may mean that only a dramatically large set of opportunities for above-market investments can “justify” a given P/E multiple.

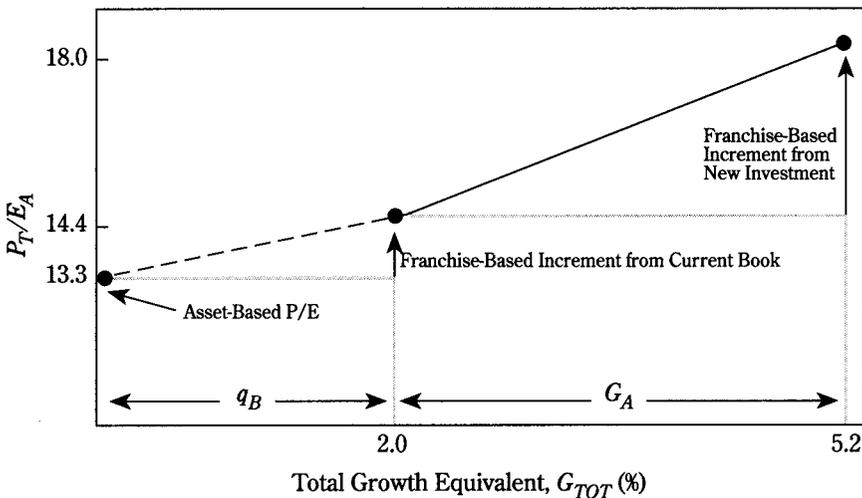


FIGURE 4.107 Elements of the Total Franchise

The same type of analysis applies to the price-to-book ratio. When P/B is based on an accounting book value, a ratio value greater than 1 does not necessarily signify value creation. True value is created only when P/B exceeds the ratio of the book equity's market value to its accounting value. When it does, further value additions are attributable to an above-market economic return on current assets and/or a franchise premium on future investment prospects.

Finally, the analysis showed how a firm's P/E multiple can be viewed in a total franchise framework. The virtue of this approach is its clear-cut delineation between the asset-based and the franchise-derived components of P/E value.

APPENDIX 4A: Derivation of the Franchise Factor Model

According to the standard dividend discount model, a theoretical stock price (P) is computed by discounting the stream of all future dividends (d) at the market rate (k). Thus,

$$P = \frac{d_1}{1+k} + \frac{d_2}{(1+k)^2} + \dots + \frac{d_N}{(1+k)^N} + \dots$$

where d_i is the dividend at time i .

If dividends are assumed to grow annually at a constant rate (g), then

$$d_i = (1+g)^{i-1}d_1 \quad \text{for } i = 1, 2, 3, \dots \quad (4A.1)$$

and

$$P = \frac{d_1}{1+k} + \frac{(1+g)d_1}{(1+k)^2} + \frac{(1+g)^2 d_1}{(1+k)^3} + \dots$$

Summing this infinite geometric progression results in

$$P = \frac{d_1}{k-g} \quad (4A.2)$$

which is the standard Gordon formula. Note that the formula was derived without regard to the source of dividend growth.

The dividend growth is related to the firm's return on equity and to

the growth in book value that results from retained earnings. To see this relationship, first note that the dollar dividend payout at time i depends on the firms' earnings over the period from time $(i - 1)$ to time i . These earnings are symbolized by E_i . The dividend payout is expressed as a fraction of earnings, the dividend payout ratio. Here, the dividend payout ratio (α) is assumed to be constant over time. Thus,

$$d_i = \alpha E_i$$

The earnings are the product of the ROE and the book value at the beginning of the period (B_{i-1}). The ROE is assumed to be a constant (r), so

$$E_i = rB_{i-1} \quad \text{for } i = 1, 2, \dots \quad (4A.3)$$

Because earnings are a constant multiple of book value, the earnings will grow at the same rate as book value. All earnings not paid out as dividends (that is, all retained earnings) add to the book value of the firm. Furthermore, for the moment, the assumption is that no other sources of additions to book value exist (for example, no new equity issuances).

The earnings retention rate is $\beta = (1 - \alpha)$. If B_0 is the initial book value, the book value at the end of the first year (B_1) is

$$B_1 = B_0 + \beta E_1$$

Similarly, B_2 , the book value at the end of the second year, is

$$B_2 = B_1 + \beta E_2$$

With the use of equation (4A.3), the book value at any time can be expressed in terms of the initial book value (B_0). For example, because $E_1 = rB_0$,

$$\begin{aligned} B_1 &= B_0 + \beta r B_0 \\ &= (1 + \beta r) B_0 \end{aligned}$$

In addition, because $E_2 = rB_1$,

$$\begin{aligned} B_2 &= B_1 + \beta r B_1 \\ &= (1 + \beta r) B_1 \\ &= (1 + \beta r)^2 B_0 \end{aligned}$$

Generalizing results in

$$B_i = (1 + \beta r)^i B_0 \quad (4A.4)$$

As the book value grows, so do the earnings and dividend streams. From equation (4A.3) and equation (4A.4), it follows that

$$E_i = r(1 + \beta r)^{i-1} B_0$$

and because $d_i = \alpha E_i$,

$$d_i = \alpha r(1 + \beta r)^{i-1} B_0$$

Finally, because $d_1 = \alpha E_1 = \alpha r B_0$,

$$d_i = (1 + \beta r)^{i-1} d_1 \quad (4A.5)$$

Thus, βr is the sustainable rate at which book value, earnings, and dividends all grow. When comparing equations (4A.5) and (4A.1), note that βr and g are the same. That is,

$$\begin{aligned} g &= \beta r \\ &= (1 - \text{Payout ratio}) \times \text{ROE} \end{aligned}$$

Note that the Gordon formula (equation 4A.2) can be rewritten in terms of the initial earnings and the dividend payout ratio as

$$P = \frac{\alpha E_1}{k - g}$$

Thus, the theoretical price/earnings ratio is

$$P/E = \frac{\alpha}{k - g} \quad (4A.6)$$

Table 4A.1 provides four examples (the four firms discussed in “The Franchise Factor”) of these pricing and P/E formulas. In all cases, the market rate (k) is assumed to be 12 percent.

Now, by algebraic manipulation, formula (4A.6) can be transformed into the Miller–Modigliani formula. First,

$$\begin{aligned} P/E &= \frac{\alpha}{k - g} \\ &= \frac{1 - \beta}{k - r\beta} \end{aligned}$$

TABLE 4A.1 Theoretical Stock Prices and P/Es for Firms A, B, C, and D (market rate, k , = 12 percent; initial book value, b_0 , = \$100)

Specifications			Resulting Values				
Firm	Payout		Retention Rate (β)	Growth Rate ($r\beta$)	Initial Earnings (rB_0)	Price $[(\alpha r B_0)/(k - g)]$	P/E $[\alpha/(k - g)]$
	Ratio (α)	ROE (r)					
A	1/3	12%	2/3	8%	\$12	\$100	8.33
B	1	12	0	0	12	100	8.33
C	1	15	0	0	15	125	8.33
D	1/3	15	2/3	10	15	250	16.67

Then, factoring out $1/k$ produces

$$\begin{aligned} \text{P/E} &= \frac{1}{k} \left[\frac{k(1-\beta)}{k-r\beta} \right] \\ &= \frac{1}{k} \left(\frac{k-k\beta}{k-r\beta} \right) \end{aligned}$$

Subtracting and adding $r\beta$ to the numerator of the last term in brackets results in

$$\text{P/E} = \frac{1}{k} \left(\frac{k-r\beta+r\beta-k\beta}{k-r\beta} \right)$$

Carrying out the indicated division gives the Miller–Modigliani formula:

$$\text{P/E} = \frac{1}{k} \left[1 + \frac{\beta(r-k)}{k-r\beta} \right] \quad (4A.7)$$

In the absence of growth (that is, $\beta = 0$), the second term in the brackets vanishes and the P/E is the inverse of the market rate, regardless of the value of r . Thus, for example, if $\beta = 0$ and $k = 12$ percent, $\text{P/E} = 1/0.12 = 8.33$. Therefore, both Firms B and C in Table 4A.1 have P/Es of 8.33 (the base P/E). If β is greater than zero but the return on equity (r) is the same as the market rate, the second term still vanishes and, again, $\text{P/E} = 1/k$. Thus, because $r = 12$ percent for Firm A, that firm also has a base P/E of 8.33.

For the P/E to rise above the base P/E, the firm must have both growth

and reinvestment at an above-market ROE. Growth alone is not enough. For Firm D, because $\beta = 2/3$ and $r = 15$ percent, the P/E is 16.67.

Additional insight into the nature of growth can be gained by rewriting equation (4A.7) in terms of price and initial book value rather than in terms of P/E. Multiply both sides of (4A.7) by E and replace E with rB_0 in the second term:

$$P = \frac{E}{k} + \frac{\beta r B_0 (r - k)}{k(k - r\beta)}$$

or

$$P = \frac{E}{k} + \left(\frac{r - k}{k} \right) \left(\frac{g}{k - g} \right) B_0 \quad (4A.8)$$

The first term in equation (4A.8) represents the present value of a perpetual stream of unchanging earnings of magnitude E . In other words, this term corresponds to a firm's full-payout equivalent. The second term can be shown to represent the earnings impact of a series of new investments. The magnitude of these new investments is $(B_0[g/(k - g)])$. The factor $[g/(k - g)]$ can be interpreted as an immediate percentage increase in book value. Thus, the present-value growth equivalent of all book increases (G) is defined as follows:

$$G = \frac{g}{k - g}$$

The new investments (GB_0) provide perpetual incremental above-market earnings of $(r - k)$. The present value of this perpetual stream is obtained by dividing $[(r - k)GB_0]$ by k .

Equation (4A.8) can be rewritten in terms of the growth equivalent as follows:

$$P = \frac{E}{k} + \left[\left(\frac{r - k}{k} \right) GB_0 \right] \quad (4A.9)$$

The growth equivalent can now be shown to equal the present value of all future investments implied by the DDM model expressed as a percentage of B_0 . Recall that B_i , the firm's book value at time i , is

$$B_i = (1 + g)^i B_0$$

The increment to book value at time i is symbolized by b_i and is equal to $(B_i - B_{i-1})$. Thus,

$$\begin{aligned} b_i &= B_i - B_{i-1} \\ &= (1 + g)^i B_0 - (1 + g)^{i-1} B_0 \end{aligned}$$

or

$$b_i = (1 + g)^{i-1} g B_0$$

The present value (PV) of all such book increments is as follows:

$$\begin{aligned} \text{PV}[b_1, b_2, b_3, \dots] &= \frac{gB_0}{1+k} + \frac{gB_0(1+g)}{(1+k)^2} + \frac{gB_0(1+g)^2}{(1+k)^3} + \dots \\ &= \left(\frac{gB_0}{1+k} \right) \left[1 + \frac{1+g}{1+k} + \frac{(1+g)^2}{(1+k)^2} + \dots \right] \\ &= \frac{gB_0}{k-g} \end{aligned}$$

Thus,

$$\frac{\text{PV}[b_1, b_2, b_3, \dots]}{B_0} = \frac{g}{k-g}$$

which is precisely G as defined previously.

Note that G is independent of the funding of the book-value increments; that is, the assumption that only retained earnings are used to fund new investments is artificial. If an opportunity to invest b_i and earn r exists at time i , this investment could be funded through the issuance of equity at a cost of k . The earnings on this new investment, net of financing costs, would then be precisely $(r - k)$.

Note further that the magnitude of the growth equivalent—not the specific timing of investment opportunities—is what matters. A different sequence of book increments $(b_1^*, b_2^*, b_3^*, \dots)$ for which $\text{PV}(b_1^*, b_2^*, b_3^*, \dots)/B_0$ is equal to G would have precisely the same impact on the theoretical price as the sequence of book increments implied by the constant-growth model.

As an example of the magnitude of growth implicit in the DDM, consider Firm D. Because $g = 10$ percent and $k = 12$ percent, the growth equivalent is 500 percent (that is, $0.10/0.02$). Thus, for this firm to sustain a P/E of 16.67 (see Table 4A.1), some sequence of investments must exist that, in present-value terms, is equal to 500 percent of the current book value of

the firm. Furthermore, each of these investments must earn 15 percent. These extraordinary opportunities are reflected in the price through the present value of the excess returns on those investments, as illustrated in equation (4A.9).

For Firm D, because $r = 15$ percent, $B_0 = \$100$, and $E = \$15$,

$$\begin{aligned} P &= \frac{15}{0.12} + \left(\frac{0.15 - 0.12}{0.12} \right) \times 5.00 \times 100.00 \\ &= 125 + 125 \\ &= 250 \end{aligned}$$

Thus, the value of the present earnings of \$15 in perpetuity is \$125 and the value of all future excess earnings is also \$125.

To understand the impact of G fully, consider the P/E formula. Dividing both sides of equation (4A.9) by E (that is, by rB_0), produces

$$P/E = \frac{1}{k} + \left(\frac{r - k}{rk} \right) G$$

The first term, $1/k$, is the base P/E (that is, $P/E = 8.33$ when $k = 12$ percent). If the second term is positive, the P/E will be above this base level. If that term is negative, the P/E will be below the base P/E. The factor $[(r - k)/rk]$ measures the impact of opportunities to make new investments that provide a return equal to the firm's ROE. This factor is the franchise factor. Thus,

$$FF = \frac{r - k}{rk}$$

and

$$P/E = \frac{1}{k} + (FF \times G)$$

Because the growth equivalent is measured in units of initial book value (that is, G is expressed as a percentage of B_0), FF is the increase in P/E per "book unit" of investment.

Note that when $r = k$, the franchise factor is zero. This result is consistent with the previous observation that growth alone is not enough to affect the P/E. As r increases, however, the impact of growth on the P/E increases.

TABLE 4A.2 Franchise Factors for Varying ROEs
(with a 12 percent market rate)

ROE (r)	FF	ROE (r)	FF
12.00%	0.00	17.00%	2.45
13.00	0.64	18.00	2.78
14.00	1.19	19.00	3.07
15.00	1.67	20.00	3.33
16.00	2.08	50.00	6.33

These results are illustrated in Table 4A.2. Consider, for example, the case of Firm D. Because $r = 15$ percent, $FF = 1.67$. Thus, an investment equal to 100 percent of this firm's initial book value (that is, \$100) will lift the P/E by 1.67 units. An investment of 5 times book will lift the P/E by 8.34 units, just enough to bring it from the base P/E of 8.33 to its actual P/E of 16.67.

Finally, note that, as r approaches infinity, the franchise factor levels off at the inverse of the (k) market rate. That is, no matter how large the ROE, with a 12 percent market rate, FF can never rise above 8.33. In particular, no matter how large the reinvestment rate, at least a 100 percent increase in book value is required to raise the P/E from 8.33 to 16.67.

APPENDIX 4B: Firm Valuation with Varying Investment and Return Patterns

An Investment Opportunity Approach to Firm Valuation

The development of the theoretical formula for valuing a firm's stock makes use of the following variables:⁸⁷

- k = market capitalization rate
- B = initial book value
- r = ROE (return on initial book value)
- NPV_j = net present value at time j of a new investment made at time j
- I_j = magnitude of investment opportunity at time j

The earnings on initial book value are assumed to remain rB in perpetuity. Thus, this earnings stream contributes (rB/k) to the current value of the firm. The contribution of all new investments to firm value is the sum

of the discounted NPVs of these investments. The present value (PV) of the firm can thus be expressed as follows:

$$PV = \frac{rB}{k} + \sum_{j=1}^{\infty} \frac{NPV_j}{(1+k)^j} \quad (4B.1)$$

Assume now that investment I_j provides payments p_{j+1}, p_{j+2}, \dots , at times $j+1, j+2, \dots$. Then,

$$NPV_j = PV_j - I_j \quad (4B.2)$$

where PV_j is the sum of the present values (at times j) of the payments p_{j+1}, p_{j+2}, \dots . That is,

$$PV_j = \sum_{i=1}^{\infty} \frac{p_{j+i}}{(1+k)^i}$$

The payment stream provided by I_j can always be represented by a perpetual-equivalent return (R_{pj}) on I_j . For this representation to be valid, the present value of the perpetual payments must be the same as PV_j . Because the present value of the perpetual payments is found by dividing by the discount rate,

$$PV_j = \frac{R_{pj}I_j}{k}$$

or

$$R_{pj} = k \left(\frac{PV_j}{I_j} \right) \quad (4B.3)$$

Combining equations (4B.2) and (4B.3) allows NPV_j to be expressed in terms of the perpetual equivalent:

$$\begin{aligned} NPV_j &= \frac{R_{pj}I_j}{k} - I_j \\ &= \left(\frac{R_{pj} - k}{k} \right) I_j \end{aligned} \quad (4B.4)$$

Substituting equation (4B.4) in equation (4B.1) and rearranging terms allows P to be rewritten as⁸⁸

$$PV = \frac{rB}{k} + \sum_{j=1}^{\infty} \left(\frac{R_{pj} - k}{k} \right) \left(\frac{I_j}{(1+k)^j} \right) \quad (4B.5)$$

Observe that no assumption has been made in this general model about the source of financing for new investments. The financing could be internal, external, or a combination of the two.

The Franchise Factor and Present-Value Growth Equivalent

In the special case in which all new investments provide the same perpetual return (R_p), equation (4B.5) becomes

$$PV = \frac{rB}{k} + \left(\frac{R_p - k}{k} \right) \sum_{j=1}^{\infty} \left(\frac{I_j}{(1+k)^j} \right) \quad (4B.6)$$

The P/E can be found by dividing both sides of (4B.6) by the initial earnings (rB). That is,

$$P/E = \frac{1}{k} + \left(\frac{R_p - k}{rk} \right) \left(\frac{\sum_{j=1}^{\infty} \left[\frac{I_j}{(1+k)^j} \right]}{B} \right) \quad (4B.7)$$

The last term is the present value of all future investment opportunities expressed as a percentage of the initial book value. The factor $[(R_p - k)/rk]$ gives the impact on P/E of each unit increase in book value; that is, if the book value increases by 100 percent, the P/E increases by $[(R_p - k)/rk]$. This expression is the franchise factor:

$$FF = \frac{R_p - k}{rk} \quad (4B.8)$$

The growth equivalent is defined as

$$G = \frac{\sum_{j=1}^{\infty} \left[\frac{I_j}{(1+k)^j} \right]}{B}$$

and is interpreted as the present-value growth equivalent of all future investments that return R_p in perpetuity. This definition is motivated by the observation that an immediate investment of magnitude G that earns R_p in perpetuity will have precisely the same price impact as the complex stream of investment opportunities discussed earlier in the appendix. The P/E formula (equation 4B.7) can now be rewritten as

$$P/E = \frac{1}{k} + (FF \times G) \quad (4B.9)$$

In general, different new investments will have different perpetual-equivalent returns and distinct franchise factors. The franchise factor corresponding to perpetual-equivalent return R_{pi} is symbolized by FF_i ; that is, $FF_i = (R_{pi} - k)/rk$. The present value of all future investments with franchise factor FF_i is symbolized by G_i .

Under these assumptions, the P/E formula (equation 4B.9) can be generalized to encompass n distinct franchise factors, as follows:

$$P/E = \frac{1}{k} + \sum_{i=1}^n (FF_i \times G_i) \quad (4B.10)$$

An example of the application of equation (4B.10) is provided in the subsection of this appendix dealing with multiphase growth.

A Duration-Based Approximation to the Franchise Factor

In the previous subsection, the magnitude of FF was shown to depend on the size of R_p . Substituting the formula for R_p (equation 4B.3) into the formula for FF (equation 4B.8) gives the following formula for FF in terms of the present value of the payments on investment I :

$$FF = \frac{PV - I}{rI} \quad (4B.11)$$

in which PV is computed at the market discount rate (k). That is, $PV = PV(k)$. Then, because the internal rate of return is the discount rate at which the present value equals the value of investment, $I = PV(IRR)$. Thus, the numerator in equation (4B.11) is $PV(k) - PV(IRR)$.

The difference between these present values can be approximated by a Taylor series:

$$PV(k) - PV(IRR) = PV'(IRR)(k - IRR) + \dots$$

With D as duration and because, by definition, the modified duration is $-PV'/PV$, the Taylor series can be rewritten as

$$PV(k) - PV(IRR) = PV(IRR)D(IRR)(IRR - k) + \dots$$

An approximate formula for FF is obtained by substituting this formula in equation (4B.11), approximating $D(IRR)$ by $D(k)$, and dropping higher-order terms:

$$FF \approx \frac{D(IRR - k)}{r}$$

Multiphase Growth

To understand multiphase growth, first consider the case in which the investment opportunity at time j is always the same fixed percentage (g) of the firm's book value at time $(j - 1)$. For example, if $g = 10$ percent and $B = \$100$, the firm is assumed to have an investment opportunity at time 1 equal to \$10 (that is, 10 percent of the initial book value of \$100). After taking advantage of this investment opportunity, the firm's book value increases by \$10 to \$110 (110 percent of \$100). The following year, another investment opportunity arises of which the magnitude is \$11 (10 percent of \$110). Pursuing this opportunity leads to a new book value of \$121 (110 percent of \$100). This pattern, which is illustrated in Table 4B.1, can be written generally as

TABLE 4B.1 Investment Opportunities and Book Value when Firm Grows at 10 Percent a Year

Time	Investment Opportunity	New Book Value
0	NA	\$100.00
1	\$10.00	110.00
2	11.00	121.00
3	12.10	133.10

NA = not applicable.

$$I_1 = gB$$

$$I_2 = g(1 + g)B$$

$$I_3 = g(1 + g)^2B, \text{ etc.}$$

If this pattern of constant growth continues forever (recall “The Franchise Factor” and Appendix 4A), then

$$G = \frac{g}{k - g} \quad (4B.12)$$

The analysis of multiphase growth, for simplicity, is restricted here to the case in which the investments I_1, I_2, \dots, I_n earn R_{p1} in perpetuity and all subsequent investments, I_{n+1}, I_{n+2}, \dots , earn R_{p2} in perpetuity. Then, from equation (4B.5),

$$PV = \frac{rB}{k} + \left(\frac{R_{p1} - k}{k} \right) \sum_{j=1}^n \left[\frac{I_j}{(1+k)^j} \right] + \left(\frac{R_{p2} - k}{k} \right) \sum_{j=1}^{\infty} \left[\frac{I_{n+j}}{(1+k)^{n+j}} \right] \quad (4B.13)$$

Dividing both sides of equation (4B.13) by the initial earnings (rB) gives

$$P/E = \frac{1}{k} + (FF_1 \times G_1) + (FF_2 \times G_2)$$

Observe that this equation is the same as equation (4B.10) with $n = 2$. The G_1 and G_2 growth equivalents are given by the following:

$$G_1 = \frac{\sum_{j=1}^n \left[\frac{I_j}{(1+k)^j} \right]}{B} \quad (4B.14)$$

and

$$G_2 = \frac{\sum_{j=1}^{\infty} \left[\frac{I_{n+j}}{(1+k)^{n+j}} \right]}{B} \quad (4B.15)$$

The additional assumption is now made that ($I_j, j = 1, \dots, n$) is a constant percentage (g_1) of the book value at time $j - 1$. Furthermore,

($I_j, j = n + 1, n + 2, \dots$) is taken to be a different constant percentage (g_2) of the prior year's book value. Thus,

$$\begin{aligned} I_1 &= g_1 B \\ I_2 &= g_1(1 + g_1)B \\ I_3 &= g_1(1 + g_1)^2 B \\ &\vdots \\ &\vdots \\ &\vdots \\ I_n &= g_1(1 + g_1)^{n-1} B \\ I_{n+1} &= g_2(1 + g_1)^n B \\ I_{n+2} &= g_2(1 + g_2)(1 + g_1)^n B \\ &\vdots \\ &\vdots \\ &\vdots \end{aligned}$$

Using these expressions in equations (4B.14) and (4B.15) and summing the resulting geometric progression provides the following:

$$G_1 = \left(\frac{g_1}{k - g_1} \right) \left[1 - \left(\frac{1 + g_1}{1 + k} \right)^n \right] \quad \text{if } g_1 \neq k$$

or

$$G_1 = \frac{ng_1}{1 + k} \quad \text{if } g_1 = k \quad (4B.16)$$

and

$$G_2 = \left(\frac{g_2}{k - g_2} \right) \left(\frac{1 + g_1}{1 + k} \right)^n \quad \text{if } g_2 < k \quad (4B.17)$$

Because the series for G_1 was finite, no restriction had to be made on g_1 . In contrast, the infinite geometric progression involving g_2 converges only when g_2 is less than k . Furthermore, as n approaches infinity, G_2 approaches zero and G_1 approaches G , as given in equation (4B.12). When $g_1 = g_2$, G_1 and G_2 combined give the G of equation (4B.12).

Consider the case of 10 years of growth at 10 percent and growth at 5

percent for each succeeding year. If $k = 12$ percent, then equations (4B.16) and (4B.17) give the following:

$$G_1 = \left(\frac{0.10}{0.12 - 0.10} \right) \left[1 - \left(\frac{1 + 0.10}{1 + 0.12} \right)^{10} \right]$$

$$= 0.8244, \text{ or } 82.44 \text{ percent}$$

and

$$G_2 = \left(\frac{0.05}{0.12 - 0.05} \right) \left(\frac{1 + 0.10}{1 + 0.12} \right)^{10}$$

$$= 0.5965, \text{ or } 59.65 \text{ percent}$$

APPENDIX 4C: A Franchise Factor Formula for the Base P/E

Recall from “The Franchise Portfolio” that, for a firm with n future investment opportunities, FF_i franchise factors, and G_i growth equivalents, the theoretical P/E can be expressed as

$$P/E = \frac{1}{k} + \sum_{i=1}^n FF_i G_i \quad (4C.1)$$

where k is the market capitalization rate and $1/k$ is the base P/E.

If a new investment of magnitude I_i is made n years from today, FF_i and G_i can be computed from the following formulas:

$$FF_i = \frac{R_i - k}{rk}$$

and

$$G_i = \frac{\left[\frac{I_i}{(1+k)^n} \right]}{B} \quad (4C.2)$$

where R_i = perpetual-equivalent return on investment I_i
 r = return on equity (the perpetual return on initial book value)
 B = initial book value

In spread banking, R_i can be expressed in terms of the net spread on borrowed funds (NS_i), the leverage multiple (L_i), and the risk-free rate (R_f); that is,

$$R_i = R_f + (L_i \times NS_i)$$

Now FF_i can be expressed as follows:

$$FF_i = \frac{R_f + (L_i \times NS_i) - k}{rk}$$

The P/E formula (4C.1) can also be extended to include franchise factors for a firm's current book of business (B): Assume that the current book comprises m subunits. The size of each subunit (b_i) is expressed as a percentage of the current book, so that

$$\sum_{i=1}^m b_i B = B$$

and

$$\sum_{i=1}^m b_i = 1 \quad (4C.3)$$

Now, define r_i as the ROE for subunit b_i . Thus, the current earnings (E) can be written as follows:

$$\begin{aligned} E &= rB \\ &= \sum_{i=1}^m r_i b_i B \end{aligned}$$

Consequently,

$$r = \sum_{i=1}^m r_i b_i \quad (4C.4)$$

That is, r is the weighted-average return on book equity, and the weights are the sizes of the subunits.

The value (P) of a firm has three components. First, if a firm has no growth opportunities and book equity capital earns k in perpetuity (that is, $r = k$), the capitalized value of current earnings is $kB/k = B$. Thus, in this case, the firm's value would be the same as its book value.

Second, if the current business provides a return that exceeds the k

market rate, an incremental value (P_0) will exist. This P_0 is defined as the capitalized value of excess earnings on the current book equity (assuming that those earnings continue year after year). Thus, P_0 can be viewed as a franchise value associated with the *current* book of business.

Finally, if *future* opportunities with above-market returns exist that the firm can pursue, value has a third component, P_1 , which is the net present value of all anticipated future earnings from new investments, or the franchise value associated with future investment opportunities.

Therefore,

$$P = B + P_0 + P_1$$

and the price/earnings ratio is

$$\begin{aligned} P/E &= \frac{B + P_0 + P_1}{E} \\ &= \frac{B}{E} + \frac{P_0}{E} + \frac{P_1}{E} \end{aligned} \quad (4C.5)$$

Note that multiplying both sides of equation (4C.5) by E/B results in a formula for the price-to-book ratio in terms of the incremental P_0 and P_1 values. The price-to-book formula is

$$\frac{P}{B} = 1 + \frac{P_0}{B} + \frac{P_1}{B}$$

This formula also shows that the premium to book is the sum of P_0/B and P_1/B ; that is,

$$\frac{P - B}{B} = \frac{P_0}{B} + \frac{P_1}{B}$$

Returning to the P/E, note that because $E = rB$,

$$\begin{aligned} \frac{B}{E} &= \frac{B}{rB} \\ &= \frac{1}{r} \end{aligned} \quad (4C.6)$$

From the definition of P_0 ,

$$\begin{aligned} P_0 &= \frac{rB - kB}{k} \\ &= \frac{(r - k)B}{k} \end{aligned}$$

and

$$\begin{aligned}\frac{P_0}{E} &= \frac{(r-k)B}{k} \left(\frac{1}{rB} \right) \\ &= \frac{r-k}{rk}\end{aligned}\tag{4C.7}$$

Adding equations (4C.6) and (4C.7) yields

$$\begin{aligned}\frac{B}{E} + \frac{P_0}{E} &= \frac{1}{r} + \frac{r-k}{rk} \\ &= \left(\frac{1}{r} \right) \left(1 + \frac{r-k}{k} \right) \\ &= \frac{1}{k}\end{aligned}$$

which demonstrates that the first two terms in the P/E equation (4C.5), combine to produce the base P/E, $1/k$. The last term in equation (4C.5), which is P_1/E , corresponds to the last term in equation (4C.1); that is,

$$\frac{P_1}{E} = \sum_{i=1}^n \text{FF}_i G_i$$

One can also express P_0/E in FF format by using equations (4C.3) and (4C.4) in equation (4C.7) and rearranging terms:

$$\begin{aligned}\frac{P_0}{E} &= \frac{\sum r_i b_i - k \sum b_i}{rk} \\ &= \sum \frac{(r_i - k)}{rk} b_i\end{aligned}$$

With equation (4C.2) as a guide, franchise factors for the current book of business are defined as follows:

$$\text{FF}_i^{(b)} = \frac{r_i - k}{rk}$$

Thus, the base P/E can be expressed as

$$\begin{aligned} \text{Base P/E} &= \frac{B}{E} + \frac{P_0}{E} \\ &= \frac{1}{r} + \sum_{i=1}^j \text{FF}_i^{(b)} b_i \end{aligned} \quad (4C.8)$$

The primary difference between formula (4C.8) and the general P/E formula (4C.1) is that, in the general formula, the term $1/k$ (the base P/E) has been replaced by the B/E ratio ($1/r$). Using equation (4C.5) produces the following expanded general form of the P/E formula:

$$\text{P/E} = \frac{1}{r} + \sum_{i=1}^j \text{FF}_i^{(b)} b_i + \sum_{i=1}^n \text{FF}_i G_i$$

APPENDIX 4D: The Franchise Factor Model Applied to the Leveraged Firm

The analysis begins with an unleveraged firm and assumes that all returns are perpetual and net of taxes. The value of the unleveraged firm (V^U) is the sum of the firm's tangible value (TV) and its franchise value (FV); earnings generated by the current book of business are denoted by rB ; the tangible value is thus the capitalized value of those earnings (rB/k); and the franchise value is the net present value of anticipated new businesses. If the earnings rate on new assets is R and the present value of all funds invested in franchise businesses is GB , the present value of these prospective earnings is (RGB/k) . The franchise value then becomes

$$\begin{aligned} \text{FV} &= \left(\frac{RGB}{k} \right) - GB \\ &= \left(\frac{R-k}{k} \right) GB \end{aligned}$$

and

$$\begin{aligned} V^U &= \text{TV} + \text{FV} \\ &= \frac{rB}{k} + \left(\frac{R-k}{k} \right) GB \end{aligned} \quad (4D.1)$$

The P/E is obtained by dividing the value of the firm by the earnings:

$$\begin{aligned} \text{P/E (unleveraged)} &= \frac{V^U}{rB} \\ &= \frac{1}{k} + \left(\frac{R-k}{rk} \right) G \end{aligned}$$

As previously, the base P/E and franchise factor are

$$\text{Base P/E (unleveraged)} = \frac{1}{k}$$

and

$$\text{FF (unleveraged)} = \frac{R-k}{k}$$

Thus,

$$\text{P/E (unleveraged)} = \text{Base P/E} + (\text{FF} \times G) \quad (4D.2)$$

The Leveraged, Tax-Free Firm

Now consider a leveraged firm (V^L) with a perpetual debt that is priced at par. In the absence of taxes, leverage does not change the firm's value (Modigliani and Miller 1958). Thus,

$$V^L = V^U$$

The value of the leveraged firm's equity (V_E^L) is the difference between the total firm value and the value of debt; that is, $V_E^L = V^L - \text{Debt}$.

The firm's debt is expressed as a percentage (h) of the current book value of assets,

$$\text{Debt} = hB$$

Thus,

$$V_E^L = V^U - hB \quad (4D.3)$$

The earnings are reduced by the debt payments (ihB), where i is the pretax interest on the debt, so

$$\begin{aligned}\text{Net earnings} &= rB - ihB \\ &= (r - ih)B\end{aligned}\quad (4D.4)$$

Finally, the firm's earnings must be greater than its debt payments. Thus,

$$r - ih > 0$$

The P/E is now obtained by dividing the value of the firm's equity by the net earnings:

$$\text{P/E (leveraged)} = \frac{V_E^L}{(r - ih)B}$$

To express the P/E in terms of a leverage-adjusted base P/E and FF, V_E^L must first be expressed in an appropriate algebraic format. In equation (4D.3), V^U is replaced by the expression given in equation (4D.1) to obtain the following relationship:

$$V_E^L = \frac{rB}{k} + \frac{R - k}{k}GB - hB$$

Interchanging the last two terms in this expression results in

$$\begin{aligned}V_E^L &= \frac{rB}{k} - hB + \frac{R - k}{k}GB \\ &= \frac{(r - kh)B}{k} + \frac{R - k}{k}GB\end{aligned}\quad (4D.5)$$

The first term in equation (4D.5) is the difference between the firm's tangible value and the value of the debt. If that difference is positive, $r - kh > 0$.

A formula for P/E is again found by dividing the equity value (equation 4D.5) by the net earnings (equation 4D.4); that is,

$$\text{P/E (leveraged)} = \frac{r - kh}{k(r - ih)} + \frac{R - k}{k(r - ih)}G$$

An equity capitalization rate (k_E) is now defined as follows:

$$k_E \equiv \frac{k(r - ih)}{r - kb} \quad (4D.6)$$

If the debt rate (i) is less than the cost of capital (k), then $r - ih > r - kb$. Thus, $k_E > k$. Moreover, k_E increases with leverage.

With this definition of k_E , the P/E for the leveraged firm is as follows:

$$\text{P/E (leveraged)} = \frac{1}{k_E} + \frac{R - k}{(r - ih)k} G$$

After a comparison of this P/E formulation with the P/E for the unleveraged firm (see equation 4D.2), the base P/E and the franchise factor for the leveraged firm can be defined as follows:

$$\text{Base P/E} = \frac{1}{k_E} \quad (4D.7)$$

and

$$\text{FF} = \frac{R - k}{(r - ih)k} \quad (4D.8)$$

With these definitions in place, the P/E can always be expressed as the sum of a base P/E and a franchise P/E. The franchise P/E is the product of the franchise factor and the growth equivalent, where the growth equivalent is unaffected by leverage.

The Weighted-Average Cost of Capital

From the defining equation for k_E (equation 4D.6),

$$(r - kb)k_E = (r - ih)k$$

Thus,

$$(r - kb)k_E + ihk = rk$$

and

$$\left[1 - \left(\frac{k}{r} \right) h \right] k_E + \left[\left(\frac{k}{r} \right) h \right] i = k$$

If k is assumed to remain constant, this equation indicates that k_E is determined from the weighted-average cost of capital. The weight ($[k/r]b$) will now be shown to be the percentage of total debt relative to the tangible value of the unleveraged firm:

$$\begin{aligned} \frac{kb}{r} &= \frac{kbB}{rB} \\ &= \frac{hB}{\left(\frac{rB}{k}\right)} \\ &= \frac{\text{Debt}}{\text{Tangible value}} \end{aligned}$$

Therefore, k_E can be interpreted as the cost of equity for a leveraged TV firm (a firm without franchise value). If the debt rate is assumed constant, the required return on equity (k_E) will increase with leverage so that k remains constant. This increasing equity capitalization rate can be viewed (in accordance with Modigliani and Miller) as a consequence of the fact that, as leverage increases, so does the riskiness of the remaining equity cash flows.

At first, it may seem surprising that, regardless of the extent of the franchise value, k_E is based only on the tangible component of the firm's full market value. In fact, these results are mathematically equivalent to computing a risk-adjusted discount rate (k^*) for the entire equity component of the firm's market value. Such a general approach would have led to precisely the same value of leveraged equity as obtained in equation (4D.5). The definition of k_E effectively loaded all the financial leverage risk onto the TV component. Consequently, k_E will generally be larger than k^* . The advantage of the given decomposition lies in the simplicity it provides and the parallelism that results with the base P/E and FF for the unleveraged firm.

The Leveraged, Fully Taxable Firm

Consider now the effect of taxes. In contrast to tax-exempt firms, taxable firms will gain from leverage.

For simplicity, assume that the full benefits of the tax shield pass directly to the corporate entity. If the annual debt payments are ($i \times \text{Debt}$), the tax gain is $t \times i \times \text{Debt}$, where t is the marginal tax rate. Because the debt is assumed to be priced at par, the tax wedge is $[t \times i \times \text{Debt}] / i = t \times \text{Debt}$.

The value of the leveraged firm is simply the value of the unleveraged firm plus the tax wedge: $V^L = V^U + (t \times \text{Debt})$. As before, the value of the leveraged firm's equity is the difference between the total value and the value of debt,

$$\begin{aligned} V_E^L &= V^L - \text{Debt} \\ &= V^U + (t \times \text{Debt}) - \text{Debt} \\ &= V^U - (1 - t)\text{Debt} \end{aligned}$$

Thus,

$$V_E^L = V^U - (1 - t)hB$$

The net earnings for the taxable firm are computed by reducing the earnings (which are assumed to be after taxes) by the *after-tax* debt payments:

$$\begin{aligned} \text{Net earnings} &= rB - (1 - t)ihB \\ &= [r - i(1 - t)h]B \end{aligned}$$

When comparing these formulas for the equity value and net earnings with similar formulas for the tax-free firm (equations 4D.3 and 4D.4), observe that the only difference is that h for the taxable firm always appears in combination with $(1 - t)$. Consequently, the base P/E and the FF for the taxable firm will be the same as in equations (4D.7) and (4D.8) with h replaced by $[(1 - t)h]$. That is, the taxable firm can be treated as if it were a tax-free firm with an adjusted leverage of $[(1 - t)h]$.

APPENDIX 4E: The Effects of External Financing

This appendix briefly reviews how earnings growth in the dividend discount model derives from retained earnings and how external financing can lead to enhanced earnings growth. The appendix then demonstrates that external financing and premium investments lead to counterbalancing changes in a firm's tangible value and franchise value. Consequently, in the absence of surprises, price growth is predetermined, earnings growth and P/E growth offset each other, and the firm remains on its value-preservation line.

Growth Assumptions in the Standard Dividend Discount Model

The standard DDM assumes that a firm pays a dividend (d_1) one year from today and that dividends in subsequent years grow at a constant rate (g). If the discount rate is k , the stream of future dividend payments can be discounted to obtain the following price formula:

$$P_0 = \frac{d_1}{k - g}$$

in which P_0 is the initial price based on annual dividend payments made at year end.

Assume that the firm retains a fixed proportion (b) of earnings (E) and pays out the balance of earnings as dividends. In this case,

$$d_1 = (1 - b)E_1 \quad (4E.1)$$

$$P_0 = \frac{(1 - b)E_1}{k - g} \quad (4E.2)$$

and

$$\frac{P_0}{E_1} = \frac{1 - b}{k - g} \quad (4E.3)$$

In the DDM, the basic assumption of a constant g and a constant b naturally lead to price and earnings growth at the same rate. To see why, observe that the second-year dividend is

$$\begin{aligned} d_2 &= (1 + g)d_1 \\ &= (1 + g)(1 - b)E_1 \\ &= (1 - b)[(1 + g)E_1] \end{aligned}$$

Because dividends are always $(1 - b)$ times earnings,

$$E_2 = (1 + g)E_1$$

Dividends continue to grow at rate g , so the price at the beginning of the second year will be

$$\begin{aligned} P_1 &= \frac{d_2}{k-g} \\ &= \frac{(1+g)(1-b)E_1}{k-g} \end{aligned} \quad (4E.4)$$

Comparing equation (4E.4) with equation (4E.2) shows that the price also grows at the g rate,

$$P_1 = (1+g)P_0$$

With earnings and price growing at the same rate, the P/E will have a constant value over time (see equation 4E.3); that is,

$$P/E = \frac{1-b}{k-g}$$

In the DDM, no provision is made for external financing. Instead, smooth growth is obtained by making two heroic assumptions: All investments are derived from retained earnings, and such investments provide the *identical* return (r) in *each future period*. If B_0 is the initial book value, then

$$r = \frac{E_1}{B_0}$$

or

$$E_1 = rB_0$$

At the end of the first year, retained earnings (bE_1) are added to B_0 ; so,

$$\begin{aligned} B_1 &= B_0 + bE_1 \\ &= B_0 + brB_0 \\ &= B_0(1+br) \end{aligned}$$

The second-year earnings are

$$\begin{aligned} E_2 &= rB_1 \\ &= rB_0(1+br) \\ &= E_1(1+br) \end{aligned}$$

Because $E_2 = (1 + g)E_1$, $g = br$. Thus, in the standard DDM, book value, price, and earnings all grow at the same rate as a result of continual new investments fueled by retained earnings.

Growth in Earnings per Share with External Financing

This subsection develops a formula for the incremental growth in earnings per share (EPS) that a firm achieves when it sells n new shares one year from today and invests the proceeds of the sale in high-return projects. Assume that the firm initially has N shares outstanding and earns E_1 dollars per share in the first year. At year end, the firm retains and invests b times E_1 in projects that return R in all subsequent years. This “core” investment leads to incremental earnings of RbE_1 in Year 2 in addition to the base earnings (E_1). The corresponding core earnings growth (from Year 1 to Year 2) is

$$\begin{aligned} g_1(E) &= \text{Core earnings growth} \\ &= \frac{E_1 + RbE_1}{E_1} - 1 \\ &= Rb \end{aligned}$$

If the firm requires additional funds to take advantage of franchise investment opportunities that arise at year end, it can issue new shares priced at P_1 . In a stable market, new share issuance alone will not change the stock price.

If n shares are issued at the beginning of Year 2, the total external funding will be nP_1 . Per (initial) share, this funding can be expressed as follows:

$$\text{External funds (per initial share)} = \frac{nP_1}{N} \quad (4E.5)$$

The external funds can also be expressed as a proportion (b^*) of E_1 :

$$\text{External funds} = b^*E_1 \quad (4E.6)$$

Equating (4E.5) and (4E.6) and solving for n produces a formula for n that will soon become useful:

$$n = \frac{Nb^*E_1}{P_1} \quad (4E.7)$$

Assume that the proceeds of the equity sale are invested so as to return R^* annually. Because these proceeds are received and invested at the beginning of Year 2, Year 2 will garner additional earnings of $R^*b^*E_1$ for each initial share.

Total EPS growth ($g_{TOT}[E]$) can now be computed. As a first step, convert earnings per share to total earnings:

$$\text{Total earnings (end of Year 1)} = NE_1$$

$$\text{Total earnings (end of Year 2)} = (N + n)E_2$$

There are three contributors to Year 2 earnings (E_2): base earnings, income from retained earnings, and income from externally funded investments; that is,

$$(N + n)E_2 = NE_1 + RbNE_1 + R^*b^*NE_1 \quad (4E.8)$$

Equation (4E.8) can now be used to derive a formula for $g_{TOT}(E)$:

$$\begin{aligned} g_{TOT}(E) &= \frac{E_2}{E_1} - 1 \\ &= \left(\frac{N}{N + n} \right) (1 + Rb + R^*b^*) - 1 \end{aligned} \quad (4E.9)$$

If no new shares are issued, the total earnings growth will be the same as the core earnings growth. That is, if $b^* = n = 0$, then

$$\begin{aligned} g_{TOT}(E) &= Rb \\ &= g_1(E) \end{aligned}$$

When new shares are sold (that is, $b^* > 0$ and $n > 0$) and the proceeds are reinvested, $g_{TOT}(E)$ will increase if R^* is sufficiently large.

An incremental growth formula that eliminates the need to know the number of shares can now be derived:

$$\begin{aligned} \text{Incremental growth} &= g_{TOT}(E) - g_1(E) \\ &= g_{TOT}(E) - Rb \end{aligned}$$

Replacing $g_{TOT}(E)$ by the expression given in equation (4E.9) produces

$$g_{TOT}(E) - Rb = \frac{N}{N + n} (1 + Rb + R^*b^*) - 1 - Rb \quad (4E.10)$$

and equation (4E.7) can be used to eliminate the number of shares in equation (4E.10):

$$\begin{aligned} \frac{N}{N+n} &= \frac{N}{\left[N + Nb^* \left(\frac{E_1}{P_1} \right) \right]} \\ &= \frac{P_1}{P_1 + b^* E_1} \end{aligned} \quad (4E.11)$$

Equation (4E.10) can be recast in a more revealing form by using equation (4E.11) and then performing a variety of algebraic simplifications. The final result is the following formula:

$$\begin{aligned} g_{TOT}(E) - Rb &= \left(\frac{P_1}{P_1 + b^* E_1} \right) b^* \left(R^* - \frac{(1+Rb)E_1}{P_1} \right) \\ &= \left(\frac{P_1}{P_1 + b^* E_1} \right) b^* \left(R^* - \frac{\hat{E}_2}{P_1} \right) \end{aligned} \quad (4E.12)$$

where

$$\begin{aligned} \hat{E}_2 &= \text{Year 2 earnings without equity sales} \\ &= (1 + Rb)E_1 \end{aligned}$$

The term (\hat{E}_2/P_1) can be viewed as an “earnings yield threshold.” Thus, for $g_{TOT}(E)$ to be greater than Rb (that is, to have incremental earnings growth from the equity sale), proceeds of the equity sale must be invested at a rate of return greater than (\hat{E}_2/P_1) . This threshold will be attained in general for franchise investments for which $R^* > k$, because the earnings yield $(\hat{E}_2/P_1) \leq k$.

Formula (4E.12) will now be applied to the franchise-value firm discussed in “The Growth Illusion: The P/E ‘Cost’ of Earnings Growth.”

$$\begin{aligned} b = b^* &= 65 \text{ percent} \\ R = R^* &= 20 \text{ percent} \\ P_0 &= \$1,500 \\ E_1 &= \$100 \\ g(P) &= 9.67 \text{ percent} \end{aligned}$$

The result is the following:

E_1	=	\$100
$1 + Rb$	=	1.13
$\hat{E}_2 = (1 + Rb)E_1$	=	\$113
P_0	=	\$1,500
$1 + g(P)$	=	1.0967
$P_1 = [1 + g(P)]P_0$	=	\$1,645
\hat{E}_2/P_1	=	6.87 percent

Because $R^* = 20$ percent and $b^* = 65$ percent,

$$\begin{aligned} \text{Earnings growth increment} &= b^* \left[R^* - \frac{\hat{E}_2}{P_1} \right] \\ &= 0.65 \times (20 \text{ percent} - 6.87 \text{ percent}) \\ &= 8.53 \text{ percent} \end{aligned}$$

The contribution of the 8.53 percent growth increment to $g_{TOT}(E)$ is diluted by the increased share base. This increased base is reflected in the first factor in equation (4E.12). In the example, that first factor is

$$\begin{aligned} \frac{P_1}{P_1 + b^* E_1} &= \frac{\$1,645}{\$1,645 + (0.65 \times \$100)} \\ &= 96.2 \text{ percent} \end{aligned}$$

Thus, only 96.2 percent of the increment actually translates into increased total earnings growth.

Combining the results for this example gives

$$\begin{aligned} g_{TOT}(E) &= Rb + (96.2 \text{ percent of } 8.53 \text{ percent}) \\ &= (0.20 \times 0.65) + (0.962 \times 0.0853) \\ &= 0.13 + 0.082 \\ &= 0.212, \text{ or } 21.2 \text{ percent} \end{aligned}$$

The process can be summarized as follows:

- When \$65 in retained earnings (65 percent of \$100) is invested at 20 percent, the earnings growth is 13 percent, which adds \$13 (13 percent of \$100) to Year 2 earnings per share.
- When another \$65 in investments is externally financed, the investment return is calculated as an incremental return over the earnings

yield threshold. Dilution reduces that increment, so the additional earnings growth becomes 8.2 percent. This growth adds another \$8.20 to the Year 2 earnings per share.

The final consideration is the change in the P/E that occurs from the beginning to the end of Year 1. The price/earnings ratio is calculated from the price per share at the beginning of the year and the earnings per share that accumulate over the course of the year. At the outset,

$$\begin{aligned}\frac{P_0}{E_1} &= \frac{\$1,500}{\$100} \\ &= 15\end{aligned}$$

At the beginning of Year 2,

$$\begin{aligned}\frac{P_1}{E_2} &= \frac{\$1,645}{\$100 + \$13 + \$8.20} \\ &= 13.57\end{aligned}$$

Thus,

$$\begin{aligned}g(\text{P/E}) &= \frac{13.56}{15.00} - 1 \\ &= -9.5 \text{ percent}\end{aligned}$$

This combination of 21.2 percent earnings growth and a 9.5 percent P/E decline is consistent with 9.7 percent price growth because

$$\begin{aligned}g(P) &= [1 + g(E)][1 + g(\text{P/E})] - 1 \\ &= (1 + 0.212) \times (1 - 0.095) - 1 \\ &= 9.7 \text{ percent}\end{aligned}$$

The 9.7 percent price growth characterizes all points on the value-preservation line that Figure 4.67 illustrated. Thus, external investment financing moves the firm along, but not off, the VPL.

Price Growth and the VPL

In the previous subsection, an example of external funding illustrated the following general principle: In a stable market, earnings growth and P/E growth always offset each other in such a way that a firm's price growth is

independent of investment returns and the funding mechanism. In fact, the year-to-year price growth is determined by the firm's initial P/E and its retention policy. Consequently, the balance between earnings growth and P/E growth can always be represented as a point on a fixed value-preservation line.

This section offers a general proof of the preceding principle. The first step is to show how investing in premium projects increases the firm's tangible value and decreases its franchise value. The balance between these two value changes (that is, the franchise conversion process) is such that both the return on investment and the extent of external financing "drop out" of the calculation of price-per-share growth. The investment returns and the extent of funding do, however, have an impact on EPS growth. Because earnings increase while price growth does not change, a counterbalancing decrease must occur in the P/E.

Recall that stock price (P) is the sum of the tangible value (TV) per share and the franchise value (FV) per share. Initially, the stock price is as follows:

$$P_0 = TV_0 + FV_0 \quad (4E.13)$$

By the end of the first year, TV and FV will have changed in accordance with their growth rates $g(\text{TV})$ and $g(\text{FV})$. At the beginning of the second year,

$$P_1 = TV_1 + FV_1$$

that is,

$$[1 + g(P)]P_0 = [1 + g(\text{TV})]TV_0 + [1 + g(\text{FV})]FV_0$$

and

$$1 + g(P) = [1 + g(\text{TV})] \left(\frac{TV_0}{P_0} \right) + [1 + g(\text{FV})] \left(\frac{FV_0}{P_0} \right) \quad (4E.14)$$

To simplify equation (4E.14), another variable is introduced:

$$f = \frac{FV_0}{TV_0} \quad (4E.15)$$

Combining equations (4E.13) and (4E.15) gives the following formulas:

$$\frac{TV_0}{P_0} = \frac{1}{1+f} \quad (4E.16)$$

and

$$\frac{FV_0}{P_0} = \frac{f}{1+f} \quad (4E.17)$$

With equations (4E.16) and (4E.17), equation (4E.14) can be simplified to

$$1+g(P) = \frac{1}{1+f} ([1+g(TV)] + f[1+g(FV)]) \quad (4E.18)$$

Finding $g(P)$ now requires substituting appropriate expressions for $g(TV)$ and $g(FV)$. The formula for $g(TV)$ was developed in the previous section for the general case in which investments are financed through a combination of retained earnings and new share issuance. These investments were shown to increase earnings and tangible value. In contrast, the new investments deplete the franchise value. To derive a formula for $g(FV)$, the total franchise value after one year is first needed:

$$\begin{aligned} \text{Total FV (start of Year 2)} &= \text{Time growth in initial FV} \\ &\quad - \text{FV depletion from investing} \\ &\quad \quad \text{retained earnings} \\ &\quad - \text{FV depletion from externally} \\ &\quad \quad \text{financed investments} \end{aligned}$$

The FV depletion from an investment is equal to the net present value of the cash flows produced by that investment. Using this concept and the symbols defined earlier in this appendix and used in equation (4E.5) results in the following relationships:

$$\begin{aligned} \text{Total franchise value (start of Year 1)} &= N \times FV_0 \\ \text{Total franchise value (start of Year 2)} &= (N+n) \times FV_1 \end{aligned}$$

and

$$(N+n)FV_1 = N \left[(1+k)FV_0 - \left(\frac{R-k}{k} \right) bE_1 - \left(\frac{R^*-k}{k} \right) b^*E_1 \right]$$

Because $TV_0 = E_1/k$, this relationship can be expressed as

$$(N+n) \times FV_1 = N \times FV_0 \times \left([1+k] - [(R-k)b + (R^*-k)b^*] \frac{TV_0}{FV_0} \right)$$

which provides the basis for a formula for $g(FV)$. Replacing TV_0/FV_0 by $1/f$ (see equation 4E.15) produces

$$\begin{aligned} 1 + g(FV) &= \frac{FV_1}{FV_0} \\ &= \frac{N}{N+n} \left([1+k] - \frac{1}{f} [(R-k)b + (R^*-k)b^*] \right) \\ &= \frac{1}{f} \left(\frac{N}{N+n} \right) [f + k(f+b+b^*) - Rb - R^*b^*] \end{aligned} \quad (4E.19)$$

Substituting formula (4E.9) for $g(TV)$ —that is, $g_{TOT}(E)$ —and formula (4E.19) for $g(FV)$ in the price-growth formula (4E.18) results in

$$\begin{aligned} 1 + g(P) &= \left(\frac{1}{1+f} \right) \left(\frac{N}{N+n} \right) [1 + Rb + R^*b^* + f + k(f+b+b^*) - Rb - R^*b^*] \\ &= \frac{N}{N+n} \left(1 + \frac{k(f+b+b^*)}{1+f} \right) \end{aligned} \quad (4E.20)$$

Note at this point that both R and R^* have canceled out, which means that the price growth is independent of the return assumptions established previously.

Referring back to equation (4E.11) and the fact that $P_1 = [1 + g(P)]P_0$, it follows that $[N/(N+n)]$ depends on $g(P)$ and it can be written as follows:

$$\begin{aligned} \frac{N}{N+n} &= \frac{P_1}{P_1 + b^*E_1} \\ &= \frac{[1 + g(P)]P_0}{[1 + g(P)]P_0 + b^*E_1} \\ &= \frac{1 + g(P)}{1 + g(P) + \frac{b^*E_1}{P_0}} \end{aligned} \quad (4E.21)$$

Substituting equation (4E.21) in (4E.20) leads to

$$1 + g(P) = \left(\frac{1 + g(P)}{1 + g(P) + \frac{b^* E_1}{P_0}} \right) \left[1 + \frac{k(f + b + b^*)}{1 + f} \right] \quad (4E.22)$$

Next, equation (4E.22) is solved for $g(P)$:

$$\begin{aligned} g(P) &= \frac{k(f + b + b^*)}{1 + f} - \frac{b^* E_1}{P_0} \\ &= k - \frac{(1 - b)k}{1 + f} + \frac{kb^*}{1 + f} - \frac{b^* E_1}{P_0} \end{aligned} \quad (4E.23)$$

The last term in equation (4E.23) involves the initial earnings-to-price ratio, which can also be written in terms of f :

$$\begin{aligned} \frac{E_1}{P_0} &= \frac{k \left(\frac{E_1}{k} \right)}{P_0} \\ &= \frac{k \times TV_0}{P_0} \\ &= \frac{k}{1 + f} \end{aligned} \quad (4E.24)$$

Using result (4E.24) in (4E.23) shows that the terms involving b^* (that is, the extent of external funding) drop out. The result is a formula for $g(P)$ that depends only on the retention rate and the initial P/E:

$$\begin{aligned} g(P) &= k - \frac{(1 - b)E_1}{P_0} \\ &= k - \frac{1 - b}{\left(\frac{P_0}{E_1} \right)} \end{aligned} \quad (4E.25)$$

Equation (4E.25) shows that the franchise conversion process does not affect price growth. This finding confirms that, even with external

funding, price growth is simply the difference between market rate and dividend yield.

“The Growth Illusion: The P/E ‘Cost’ of Earnings Growth” demonstrated that

$$g(P/E) = \frac{1 + g(P)}{1 + g(E)} - 1$$

Because the franchise conversion process increases $g(E)$ but does not change $g(P)$, this relationship indicates that any increase in $g(E)$ must be offset by a decrease in $g(P/E)$. This statement defines the basic trade-off that determines the VPL for a given year.

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Franchise Valuation under Q-Type Competition

When considering a company's prospects, analysts often segment the earnings progression, either formally or intuitively, into a series of growth phases followed by a relatively stable terminal phase. This study focuses on the role of competition in the terminal phase. In the simplified two-phase model of a single-product company, the first-phase earnings growth drives the company's overall return on equity toward the (generally higher) incremental ROE on new investments. The company then enters the terminal phase with a high ROE that attracts the attention of a potential competitor that can replicate the company's production/distribution capacity at some multiple Q of the original capital cost. This "Q-type competition" can lead to margin erosion and a reduction in earnings as the ROE slides to more competitive levels. The implication is that, unless a company has either the diversity of product/service cycles or other special ways to deflect competitive pressures, the analyst should address the potential impact of Q-type competition on the sustainability of the company's franchise and the company's valuation.

Most valuation models view a company as going through various phases of differentiated growth before ultimately entering a terminal phase of "competitive equilibrium." Relatively little attention has been

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given to the nature of this terminal phase, however, or to the material impact that various characterizations of this phase can have on the valuation of the company.

In developing a valuation model for a company, analysts face an almost irresistible temptation to focus on the early, more exciting growth phases of the earnings progression. Indeed, the typical practitioner treatment of the terminal phase has been to assume that earnings either stabilize or regress to some general market growth rate. In the theoretical literature, a number of early writers have been concerned with the issue of how to model a growth company's transition into an equilibrium state.¹ This article demonstrates how useful insights into the complex structure of this terminal phase can be obtained from recent work on a sales-driven franchise approach to valuation (Leibowitz 1997a, b).

In a sales-driven context, the terminal phase can be construed as the period when sales growth finally stabilizes but in which the company's earnings may continue to change as the pricing margin moves toward some competitive equilibrium. This margin-equilibrating process can be usefully described in terms of the ratio of asset replacement cost to the company's book value, a parameter that is related to Tobin's q (Tobin 1969; Lindenberg and Ross 1981). Generally, lower replacement costs in the company's industry lead to adverse franchise changes, "franchise slides." In other cases, significantly higher replacement costs can lead, even after all sales growth has come to an end, to further earnings growth, or "franchise rides." The potential for such earnings variability in the terminal phase appears to have received insufficient recognition in most of the literature on valuation models, including the previous work of this author.

Of course, the valuation impact of this terminal-phase effect will depend totally on the nature of the company's business and its long-term competitive posture. For example, companies that might stand to gain from postgrowth margin expansion include companies that are able to achieve a sustainable market dominance, perhaps because growth itself builds a relatively unassailable efficiency of scale; companies whose organizational, distributional, or technological assets far exceed a more readily replicable capital base; companies with sufficient patent protection and/or extraordinary brand acceptance to assure franchise-level margins for years to come; and companies whose products (leading-edge products, for example) can themselves act as germinators for subsequent generations of even more-advanced products. For such fortunate companies, the investor can look forward to a future period of sustained high sales when the margins can be enhanced, or at least maintained, and when a high payout ratio can at last be applied. It is in this halcyon period that the patient investor will finally be rewarded with the significant cash returns that formed the foundation for the value ascribed to the company at the outset.

For less-fortunate growth companies, alas, barriers to entry do indeed become porous over time, high franchise margins are vulnerable to erosion, and extraordinary earnings levels are subject to the gravitational pull of commoditization. The analysis of such companies must consider the P/E reduction that arises from a franchise slide.

For the practical analyst, the basic message does not lie in the specific numerical results or the quantitative models developed in this paper. Rather, the key finding is the surprising importance of exactly how a growth franchise plays out over time. This finding suggests that the analyst should go beyond estimation of a firm's growth rate and the duration of its growth phase. Serious consideration—even if only qualitative—should be given to the period when the firm's capital needs have abated and it can begin directing a more significant portion of the attained earnings back to the investor. Apart from any numerical assessments that may be difficult or impossible to achieve, the analyst may be able to provide some insight into the durability of the firm's franchise in the face of the inevitable competition always present in any truly global market. Any such insights will provide a helpful new dimension in enabling investors to ascertain whether a particular firm, in that distant but critically important period, could be expected to enjoy an enhanced franchise ride, to face a costly franchise slide, or to find itself on the more intermediary path of a “franchise glide.”

SINGLE-PHASE NO-GROWTH MODEL

The simplest valuation model deals with a company that has a stable level of current earnings but a total absence of any investment prospects that could generate returns in excess of the cost of capital. In this simplest of all cases, the well-known result is

$$P = \frac{E}{k}$$

where P is the firm's intrinsic value, E is the fixed level of earnings, and k is the cost of capital. In this “no-growth” example, all earnings are being paid out as dividends.² Clearly, the very notion of a constant earnings stream is artificial. Nonetheless, this simple case serves handily as a convenient starting point for the analysis of more-complex multiphase growth models. In particular, the constant-earnings assumption forms the basis for the treatment of the terminal phase in many valuation models.

To deal with the question of the earnings progression under a specific form of competitive equilibrium and the ultimate impact that such a state would have on the company's valuation, the first step is to recast the prob-

lem in sales-driven terms. In the terminology of sales-driven franchise value (Leibowitz 1997a), the constant-earnings model can be rewritten as

$$P = \frac{E}{k} \\ = \frac{mS}{k}$$

where S is (constant) annual unit sales and m is net margin. (For simplicity, assume a regime without taxation.) The earnings and sales flows can be related to the company's asset value, B , through the relationship

$$E = rB \\ = (mT)B$$

where r is return on equity (ROE) for the (unlevered) company and T is "sales turnover" (i.e., annual sales per dollar of book value).

The company enjoys a "franchise return" as long as its ROE is greater than its cost of capital (i.e., $r - k > 0$).

Alternatively, in sales terms, a franchise margin factor, fm , can be defined as the earnings on each sales dollar in excess of the return required to cover the annual capital cost. Now, it can be shown that

$$fm = m - \frac{k}{T}$$

It readily follows that fm will be positive when the company enjoys an ROE franchise. Thus, the company will enjoy a franchise ride to the extent that it can sustain sufficient pricing power (or production cost advantage) to achieve margins in excess of k/T .

This rationale motivated the use of the franchise margin as a gauge of the company's pricing power (i.e., its ability to extract a margin above and beyond that needed to cover the cost of capital).

Q-Type Competitive Equilibrium

For purposes of clarity, the discussion in this chapter focuses on the dour case of the franchise slide: the situation in which the company undergoes a margin erosion once the growth phase has been completed.

In a modern competitive environment, technological obsolescence progresses rapidly, product cycles contract, capital is broadly available for valid

projects, and globalization reduces the advantage of low-cost production sites. In such an environment, sustaining a long franchise ride is a great challenge. Large, technologically proficient, well-capitalized competitors lurk in the shadows of even the brightest franchise. Theoretically, when the barriers to entry have eroded, these competitors will be happy to replicate the company's products and/or services for a margin that just covers their cost of capital. In other words, in this environment, competition (or even the threat of competition) should drive prices down to a level at which the franchise margin essentially vanishes (where $fm \rightarrow 0$ or $m \rightarrow k/T$).

Other authors and I have described some aspects of such competition (Leibowitz 1997a, b; Rappaport 1986, 1998), but I did not recognize that this margin erosion would be exacerbated by a form of the Tobin q effect. In my earlier work, the tacit assumption was that a new competitor would incur the same capital costs to achieve the comparable sales capacity. But what if the competitor's new facilities, for one reason or another (the opportunity to use the latest technology, more-precise market targeting, or simply pricing shifts in the market for capital goods), could be developed with a lower capital expenditure; in other words, what if the replacement cost was below the original company's book value? This ratio of a competitor's replacement costs to the company's book value can be designated Q .³

With this terminology, Q -type competitive equilibrium is defined as a situation in which one or more competitors could replace the original company's production and distribution capability through the capital expenditure of only QB where $Q \leq 1$.⁴

Now consider the earnings differential between the original company and the hypothetical competitor. The original company's earnings are $E = rB$, but the competitor can generate the same level of unit sales by the capital expenditure of only QB . The competitor company would thus be tempted to move into the fray if it could achieve a level of earnings kQB that would cover its capital costs. Thus, in a fully competitive environment, the original company's earnings would also have to descend to kQB . And because the original company's assets represent funds that have already been spent, the company would have to respond to this competition whether the resulting margin did or did not cover the sunk cost of its capital. The original company's intrinsic value would then have to decline by a factor equal to the ratio of these two earnings levels:

$$\begin{aligned} \frac{kQB}{E} &= \frac{kQB}{rB} \\ &= \frac{kQ}{r} \end{aligned}$$

The same point can be made by noting that the ratio of the original company's earnings to the replacement cost could be interpreted as a kind of "excessive ROE," $E/QB = rB/QB$, that must ultimately descend to the market rate k . Here again, the company's pricing would be reduced by the ratio of the competitive ROE k to this currently "excessive ROE." That is,

$$\frac{k}{(rB/QB)} = \frac{kQ}{r}$$

so the same factor, kQ/r , results.

Note that this analysis holds regardless of how one accounts for the company's capital base, B —whether by book accounting, liquidation value, earnings capitalization, or so on. The key is not the original company's capital base, which is simply a sunk cost (and one that may even be artificially measured), but the actual capital expenditure required for new entrants to field a comparable sales capacity and just cover their cost of capital—that is, QB .⁵ Although Q may be defined in terms of the original company's book value accounting for B , the multiple QB represents the competitor's *literal* capital expenditure required to produce the current sales level. Similarly, r basically relates the "hard" variable of earnings to the book value in whatever way B is defined. Thus, because Q and r are both defined in relation to the original company's book value, the choice of the accounting for B drops out of the Q/r ratio that determines the pricing reduction. If potential competitors need only achieve their capital costs, the original company's earnings will ultimately be reduced by the factor kQ/r , regardless of how the book value of assets is measured and regardless of what value is ascribed to those book assets.

The valuation impact of this earnings decline will clearly depend on the rapidity of the franchise slide. The worst case would be an immediate "cliff" drop-off in earnings, which would result in a price value of

$$\begin{aligned} P &= \frac{kQB}{k} \\ &= QB \end{aligned}$$

In other words, the company would be worth no more than the new capital expenditure required to replace its sales capacity.⁶

Before leaving this simplest of all cases, consider how the franchise

slide affects the company's P/E. On the assumption that the denominator of this ratio is the preslide earnings,

$$\begin{aligned} P/E &= \left(\frac{kQB}{k} \right) \left(\frac{1}{rB} \right) \\ &= \left(\frac{1}{k} \right) \left(\frac{kQ}{r} \right) \\ &= \frac{1}{k} \left(\frac{r_Q}{r} \right) \end{aligned}$$

where $r_Q = (E_Q/B) = kQ$ is the ROE for the postslide company.⁷

A GENERAL DECAY MODEL

The preceding discussion was based on the special case of an immediate franchise plunge in a harshly competitive environment from an excess-return franchise to no franchise whatsoever. A more realistic (and more general) situation would be for the franchise to erode at some fixed pace in the course of time. The simplest approach to modeling such a situation would use a fixed annual decay rate, d , that takes the company's earnings from its original level down to the ultimate fully competitive level, E_Q . Thus, the earnings in the t th year would be expressed as

$$E(t) = \begin{cases} E(1-d)^t & t < D \\ E_Q & t \geq D \end{cases}$$

where D is the time required for the decay to reach the E_Q level, $E_Q = E(1-d)^D$, so

$$\begin{aligned} D &= \frac{\log(E_Q/E)}{\log(1-d)} \\ &= \frac{\log(kQ/r)}{\log(1-d)} \text{ for } 0 < d < 1 \end{aligned}$$

In the happy case in which Q is sufficiently large, this "decay orientation" would have to be expanded to include a margin that can *grow* at some annual rate until competitive equilibrium is attained.

At this point, a numerical example would probably be helpful: Suppose

$$k = 12 \text{ percent}$$

$$B = 100$$

$$E = 15 \text{ (implying an initial ROE of 15 percent)}$$

$$Q = 0.75$$

Because all earnings are paid out in this single-phase model, there is no reinvestment, and the book value remains constant.

Under competition, the earnings are assumed to fall to the point at which the ROE equals

$$Qk = 0.75 \times 12 \text{ percent} = 9 \text{ percent}$$

and the earnings are $E_Q = 9$.

If the selected decay rate is 5 percent a year, the 40 percent earnings decline from 15 to 9 will occur gradually over a span of 10 years. The time path of this earnings decline is shown as the lower curve in Figure 5.1.

The general relationship between the annual decay rate and the time required to reach equilibrium is shown in Figure 5.2. The lower-curve values for the no-growth model show that raising the decay rate from 1 percent to 5 percent significantly shortens the decay time—from 50 years to 10. In between, a 2.5 percent decay rate results in a span of 20 years, which might be considered unrealistically long for many cases. The upper curve will be discussed later.

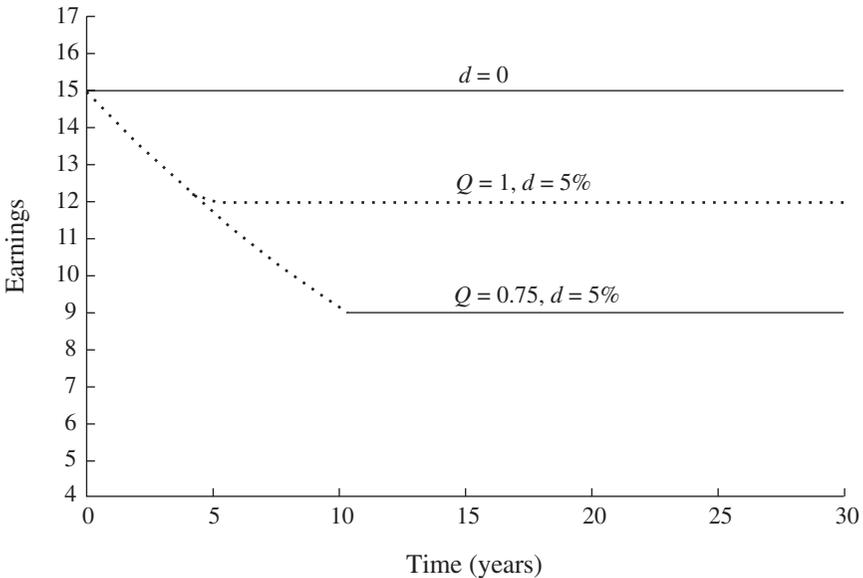


FIGURE 5.1 Earnings Patterns in Two Competitive Decay Scenarios: No-Growth Model

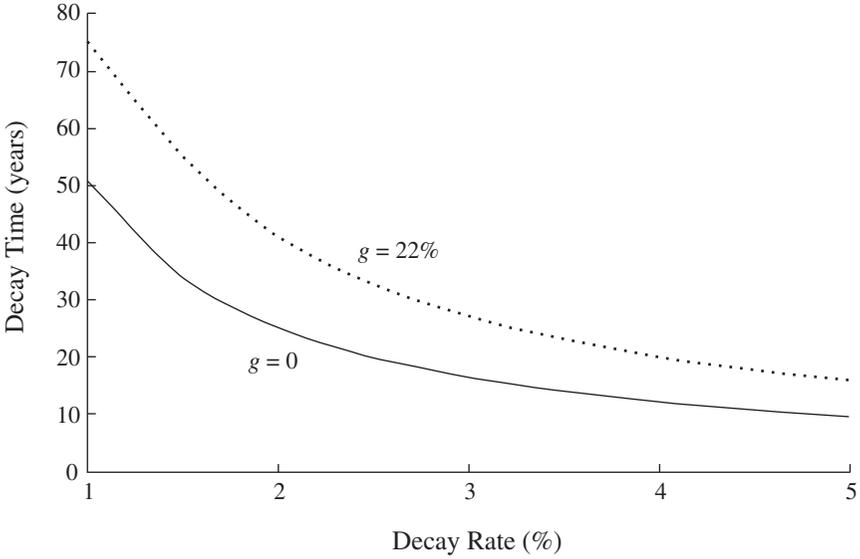


FIGURE 5.2 Decay Times to Reach Q-Type Competitive Equilibrium for No-Growth and Growth Models: $Q = 0.75$

Now, the intrinsic price, $P(Q,d)$, in this “ (Q,d) decay process” can be determined in a reasonably straightforward way:

$$\begin{aligned}
 P(Q,d) &= \sum_{t=1}^{\infty} \frac{E_t}{(1+k)^t} \\
 &= \sum_{t=1}^D \frac{(1-d)^t E}{(1+k)^t} + \sum_{t=D+1}^{\infty} \frac{E_Q}{(1+k)^t} \\
 &= E \left(\frac{1-d}{1+k} \right) \left[\frac{1 - \left(\frac{1-d}{1+k} \right)^D}{1 - \frac{1-d}{1+k}} \right] + \left[\frac{E_Q}{(1+k)^D} \right] \left(\frac{1}{k} \right) \\
 &= E \left(\frac{1-d}{k+d} \right) \left[1 - \left(\frac{1-d}{1+k} \right)^D \right] + \left[\frac{E(1-d)^D}{(1+k)^D} \right] \left(\frac{1}{k} \right) \\
 &= E \left\{ \left(\frac{1-d}{k+d} \right) - \left(\frac{1-d}{1+k} \right)^D \left[\left(\frac{1-d}{k+d} \right) - \left(\frac{1}{k} \right) \right] \right\}
 \end{aligned}$$

or finally,

$$\begin{aligned}
 P(Q, d) &= E \left\{ \left(\frac{1-d}{k+d} \right) + \left(\frac{1-d}{1+k} \right)^D \left[\frac{d(1+k)}{k(k+d)} \right] \right\} \\
 &= E \left[\frac{1-d}{k+d} \right] + \frac{QB}{(1+k)^D} \left[\frac{d(1+k)}{k+d} \right]
 \end{aligned}$$

which makes use of the earlier result that

$$\begin{aligned}
 E(1-d)^D &= E_Q \\
 &= kQB
 \end{aligned}$$

Note that the parameter D depends on the values of Q and d .

The P/Es for a range of decay rates and Q values are plotted in Figure 5.3. For $Q = 0.75$ and $d = 5$ percent, the P/E turns out to be 6.12 times, or 27 percent below the “undecayed” P/E of 8.33 times. (In contrast, a margin expansion, a $Q = 2$, for example, would drive the P/E higher, to 10.88 times—a 31 percent improvement.) For faster decay rates, the P/E impact would obviously be greater. But note that for very slow decays, different Q

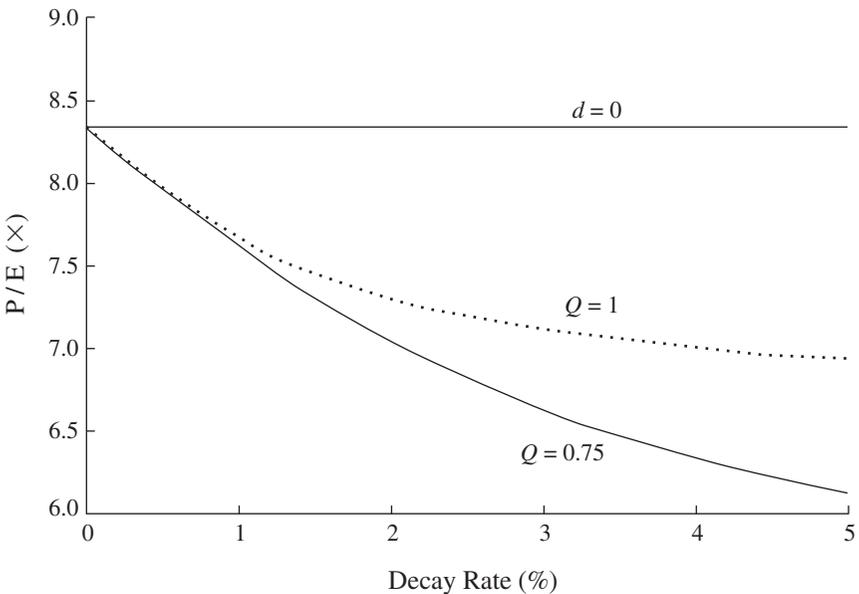


FIGURE 5.3 P/Es for Various Decay Rate Scenarios: No-Growth Model

values have very little effect. The reason is that the present-value (PV) effect of the decay is felt predominantly in the early years. If the starting point is a moderate to high ROE, as in this example with the value $r = 15$ percent, then the earnings slide in the early years, the years that count, will be identical regardless of the Q ratio that determines the subsequent level to which the earnings ultimately decline.⁸

THE PV-EQUIVALENT ROE

The decay process can also be characterized in terms of PV-equivalent earnings, $E^*(Q, d)$, or an equivalent ROE, $r^*(Q, d)$. That is,

$$\begin{aligned} P(Q, d) &= \frac{E^*(Q, d)}{k} \\ &= r^*(Q, d) \left(\frac{B}{k} \right) \end{aligned}$$

where B is the initial book value. The effective ROE, $r^*(Q, d)$, can be quickly computed from the earlier expression for $P(Q, d)$:

$$\begin{aligned} r^*(Q, d) &= \frac{k}{B} P(Q, d) \\ &= \frac{k(rB)}{B} \left\{ \left(\frac{1-d}{k+d} \right) + \left(\frac{1-d}{1+k} \right)^D \left[\frac{d(1+k)}{k(k+d)} \right] \right\} \\ &= \frac{kr(1-d)}{k+d} + r \left(\frac{1-d}{1+k} \right)^D \frac{d(1+k)}{k+d} \\ &= \frac{kr(1-d)}{k+d} + \frac{kQ}{(1+k)^D} \left[\frac{d(1+k)}{k+d} \right] \\ &= \left(\frac{k}{k+d} \right) \left[r(1-d) + Qd \left(\frac{1}{1+k} \right)^{D-1} \right] \end{aligned}$$

or

$$\frac{r^*(Q, d)}{r} = \left(\frac{k}{k+d} \right) \left[(1-d) + \frac{Qd}{r} \left(\frac{1}{1+k} \right)^{D-1} \right]$$

This ratio will clearly decline as r rises.

Finally, the relationship $E^*(Q,d) = r^*(Q,d)B$ can be used to rewrite the P/E as

$$\begin{aligned} \frac{P(Q,d)}{E} &= \left[\frac{r^*(Q,d)B}{k} \right] \left(\frac{1}{rB} \right) \\ &= \frac{1}{k} \left[\frac{r^*(Q,d)}{r} \right] \\ &= (P/E) \left[\frac{r^*(Q,d)}{r} \right] \end{aligned}$$

This expression illustrates that the basic effect of the franchise slide is to reduce the original P/E by a factor equal to the ratio of the effective ROE to the initial ROE. Thus, for example, for the case of a 5 percent a year decay down to a Q level of 0.75, the equivalent ROE will be 11 percent, which represents a 27 percent decline from the initial ROE of 15 percent. This 27 percent decline corresponds to the 27 percent reduction incurred as the P/E fell from 8.33 times to 6.12 times.

This reduction characterization is important because it comes up again later in the more realistic multiphase valuation models. Moreover, the constant-earnings formulation also frequently serves as a terminal phase for multiphase models. To the extent that the terminal phase is intended to reflect a state of competitive equilibrium, and to the extent that a (Q,d) process reasonably characterizes the resulting franchise slide, the terminal valuation in these multiphase models should also be reduced by the appropriate factor.

BASIC TWO-PHASE GROWTH MODEL

Now turn to a basic growth model that approximates many formulations encountered in practice. The model consists of two phases: The first is H years of earnings growth at an annual rate g , and the second is the full payout of the earnings level reached at the end of the first phase. The ultimate in simplicity is obtained by treating the first phase as requiring total reinvestment of all earnings (i.e., there are no cash payouts until the second phase). The upper curve in Figure 5.4 illustrates the earnings pattern associated with such a two-phase model with earnings growth of 22 percent over a 10-year period.

The first step is to determine the P/E for the standard case in which the

terminal phase consists simply of a constant earnings stream. This ratio can be easily found:

$$\begin{aligned}
 P &= 0 \frac{E}{1+k} + 0 \frac{E(1+g)}{(1+k)^2} + \dots + 0 \frac{E(1+g)^{H-1}}{(1+k)^H} \\
 &\quad + 1 \frac{E(1+g)^H}{(1+k)^{H+1}} + 1 \frac{E(1+g)^H}{(1+k)^{H+2}} + \dots \\
 &= \frac{E}{k} \left(\frac{1+g}{1+k} \right)^H
 \end{aligned}$$

Thus,

$$P/E = \frac{1}{k} \left(\frac{1+g}{1+k} \right)^H$$

This two-phase model is generally intended to reflect an initial span of growth and prosperity followed by a second-phase regression to a competitive equilibrium. The two lower curves in Figure 5.4 illustrate the earnings associated with applying the harsher (Q, d) version of competi-

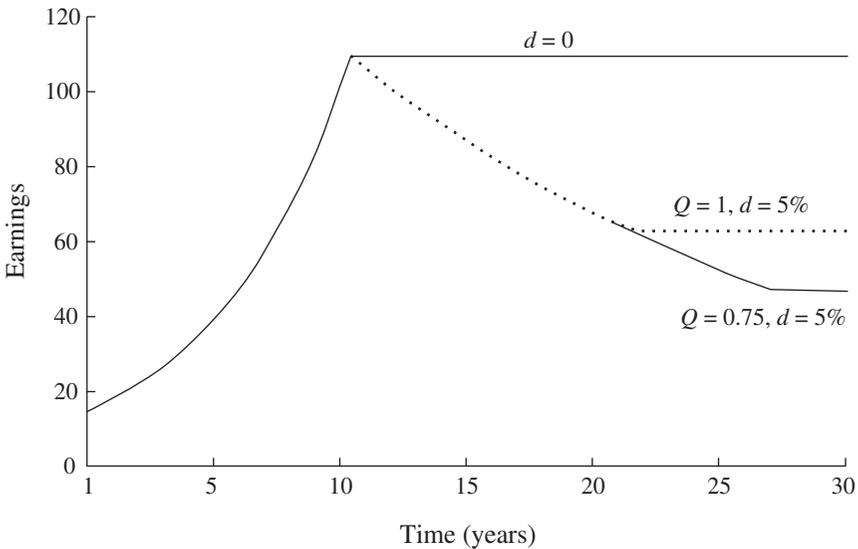


FIGURE 5.4 Earnings in a Two-Phase Growth Model

tive equilibrium to this second phase. The first phase coincides with the standard model. During the second phase, however, the earnings and payouts follow the decay paths shown. This decay process again leads to a significant reduction in P/E. Moreover, the P/E reduction induced by the (Q, d) decay turns out to depend on the earnings growth rate, with the somewhat counterintuitive result that higher growth rates incur greater percentage reductions!

Growth-Driven ROE

Some insight into these decay effects can be gained by observing that for the case of $d = 5$ percent and $Q = 0.75$, the decay time in Figure 5.4 stretches out to 16 years after the end of the growth horizon—much longer than the 10 years encountered in the no-growth model. (The contrast between the lower, no-growth curve and the upper, growth curve in Figure 5.2 illustrates that the growth case has longer decay times than the no-growth case across the entire range of decay rates.) Comparison of Figures 5.1 and 5.4 reveals immediately that the percentage earnings declines in the no-growth and growth cases are quite different: The growth case has a much larger earnings drop. With higher growth rates, the earnings naturally rise to higher levels, and the subsequent decline to a competitive level must, therefore, be all the greater. Hence, for a given decay rate, higher growth rates result in more-severe P/E reductions relative to the undecayed P/E.

A full understanding of these P/E effects requires first addressing some of the surprising ROE implications in *any* growth model. A well-known formulation is that when a portion b of earnings is reinvested at rate of return R , the earnings will grow at the rate of $g = bR$. In the highly simplistic growth model, all earnings are reinvested during the first phase, so $b = 1$ and $g = R$ (that is, the growth rate coincides with the return achieved on the reinvested earnings). Because this incremental ROE is rarely an explicit output of such models, it is not generally appreciated that, in a zero-payout situation, an assumed high growth rate corresponds to an implied correspondingly high ROE on the reinvested earnings. (With positive payouts—that is, $b < 1$ —the implicit ROE actually *exceeds* the growth rate!)

At any time t , the company's overall or total ROE, $r(t)$, is an amalgam of the incremental return on the reinvested earnings, $R = g$, and the initial ROE. The upper solid curve in Figure 5.5 shows the cumulative ROE earned on the company's *total capital base*—the initial book value together with the new investments. When the growth rate exceeds the initial ROE (i.e., when $g = R > r$), this blended ROE will rise from r at the outset and move toward $g = R$ (the top line in Figure 5.5) as the growth progresses. At the end of the growth phase, the ROE will reach a value of $r(H)$ where

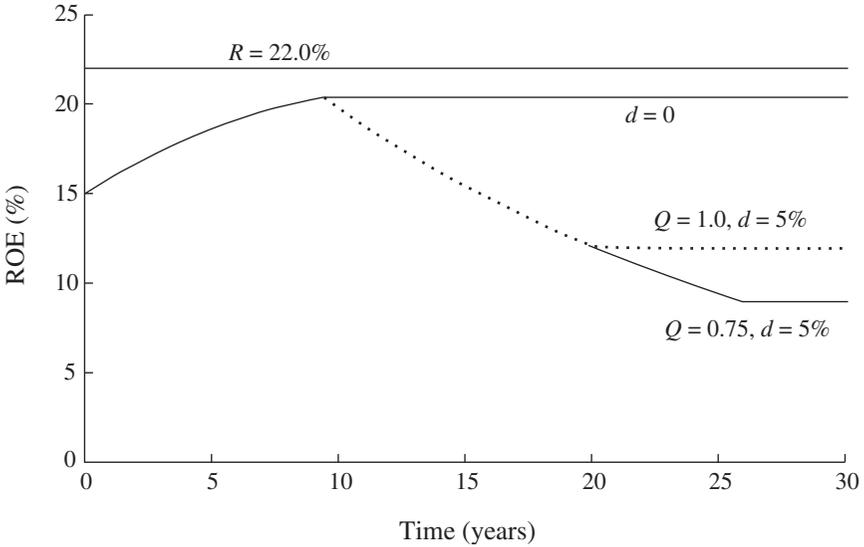


FIGURE 5.5 ROE at Time t , $r(t)$, on Cumulative Book Value during Growth and Payout Phases

$r < r(H) < g$. Indeed, when the growth period is of reasonable duration (10 years or longer), the attained ROE, $r(H)$, will be quite close to the growth rate. For example, with the base case of $H = 10$ years, $r = 15$ percent, and $g = 22$ percent, $r(H) = r(10) = 20.7$ percent. When the second phase begins, all earnings are paid out, earnings growth comes to an end, and no further additions are made to the company’s capital base. Consequently, without any competitive decay, the ROE will remain fixed at this $r(H)$ level throughout the second phase, even though this phase stretches into perpetuity (see Figure 5.5).

An important aspect to remember is that this “high water mark” ROE attained at the end of the first phase then becomes tacitly embedded in the terminal earnings flow. In the standard model, the company’s terminal earnings remain constant, but not many analysts appreciate that this fixed level of terminal earnings (the upper line in Figure 5.4) is implicitly underpinned by $r(H)$. Nor is it widely appreciated that $r(H)$ will typically have a high value that often approximates the earnings growth rate over the first H years and, moreover, that the standard model tacitly assumes that this high ROE can last into perpetuity.

Terminal ROEs in Q-Type Competition

The two-phase model is typically used in situations in which the company is expected to experience a significant burst of earnings growth for a period of time. Because the primary focus is on this growth period, the constant-earnings format for the second phase may appear to be a natural and even conservative choice. After all, the constant earnings in the second phase generate a relatively low P/E of $1/k$ for the terminal valuation at the end of the growth period.⁹ The analyst's intent in using this "minimum" P/E may be to convey the image of a company that descends into a rather bland equilibrium after an initial growth phase, thereby highlighting the initial growth phase as the primary driver of the company's valuation.

As shown earlier for the single-phase models, however, the relative level of competitiveness cannot be ascertained from the earnings level alone or from the lack of further earnings growth. One must look beyond the earnings to the more fundamental sales dynamics and/or ROE levels that actually generate those earnings.

From this fundamental vantage point, the growth process fuels a continually rising ROE that approaches the growth rate itself as the first phase lengthens. In a Q-type competitive world, sustaining this high ROE for any period of time (much less for perpetuity) would be difficult. In a sales framework, the growth process may be viewed as generating sales growth at the rate g while maintaining the same margin throughout the entire process. Moreover, once the sales zenith is achieved at the end of the first phase, then a constant-earnings second phase is tantamount to the assumption that both the high level of annual sales already attained *and the full margins* are maintained in perpetuity. To describe this situation as a form of "competitive equilibrium" is a challenge indeed.

One of the problems in addressing this paradox is analysts' understandable reluctance to squarely confront the prospect that some earnings decline may be a natural concomitant of any competitive equilibrium. This reluctance is undoubtedly reinforced by the problem of finding a simple, relatively assumption-free procedure for characterizing such an earnings decline. The (Q, d) decay process described earlier may prove helpful in this regard.

The second phase of these growth models is really no different from the single-phase payout models described at the outset. The ROE $r(H)$ attained at the end of the growth phase can be subjected to the same process of annual decay at rate d until it reaches an equilibrium level where $r(H + D) = Qk$. The result is the ROE patterns described by the lower two curves in Figure 5.5.

And once again, the effect of this decay process can be captured

through a PV-equivalent ROE, r_Q^* , that will have exactly the same formulation as obtained earlier. Moreover, the valuation effect of the (Q,d) decay process can again be simply characterized:

$$\begin{aligned}
 P(Q,d/H,g) &= \left(\frac{1}{1+k}\right)^H \left[\frac{r^*(Q,d)B(H)}{k} \right] \\
 &= \left(\frac{1}{1+k}\right)^H \left[\frac{r^*(Q,d)}{r(H)} \right] \left[\frac{r(H)B(H)}{k} \right] \\
 &= \left(\frac{1}{1+k}\right)^H \left[\frac{r^*(Q,d)}{r(H)} \right] \left[\frac{E(H)}{k} \right] \\
 &= \left(\frac{1}{1+k}\right)^H \left[\frac{r^*(Q,d)}{r(H)} \right] \left[\frac{(1+g)^H E}{k} \right] \\
 &= \left(\frac{1+g}{1+k}\right)^H \left(\frac{E}{k}\right) \left[\frac{r^*(Q,d)}{r(H)} \right] \\
 &= P(0,0/H,g) \left[\frac{r^*(Q,d)}{rH} \right]
 \end{aligned}$$

where $P(0,0/H,g)$ is the undecayed price obtained from H years of earnings growth at the yearly rate of g . And in P/E terms,

$$\frac{P(Q,d/H,g)}{E} = \left(\frac{P(0,0/H,g)}{E} \right) \left[\frac{r^*(Q,d)}{r(H)} \right]$$

Thus, once $r(H)$ is determined, the reduction factor can be readily found by using the expression developed earlier for $r^*(Q,d)$.

The computational problem is actually more likely to arise in finding $r(H)$ than in using $r(H)$ to compute $r^*(Q,d)$. This terminal ROE is rarely explicitly computed, and its calculation is somewhat complicated by its being a mixture of the initial ROE, r_0 , and the growth rate. (Of course, for the special case of $r_0 = g$, the immediate result is that $r[H] = g$.)

One way of approaching $r(H)$ is to observe that the company's book

value, $B(H)$, can be viewed in terms of the initial book value and the reinvestment of the growing earnings stream:

$$\begin{aligned} B(H) &= B(0) + E + E(1+g) + \dots + E(1+g)^{H-1} \\ &= B(0) + E \left[\frac{(1+g)^H - 1}{g} \right] \\ &= B(0) + B(0) \left(\frac{r_0}{g} \right) \left[(1+g)^H - 1 \right] \end{aligned}$$

Thus, for the base case of $r_0 = 15$ and $g = 22$ percent, the cumulative book value at the growth horizon will rise from 100 to 530. Note that this rise represents an annualized growth rate in book value of 18 percent (i.e., considerably less than the 22 percent earnings growth rate).

The $r(H)$ is then simply the terminal earnings, $E(H+1) = E(H)$, divided by this book value:

$$\begin{aligned} r(H) &= \frac{E(H)}{B(H)} \\ &= \frac{E(1+g)^H}{B(0) \left\{ 1 + \frac{r_0}{g} \left[(1+g)^H - 1 \right] \right\}} \\ &= \frac{r_0(1+g)^H}{1 + \frac{r_0}{g} \left[(1+g)^H - 1 \right]} \end{aligned}$$

This expression reduces to $r(H) = r_0 = g$ for the special case of $r_0 = g$. For a very short horizon, H approaching zero, $r(H) = r_0$. In contrast, as the growth horizon grows very large, $r(H)$ approaches g regardless of the initial ROE. For the base case, Figure 5.5 illustrates how the ROE grows from 15 percent at the outset (earnings of 15 on an initial book value of 100) to 20.7 percent by the 10th year (earnings of 110 on a total book value of 530).

Another, more intuitive way to grasp this key point of the rising level of the implicit ROE throughout the growth period is to consider a growth period of one year. In this case, the first year's earnings, E_1 , are fully reinvested, so the second year's earnings level is $E_1(1+g)$, which is then paid out at the end of the second year and in every subsequent year into perpetuity. The company's book value begins at B_0 and then grows by the rein-

vestment of the first year's earnings. Hence, the book value at the start of the second year is

$$\begin{aligned} B_1 &= B_0 + E_1 \\ &= B_0(1 + r_0) \end{aligned}$$

(Note that in this simple example, the growth in the book value is at a rate of r_0 instead of the steady earnings growth rate of $g > r_0$.) The achieved ROE at the one-year horizon is simply the going-forward earnings over the book value:

$$\begin{aligned} r_1 &= \frac{E_1(1+g)}{B_0(1+r)} \\ &= r_0 \left(\frac{1+g}{1+r_0} \right) \\ &= r_0 \left[1 + \left(\frac{g-r_0}{1+r_0} \right) \right] \end{aligned}$$

Thus, the ROE can be seen to grow over the year by a factor that depends on the extent that the earnings growth rate exceeds the initial ROE.¹⁰

The higher $r(H)$ is, the greater will be the voltage gap between the highest attained earnings and the final earnings level consistent with competitive equilibrium. The greater magnitude of this franchise slide in ROE terms is illustrated in Figure 5.5 for two decay paths ($Q = 1.0$ and $Q = 0.75$, both for a decay rate of 5 percent). With the steeper ROE (and earnings) drop, the P/E impact will be more severe under conditions of high growth. This result is also evident in Figure 5.6, which shows the plots of the P/Es associated with various growth rates and growth horizons, all for $Q = 0.75$ across a range of decay rates.

Several observations can be gleaned from Figure 5.6. On the one hand, the undecayed P/Es are naturally much higher for the high-growth cases, with the longer growth horizon leading to significantly higher levels—P/E = 19.60 and 30.05 for the 10- and 15-year horizons, respectively. On the other hand, the higher the undecayed P/E, the greater the adverse impact from the franchise slide; for example, with a 5 percent decay rate, these P/Es drop to 13.59 for $H = 10$ and 20.76 for $H = 15$. Thus, for the long horizon (15 years) with its greater earnings and ROE growth, the franchise slide's P/E effect is considerably greater (in ratio units) than for the shorter horizon (10 years), even though the decay process is deferred to the end of the 15-year horizon.

Of course, Figure 5.6 is based on the margin-erosion case in which $Q =$

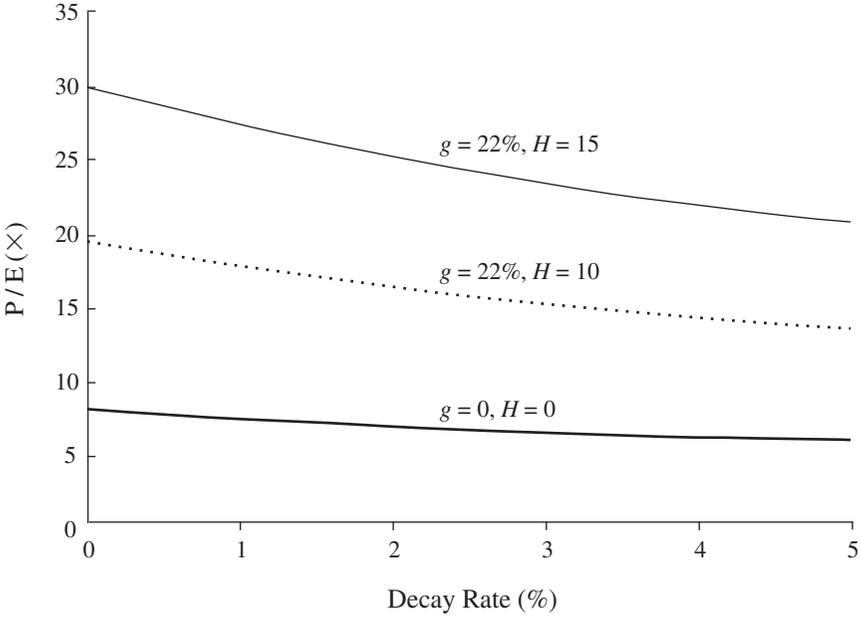


FIGURE 5.6 P/Es for No-Growth and Growth Models: $Q = 0.75$

0.75. In a margin-enhancement case, with a 5 percent annual growth toward a $Q = 2$, the P/E would rise to 21.34 and 31.74, respectively, for the 10- and 15-year growth horizons.

The preceding results are based on a highly simplified model where all growth-phase earnings are retained and reinvested. A fair question is whether these patterns would be materially altered for companies with positive dividend payout ratios. It turns out that, although higher dividend payouts and longer growth horizons do moderate the impact, these terminal-phase P/E effects remain significant across a wide range of growth situations.

Basically, the robust quality of these P/E effects comes from their being fundamentally driven by the magnitude of the return on new investments. In the expression for the P/E in this article, recall that the decay effect is determined by the factor $[r^*(Q,d)]/r(H)$. The PV-equivalent $r^*(Q,d)$ reflects the voltage gap between the high-water-mark $r(H)$ and the ultimate competitive equilibrium at an ROE of Qk . The wider this ROE gap, the more significant the decay effect. In turn, this ROE gap is largely determined by the return on new investments. With a high R , the company's overall ROE, $r(t)$, will rise rapidly toward R . Thus, when R is high, $r(H)$ will tend to be high and the more severe decline to competitive ROE levels will lead to lower P/Es.

Moreover, high R values tend to be an intrinsic feature of virtually any productive growth situation. In the preceding development, the assumption was that $R = g$, so high growth and high R values automatically went hand in hand. Even in the more general situation with dividend payouts, however, the value of R is implicitly determined by

$$R = \frac{g}{b}$$

where b is the earnings retention factor. This formula makes clear that higher dividend payouts (i.e., lower b values) actually imply higher R values. For example, with a retention factor of 0.4, even a relatively modest earnings growth rate of 10 percent corresponds to an $R = 25$ percent. Such high ROEs attract competitive attention and, ironically, may ultimately lead to steep ROE slides. In this sense, growth prospects and the vulnerability to Q -type competition are inextricably bound together.

CONCLUSION

The results discussed here raise interesting questions about both the valuation process for high-growth stocks and the subtle implications of standard growth models. As one delves deeply into patterns of company growth, one finds that even simple earnings growth is implicitly associated with considerably more-complex processes than are assumed in standard growth models. At the beginning, the typical high reinvestment rates that fuel earnings growth also add to the company's capital base and enhance its production and distribution capacity. The increased sales and earnings generated by these capacity enhancements are sources of high margin flows, which is fine because they provide substantial profits.

The problem arises when these high-margin earnings move toward competitive equilibrium. With a Q -type definition of such an equilibrium, the high-margin flows must descend toward margin levels that would just satisfy new competitors. To the extent that an investor would begin to receive a substantial payout only in the postgrowth period, such a margin shift could materially affect the company's valuation. In essence, reinvestment-driven growth represents a leveraging of competitively vulnerable earnings. It is tantamount to a repeated doubling-up of the stakes in the face of escalating risks. If the franchise ride can be extended, however, with new or existing products, these terminal-phase effects may be muted.¹¹

This chapter focused on the one- and two-phase valuation models, but the general thrust of the argument applies to any multiphase model that uses a constant-earnings assumption in the terminal phase. Insuffi-

cient attention has been given to this problem of how the high ROEs that are typically embedded in the terminal phase might fare in the face of serious global competition. By recognizing the importance of such effects, the analyst should be able to generate more-realistic characterizations of a firm's long-term earnings and, in turn, be able to develop better estimates for its valuation.

The author would like to express gratitude for the many helpful suggestions relating to this chapter from Peter Bernstein, Paul Davis, Benson Durham, Hans Erickson, Scott Evans, Robert Ferguson, Eric Fisher, James Fleischmann, William Gray, Brett Hammond, Leo Kamp, Stanley Kogelman, and Richard Michaud.

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P/E Forwards and Their Orbits

From a theoretical viewpoint, earnings growth that follows the consensus should—all else being equal—result in rising or falling P/Es that provide the equity investor with the price appreciation needed to just meet the market's total return expectation. For a given earnings growth rate, this expectational equilibrium should move a fairly priced P/E toward a sequence of “forward” values that ultimately trace out an implied “P/E orbit.” For two-phase models with the typically higher level of first-phase growth, the P/E orbit will trace a smooth year-by-year descent from the starting P/E to the terminal, second-phase P/E. These descending forward P/Es provide a baseline that represents the inertial pricing paths implied by an unaltered consensus. Analysts who assign P/E estimates that diverge from this baseline path presumably believe that they have special insights that justify such a departure from the consensus-implied level. Awareness of the P/E orbit concept should help analysts avoid falling for the classic trap of “P/E myopia”—misestimating the prospective return by automatically applying a current P/E to future earnings levels derived from consensus growth projections.

In earlier work on franchise value and the price-to-earnings ratio, the focus was on valuation and how a company's long-term prospects determine fair value under equilibrium conditions (Leibowitz and Kogelman 1994; Leibowitz 1997a, b). In the current study, the focus shifts to the time path of

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P/Es under similar equilibrium conditions. Given the current P/E values, how might one theoretically expect the P/Es to change with various earnings growth rates over the next few years? By analogy to fixed-income terminology, these equilibrium-implied future P/Es can be labeled “P/E forwards,” and their trace over time can be called “P/E orbits.” This seemingly innocent approach leads to a number of striking implications. For example, it shows that high-growth stocks can induce a P/E myopia that can lead otherwise thoughtful analysts to an overestimation of holding-period returns.

At the outset, note that the equilibrium framework here, with its assumption of consistent fair pricing, is far from descriptive of market realities. Consequently, many of the results may at first seem counterintuitive or even paradoxical. The utility of this framework does not rest on its direct, literal applicability. Rather, the P/E forward orbits, by tracing out the short-term implications of virtually all standard valuation techniques based on discounted cash flows, can be viewed as characterizing baseline behavior from which the market’s departures can be more clearly delineated. The practitioner can then assess the “beyond-model considerations” that might be sufficiently powerful to drive P/Es away from their model-prescribed paths.

SHORT-TERM RETURN

The short-term holding-period return, HPR , from an equity investment is the sum of dividend receipts, D , and price appreciation, ΔP , divided by the initial price, P :

$$HPR = \frac{D}{P} + \frac{\Delta P}{P} \quad (6.1)$$

If b is the fraction of the earnings, E , retained and reinvested in the company, then the dividend can be expressed in terms of the payout fraction $1 - b$:

$$HPR = \frac{(1-b)E}{P} + \frac{\Delta P}{P} \quad (6.2)$$

The price appreciation over the year can be related to the changes in the earnings and the P/E:

$$\Delta P = (P'/E')E' - (P/E)E \quad (6.3)$$

where P'/E' and E' represent values at the end of the year.

Growth in earnings, g , is clearly a key variable, and it can be incorporated by noting that

$$E' = (1 + g)E \tag{6.4}$$

Hence,

$$\begin{aligned} \Delta P &= \left[(P'/E')(1 + g) - (P/E) \right] E \\ &= \left[\frac{(P'/E')}{P/E} (1 + g) - 1 \right] (P/E) E \\ &= [(1 + g_{P/E})(1 + g) - 1] P \\ &= [g + g_{P/E}(1 + g)] P \end{aligned} \tag{6.5}$$

where $g_{P/E}$ is the percentage change in the P/E itself, or

$$g_{P/E} \equiv \frac{(P'/E') - (P/E)}{(P/E)} \tag{6.6}$$

The notion of “P/E growth,” as represented by $g_{P/E}$, is admittedly not part of the standard investment vocabulary, but the subsequent discussion will show how $g_{P/E}$ can prove to be a highly useful analytical device.

With this new expression for the price appreciation, the holding-period return can be written as

$$HPR = \frac{1 - b}{P/E} + g + g_{P/E}(1 + g) \tag{6.7}$$

Throughout this chapter, the retention factor b is treated as fixed (even though there are potential interactions between b , g , and $g_{P/E}$).

The last two terms of Equation 6.7 are simply different components of price appreciation. Thus, the growth term g actually reflects price move ΔP_1 associated with a constant P/E applied to the earnings increment:

$$\begin{aligned} \frac{\Delta P_1}{P} &= \frac{(P/E)(E' - E)}{P} \\ &= \frac{(P/E)(gE)}{P} \\ &= g \end{aligned} \tag{6.8}$$

Similarly, the $g_{P/E}$ term reflects price movement ΔP_2 derived from the change in the P/E that is applied to the new earnings level:

$$\begin{aligned}\frac{\Delta P_2}{P} &= \frac{[(P'/E') - (P/E)]E'}{P} \\ &= \left[\frac{(P'/E') - (P/E)}{P/E} \right] (E'/E) \\ &= g_{P/E}(1 + g)\end{aligned}\tag{6.9}$$

Over short periods, the product of the two growth terms (with both expressed as fractions) will generally be small, so an analyst can usually rely on the simplifying approximation

$$\begin{aligned}\frac{\Delta P_2}{P} &= g_{P/E} + g_{P/E}g \\ &\cong g_{P/E}\end{aligned}\tag{6.10}$$

To maintain clarity in the subsequent development, I shall soon adopt this approximation without further comment and then use the following simple relationship for holding-period return:

$$HPR = \frac{1-b}{P/E} + g + g_{P/E}\tag{6.11}$$

The exact expressions are presented in Appendix 6A.¹

EQUILIBRIUM ASSUMPTIONS

To this point, the holding-period return equation is no more than simple algebra and thus totally general. The next step is to describe the situation under certain conditions of equilibrium. The imposition of these equilibrium conditions imbues the basic tautology of holding-period returns with powerful (and even somewhat curious) economic implications.

First, under equilibrium, the holding-period return corresponds to the expected market return, \bar{k}_p , for the relevant risk class during the t th holding period (in this article, generally one year). Let E_t reflect the *normalized* level of next year's earnings and \bar{g}_t represent the expected growth in this normalized earnings level. Keep in mind that \bar{g}_t is the expected earnings growth only over the single period t ; it is not an assumed constant growth rate for all future periods. Indeed, the company's future may be viewed as

encompassing a series of prospective growth rates that could change, even radically, from one period to the next. For equilibrium, the consensus set of earnings projections over time must be compatible with the stock's current price. Many series of earnings projections may satisfy this requirement, but at this point, the current price is the only concern, and the current P/E can be viewed as a "sufficient statistic" that embeds all of the market's relevant expectations.

Now, if $\bar{g}_{(P/E)_t}$ is the expected percentage change in this equilibrium $(P/E)_t$, then

$$\bar{k}_t = \frac{(1-b)}{(P/E)_t} + \bar{g}_t + \bar{g}_{(P/E)_t} \quad (6.12)$$

Equation 6.12 represents a fundamental statement of the sources of what is now the *expected* short-term return, and it has been presented in various forms in the academic literature (for example, Wilcox 1984; Estep 1987). This formulation should play a central role in market dialogue, but practitioners commonly simplify this result even further by focusing on only the first two elements of return—dividend yield and earnings growth. In other words, market practitioners often act as if the return equation, Equation 6.12, had the reduced form of

$$\bar{k}_t = (1-b) \left(\frac{E}{P} \right)_t + \bar{g}_t \quad (6.13)$$

In effect, this formulation is based on an implicit assumption that the P/E will be stable—that is, that $\bar{g}_{(P/E)_t}$ is zero.

The tacit assumption of P/E stability under equilibrium is pervasive, but as spelled out in later sections, this myopic approach to future P/Es has a number of implications that could lead the analyst far from the intended path. One example is the significant misestimation of prospective return when, based on a consensus projection of earnings growth, a constant P/E is applied to a future earnings level. With high-growth stocks, this constant-P/E approach can seriously overstate prospective returns. A second example is the confusion that can easily arise between the short-term return equation and the well-known Gordon model for P/E valuation (Equation 6.18). At first glance, these formulations appear to be equivalent. The Gordon model, however, is based on a constant earnings growth over infinitely long times; hence, it represents a vastly different concept from the short-term return model.

To fully appreciate the distortions introduced by forced P/E stability,

an exploration is needed of P/E movement under conditions of full equilibrium.

SIMPLEST ORBIT: NO DIVIDENDS

The clearest possible example involves a growth stock that pays no dividends (i.e., $b = 1$). In such a case, the equilibrium return becomes

$$k = g + g_{P/E} \quad (6.14)$$

To simplify the notation, I have dropped the bars and the subscript in expressing Equation 6.14, but keep firmly in mind that we are dealing with expected values over a single one-year period, t .

For a numerical example, start with $k = 12$ percent as the market discount rate for all stocks discussed throughout this article. Suppose a stock trades at a P/E multiple of 25 and the company's earnings growth over the coming year is expected to be 16.5 percent. (The rationale for choosing this particular growth rate will become evident later.) Given this earnings growth rate and the expected market return of 12 percent,

$$\begin{aligned} g_{P/E} &= k - g \\ &= 12\% - 16.5\% \\ &= -4.5\% \end{aligned}$$

This result suggests that over the course of the year, the P/E should be expected to fall by 4.5 percent (from the current 25 to the forward P/E of 23.88).

This result follows directly from the equilibrium return equation (Equation 6.14), but it is surprising at first. Why should the P/E register such a sharp decline over the course of a single year, especially after a 16.5 percent growth in earnings? The result is grounded in the assumption that the initial P/E of 25 represents fair equilibrium pricing. In other words, the fair-pricing assumption implies that, given the long-term prospects for the company, an appropriately specified valuation model (using $k = 12$ percent as the discount rate) would validate the P/E of 25. (Note that many future sequences of annual earnings growth rates can lead to an initial fair value of $P/E = 25$. In the example here, only the first year of earnings growth need be specified to be 16.5 percent.)

Under the stated assumptions, the company's pricing should move its initial P/E to another fair value, with the investor receiving the expected return of 12 percent over the course of the year. With expected earnings growth of 16.5 percent for the coming year, a fixed P/E will provide a 16.5

percent return, far in excess of the 12 percent expected return. The only way to bring the equilibrium return down to the expected level is to have the expected P/E decline of 4.5 percent.

Now, of course, there may be a myriad of reasons why a specific investor may hold to the belief that the P/E will not experience any such decline—improvement in the stock’s prospects, the market’s better appreciation of the stock’s promise, the salutary effect of realized earnings growth (even if it only confirms the previously expected high 16.5 percent level), general market improvements, changes in required discount rates, and so on. All of these events constitute a departure, however, from the equilibrium conditions as they have been defined. Hence, excluding the P/E movements induced by such nonequilibrium factors, the stock’s P/E should be “expected,” given a total holding-period return of 12 percent, to decline by 4.5 percent.

Now, suppose the same situation prevails in the second year. Then, the P/E should again decline by 4.5 percent, from 23.88 to 22.80. As long as earnings growth remains at 16.5 percent (and the market discount rate stays at 12 percent), the P/E should continue to decline by 4.5 percent year after year, as depicted by the upper curve in Figure 6.1.

As an example of such a company, consider a pharmaceutical company that is currently enjoying a healthy 16.5 percent earnings growth from sales of a proprietary drug. Unfortunately, the drug will go generic within a few years. If the company’s research pipeline is unpromising, this

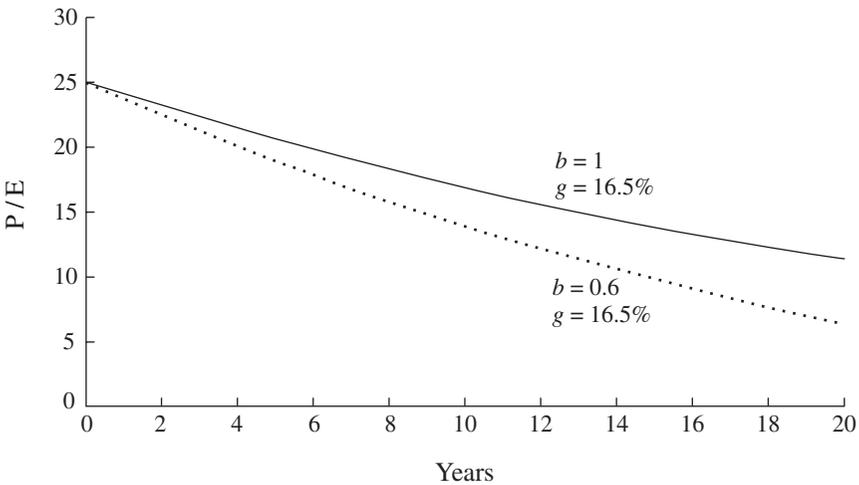


FIGURE 6.1 P/E Orbits for 16.5 Percent Earnings Growth and Retention Factors of $b = 1$ and $b = 0.6$

company's eroding franchise could bring about just such a decline in P/E in the near term as discussed here.

At this point, a few words of caution are needed so that Figure 6.1 will not be misinterpreted. First, the descending P/E orbit does not imply any decline in the equity price. The 16.5 percent earnings growth more than offsets the 4.5 percent P/E decline, so the corresponding stock price trajectory would be one of 12 percent positive growth, just as one would expect with a 12 percent discount rate. Second, the basic assumption in Figure 6.1 is that the initial P/E multiple of 25 represents a fair-value discounting of the company's future earnings growth. Although such prospects may incorporate 16.5 percent earnings growth in the early years, such a high level of earnings growth cannot continue indefinitely. With a 12 percent discount rate, perpetual earnings growth at 16.5 percent would call for an infinite P/E and, therefore, would violate the assumption that $P/E = 25$ represents fair pricing. Figure 6.1 should thus be viewed as portraying the P/E descent for just so long as the earnings growth remains at 16.5 percent.

Also, remember that the declining orbit reflects a constant set of high-growth expectations. In the very different situation in which the market's expectations have *just shifted* to new and higher levels of growth, the P/E should *rise* to a new fair value that reflects the more favorable prospects. Once the fair-value P/E is reached, however, any consensus growth rate that exceeds the market's expected return should theoretically lead to a declining orbit similar to that in Figure 6.1.

Finally, the P/E orbit depicted in Figure 6.1 does not depend on the choice of 25 as the starting P/E. As long as $k = 12$ percent and $g = 16.5$ percent, the projected P/E "should" decline by 4.5 percent in each and every year. This relationship holds regardless of the starting P/E value. Thus, with the expected return fixed at $k = 12$ percent and given a 16.5 percent expected earnings growth for the forthcoming year, the same 4.5 percent decline holds for all P/E values.

P/E ORBITS FOR HIGH-GROWTH STOCKS

The preceding argument was based on the simplest case, the case of full reinvestment, where $b = 1$ and no dividends are paid. The question naturally arises of how many of the preceding results carry over to the general case when $b \neq 1$ and, as in Equation 6.12,

$$k = \frac{(1-b)}{P/E} + g + g_{P/E} \quad (6.15)$$

The percentage P/E change then becomes

$$g_{P/E} = k - g - \frac{1-b}{P/E} \tag{6.16}$$

The year-end ratio, P'/E' , can be expressed as

$$\begin{aligned} P'/E' &= (1 + g_{P/E})(P/E) \\ &= \left[1 + k - g - \left(\frac{1-b}{P/E} \right) \right] (P/E) \\ &= (1 + k - g)(P/E) - (1 - b) \end{aligned} \tag{6.17}$$

Thus, for high-growth stocks, the P/E again undergoes a percentage decline of $k - g$, but now, it does so together with an additional fixed decrement of $1 - b$.

For example, consider the earlier situation of $g = 16.5$ percent, $P/E = 25$, and now $b = 0.6$ (i.e., 60 percent of the earnings is retained and the remaining 40 percent is distributed as dividends). At a P/E multiple of 25, the dividend yield becomes $0.4/25 = 1.6$ percent. After the first year, the forward P/E becomes²

$$\begin{aligned} P'/E' &= (1 + k - g)(P/E) - (1 - b) \\ &= (1 + 0.12 - 0.165) 25 - (1 - 0.6) \\ &= 23.48 \end{aligned}$$

The one-year-forward P/E in the dividend-paying case is lower than that computed earlier for the no-dividend case. The reduction in the forward P/E comes from the need to offset the higher excess return provided by the positive 1.6 percent dividend return added on top of the 16.5 percent earnings growth. If the 16.5 percent growth were to be continued for subsequent years (but not indefinitely, as discussed earlier), the result would be the P/E orbit presented as the lower curve in Figure 6.1. Unlike the preceding example, the dividend-paying case has percentage P/E declines that become more severe as time progresses.

P/E ORBITS FOR LOW-GROWTH STOCKS

The preceding examples dealt with high-growth situations, in which a P/E descent was required to offset the high level of growth. For low-growth stocks, the same formulation leads to continuous P/E change, but now, the

change results in an *ascending* P/E orbit. The upper curve in Figure 6.2 displays this ascending P/E for an earnings growth rate of 8 percent and a starting P/E of 25.

Keep in mind that the P/E orbits in Figure 6.2 are derived from the overriding assumption that all these stocks fall into a risk class that requires a 12 percent expected return. For stocks with a growth rate of only 8 percent and a dividend yield of 1.6 percent, the remaining 2.4 percent of required return must be generated by expected P/E appreciation—hence, the ascending P/E orbit.

Again, movement toward a higher P/E in the face of lower earnings growth seems contrary to basic intuition. But remember that we are not talking about a change in *expectations* from high growth to a lower rate of growth. In the equilibrium framework, the consensus investor *expects* a 12 percent total return, *expects* an 8 percent earnings growth, and *expects* a 1.6 percent dividend yield over the coming year. The only way such a consensus investor will invest in such a security, all else being equal, is if the P/E is also *expected* to increase by 2.4 percent. Any P/E increase below this “required level” will be disappointing, and any greater increase will be a source of excess return.

The P/E orbit for $g = 8.0$ percent depicted in Figure 6.2 appears to rise without limit. Of course, this cannot be, either in practice or in reasonable theory. A P/E of 25 (or higher in the subsequent years) is inconsistent with a company that can increase earnings only at 8.0 percent year in and year out. Thus, the 8.0 percent P/E orbit in Figure 6.2 must be viewed as the

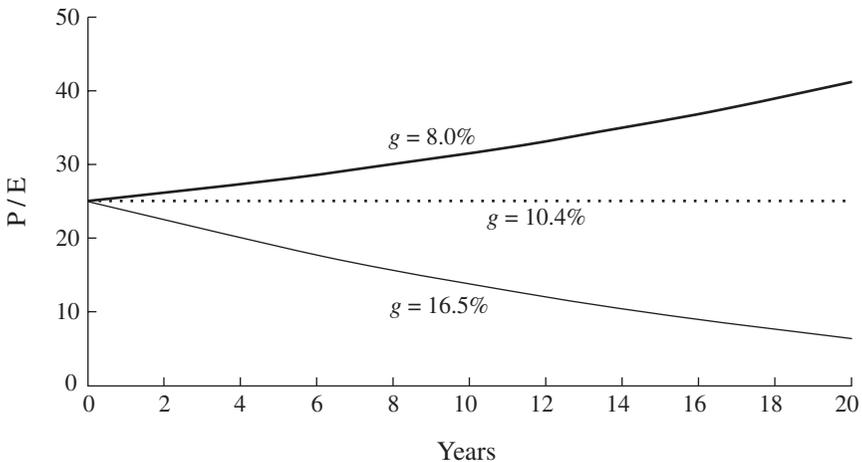


FIGURE 6.2 P/E Orbits for Growth Rates of 16.5 Percent, 10.4 Percent, and 8.0 Percent with Starting P/E of 25 and $b = 0.66$

path of the early years for a company whose earnings growth must accelerate at some point in the future to justify its high current P/E.

An example of a low-growth company with a high and growing P/E might be a pharmaceutical company that has low current earnings but enjoys a magnificent pipeline of drug prototypes. The new drugs constitute a sizable franchise that will grow in value as their approval and launch times draw closer.

THE STABLE P/E

One of the most widely used valuation formulas is based on the assumption of *perpetual* growth at a constant rate g where $g < k$:

$$P/E = \frac{1-b}{k-g} \tag{6.18}$$

This formulation is often referred to as the “Gordon model” (Gordon 1962; Ferguson 1997). Figure 6.3 illustrates the Gordon P/E values for various retention rates across a range of growth rates. Note that only a relatively narrow range of growth rates gives rise to reasonable P/E values. The

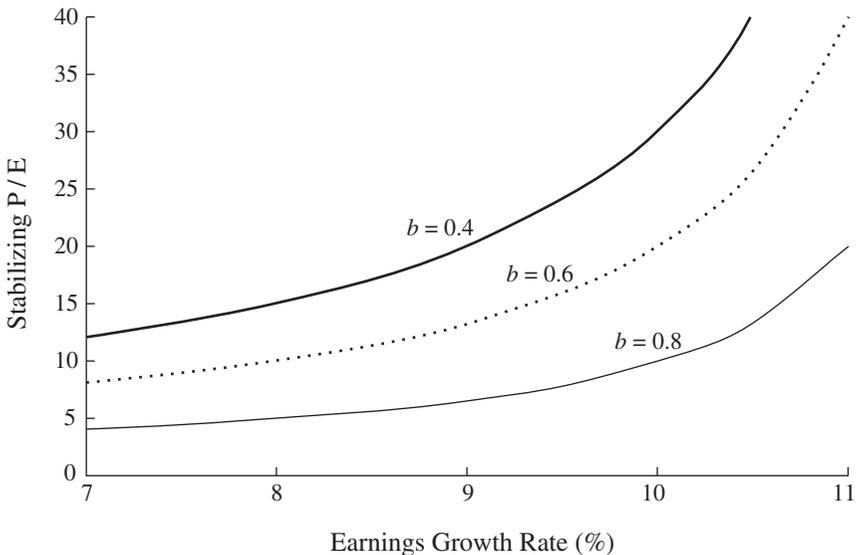


FIGURE 6.3 Stabilizing P/Es (Equal to Gordon P/Es) for Various Growth Rates and Retention Factors

Gordon P/E formula is typically derived from long-term models that discount a perpetual growth of dividends (Gordon; Modigliani and Miller 1958).

A very different framework that leads to the same Gordon formula can be derived from the short-term expectational requirement stated in Equation 6.15 under the assumption that the P/E remains stable over the one-year period (i.e., that $g_{P/E} = 0$). For a given earnings growth rate g , one can solve for the starting P/E that leads to a stable P/E over the next year³

$$(P/E)_s = \frac{1-b}{k-g} \quad (6.19)$$

Thus, this short-term, stable $(P/E)_s$ value can be expressed by the exact same formula as the long-term Gordon formula—Equation 6.18. There is a vast difference, however, between the one-year result of Equation 6.19 and the interpretation of the long-term versions of this equation. In contrast to the long-term interpretation, which is based on a growth rate that is fixed forever, the short-term version says that *one-year's* growth at g will produce a stable P/E *if and only if* the starting P/E happens to coincide with the stabilizing P/E, $(P/E)_s$.⁴

The stabilizing P/E ratio can also serve as the critical level in “bifurcated” orbits. That is, for a given fixed growth rate g , any starting P/E above $(P/E)_s$ will have an ascending orbit and any starting P/E below $(P/E)_s$ will have a descending orbit. And, of course, when the starting P/E is $(P/E)_s$, the orbit will simply be a horizontal line.⁵

An equivalent *short-term* interpretation is found by solving for the stabilizing growth rate, g_s :

$$g_s = k - \frac{1-b}{P/E} \quad (6.20)$$

For a starting P/E, g_s is the short-term earnings growth that will provide P/E stability for a one-year period. Of course, if g_s persists for two years, then P/E stability will last two years, and so on. As the duration of growth at g_s extends longer and longer, the short-term and long-term interpretations converge: The $(P/E)_s$ is the one P/E that will remain stable with continued growth at g_s , and $(P/E)_s$ is the fair price for a company with a perpetual growth at the fixed rate g_s . Thus, for a given starting P/E, earnings growth at g_s not only projects a stable P/E over the coming years but, when continued in perpetuity, serves to validate the given P/E as being a consistent fair valuation.

One dramatic way of underscoring the key role of g_s is to restate the

earlier observation in the following form: Under equilibrium conditions, the P/E will remain stable over any given year *if and only if* the earnings growth coincides with the stabilizing rate g_s .

If the starting P/E is the 25 that was used in the earlier examples, then P/E stability will be achieved when earnings growth proceeds at the rate

$$\begin{aligned} g_s &= k - \frac{1-b}{P/E} \\ &= 0.12 - \frac{0.4}{25} \\ &= 10.4\% \end{aligned}$$

Thus, at $g = 10.4$ percent, the P/E will remain unchanged, providing an orbit that consists of a single horizontal line.

In Figure 6.2, where the P/E orbits for various growth rates are shown, the central role of the stabilizing growth rate $g_s = 10.4$ percent is evident. For growth rates that exceed the stabilizing g_s value, the P/E orbit is descending. For growth rates below g_s , the orbit is ascending.⁶

Clearly, a constant growth rate (other than the stabilizing rate) will drive the orbit into a continual ascent or descent, neither of which makes sense over the long term. Thus, to achieve “sensible” orbits, the growth rate must undergo at least one future shift that is sufficient to change the orbit’s basic direction. The simplest such orbital shift is a transition to a stabilizing growth rate that produces a horizontal orbit from that point forward. Such an orbit represents a going-forward version of the classic two-phase model.

TWO-PHASE MODELS

The simplest dividend discount model (beyond the trivial single-phase model) is the two-phase model, in which one growth rate holds prior to a defined horizon and then a second growth rate prevails in perpetuity. A general characterization of P/E behavior can now be described for this widely used class of valuation models.

In the most common situation, the first phase has a higher growth rate than the final phase (Damodaran 1994; Fairfield 1994; Peterson and Peterson 1996). In such cases, the starting fair-value P/E is always higher than the final P/E. The P/E descends along its orbit until the horizon point, where it should match the stable P/E of the final phase.

As an illustration, consider the earlier example with $b = 0.6$, $g = 16.5$ percent, and starting P/E = 25. After a 10-year initial phase of 16.5 percent

growth, suppose the company enters a final phase consisting of perpetual growth at 9.14 percent. The final (stable) P/E associated with this terminal growth rate will be

$$\begin{aligned} P/E &= \frac{1-b}{k-g} \\ &= \frac{0.4}{0.12-0.0914} \\ &= 14 \end{aligned}$$

The resulting P/E orbit for this two-phase model is shown in Figure 6.4. The P/E starts at 25, descends year by year, and then stabilizes at the final P/E value of 14 for the remainder of time. Note that the two growth rates in this example totally determine that 25 is a fair value for the starting P/E.

This example clarifies why the P/E descent seems counterintuitive but, in fact, makes sense in the context of fair valuation. The high growth rate in the first phase leads to the high starting P/E value of 25. From this height, the P/E must move downward to its final-phase P/E of 14. It is, therefore, hardly surprising that the early sequence of declines in a fair-value P/E follows the orbit depicted in Figure 6.4. Similarly, in the relatively unusual case in which a stock has a lower growth rate in its first phase, the

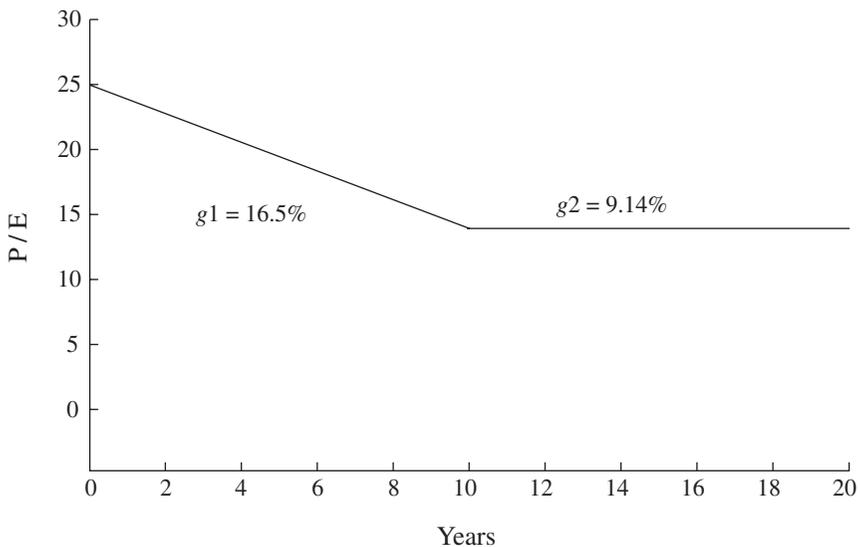


FIGURE 6.4 P/E Orbit for a 10-Year Two-Phase Model with Terminal Growth of 9.14 Percent and Terminal P/E of 14

fair value for the starting P/E would be expected to be lower and then rise until it ultimately reaches its final-phase level.

CONSISTENT-ORBIT REQUIREMENTS

Suppose the terminal growth rate remains 9.14 percent and the terminal P/E is 14. Then, to attain the fixed horizontal orbit as the ultimate outcome, the initial growth phase must be stringently constrained. As described previously, for a 10-year initial phase, a constant growth rate of 16.5 percent is required for the P/E to descend from its starting value of 25 to the terminal P/E of 14. With other growth rates for the initial 10-year period, the terminal P/E of 14 will not be reached even if the subsequent growth rate always shifts to the same terminal rate of 9.14 percent. This effect is illustrated in Figure 6.5, where the lower initial growth rate of 8.0 percent leads to an ever-ascending orbit and the higher initial growth rate of 20.0 percent results in an unending descent. The only way the terminal P/E of 14 can be reached in exactly 10 years is to have an initial growth rate of 16.5 percent. Thus, for a given starting P/E, only certain combinations of initial and final growth rates lead to what might be called “consistent orbits” (i.e., P/E paths that provide the expected 12 percent return on an ongoing basis).⁷

With different starting P/E levels, different growth rates are naturally needed to launch the P/E into a given terminal P/E. For example, with the

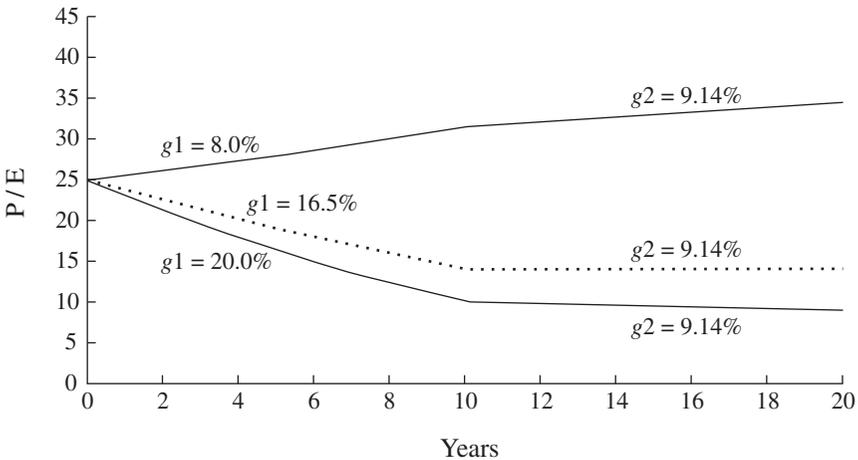


FIGURE 6.5 Two-Phase Model with Various Initial Growth Rates but Same Terminal Growth of 9.14 Percent

initial growth phase still 10 years and the final P/E at 14, a starting P/E of 18 would require 12.30 percent initial growth whereas a starting P/E of 12 would require a growth rate of only 7.25 percent. The P/E orbits for these three initial conditions are depicted in Figure 6.6.

Of course, with initial phases of various durations, a dramatic shift can occur in the growth rate required to maintain a consistent orbit. For example, as shown in Figure 6.7, with a starting P/E of 25, if the initial phase is shortened to 5 years, a 23.50 percent growth rate is needed to achieve consistency with a terminal P/E of 14. With the initial phase lengthened to 15 years, the initial growth rate needs to be 14.25 percent.⁸

Figure 6.8 provides a general characterization of the initial growth rates required, given a range of initial-phase durations, to achieve consistent orbits. The terminal phase for these orbits is fixed at a 9.14 percent growth rate and a corresponding P/E of 14. Figure 6.8 displays the first-phase growth rate and the number of years that this rate must persist to achieve a consistent orbit with three starting P/Es. The top curve fits the basic example of a starting P/E of 25. The three points marked indicate the required first-phase rates of 23.50 percent for 5 years, 16.50 percent for 10 years, and 14.25 percent for 15 years. In very short growth phases, extraordinarily high growth rates are required for consistency. As the duration of the initial growth phase lengthens, the greater time reduces the required level of initial earnings growth but the required growth rate remains challenging (e.g., for a starting P/E of 25, even with a 20-year duration, the initial-phase growth rate must be sustained at greater than 13 percent). It

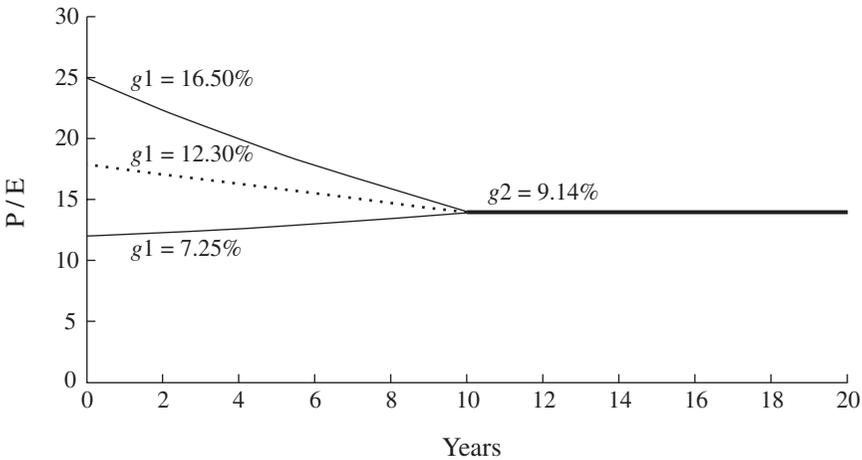


FIGURE 6.6 Ten-Year Two-Phase Model with Various Starting P/Es and Required Initial Growth Rates

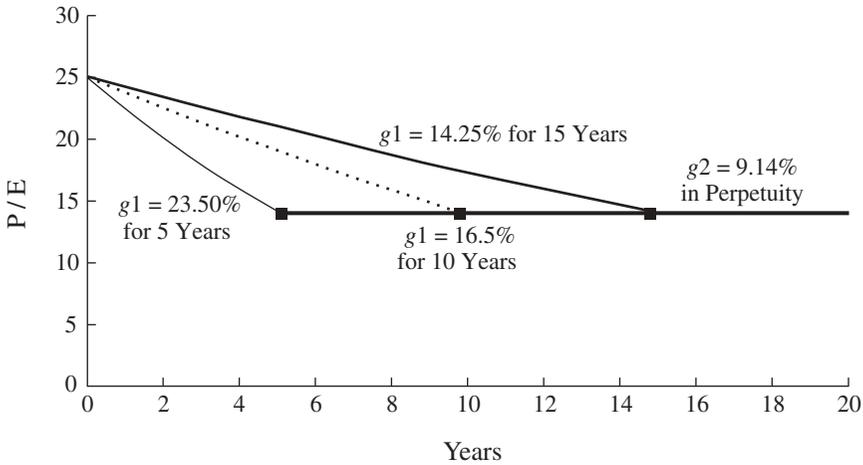


FIGURE 6.7 Two-Phase Model with Various Initial Durations and with Initial Growth Rates Set to Achieve Consistent Orbits

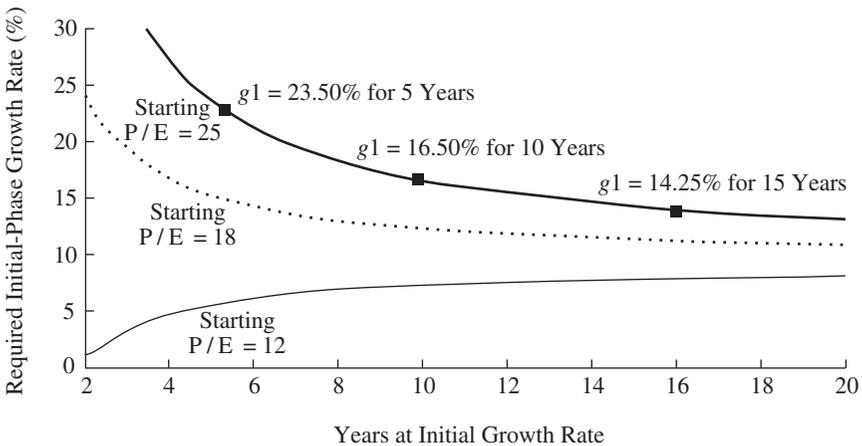


FIGURE 6.8 Required Initial-Phase Growth Rates and Horizons to Achieve Consistent Two-Phase Orbits with Terminal P/E = 14 and Terminal Growth = 9.14 Percent

may be a difficult call deciding which is the more challenging duration and growth combination—a short burst of extremely high growth or a longer period of more-moderate growth that is still significantly higher than the terminal growth.

The growth rates in Figure 6.8 can also be viewed as the envelope of growth rates required to provide the assumed 12 percent annual return.

With the starting and terminal P/E ratios set at 25 and 14, respectively, earnings growth that remains consistently below the “required curve” will naturally depress market returns. Various forms of this type of analysis have been used to project market returns over intermediate time periods (see Bogle 1999).

As shown in Appendix 6A, the basic concept of P/E orbits can be generalized in many ways, some of which can lead to extremely complex formulations. However, the key findings presented here remain the same: Consensus growth rates have strong implications for the level of expected future P/Es.

P/E MYOPIA

Tracing out the P/E orbit brings to the surface several of the problems inherent in standard valuation models. In many short- and intermediate-term models, earnings are assumed to grow at a specified rate until some given horizon date—anywhere from 1 year to 10 years hence. Then, the attained earnings level on the horizon date forms the basis for an estimated terminal price. Unfortunately, an all-too-common tendency is to determine this terminal price by simply applying the current P/E to the horizon earnings level. In other words, the P/E is simply assumed to remain stable.

Admittedly, the assumption of P/E stability has the undeniable appeal of great simplicity in analyses that already have more than enough complexity. A stock’s current P/E level naturally has much more reality than future projections, which are necessarily fuzzy. So, the temptation to adopt a myopic P/E focus and stick with the current P/E as the most likely horizon P/E level is natural. But, as the preceding examples show, the assumption of P/E stability is highly questionable—especially when a high rate of earnings growth prevails in the early years. To the extent that high growth rates and the dividend yield (if any) exceed the expected return, the baseline estimate for forward P/Es should follow the orbital descent to lower values.

Many analysts fail to appreciate just how powerful a set of conditions are implicitly invoked when the notion of a stable P/E is embraced. Table 6.1 shows that even over a short (one-year) period, P/E stability leads to a number of major implications about the expected values of key market variables.

First, recall that under P/E stability, $g_{P/E} = 0$; hence, the dividend yield, DY and the earnings growth are the only two sources of return:

$$k = DY + g \quad (6.21)$$

TABLE 6.1 The Stable P/E Assumption and Implied Expected Values over a One-Year Period ($b = 0.6$)

Example	Prescribed Values						Implied Values					
	P/E Stability	P/E	DY	k	g	P/E	DY	k	g	(P/E)'	$S_{P/E}$	
1	Yes	?	?	12%	9.14%	14	2.86%	✓	✓	14.00	0%	
2	Yes	?	?	12	16.50			Inconsistent			0	
3	Yes	2.5	1.6%	12	?	✓	✓	✓	10.4%	25.00	0	
4	Yes	2.5	1.6	?	10.40	✓	✓	✓	12.0%	25.00	0	
5	Yes	2.5	1.6	?	16.50	✓	✓	✓	18.1	25.00	0	
6	Yes	2.5	1.6	12	16.50			Inconsistent			0	
7	No	2.5	1.6	12	16.50	✓	✓	✓	✓	23.69	-5.24	
8	No	2.5	1.6	12	23.50	✓	✓	✓	✓	22.35	-10.61	

Note: ✓ = already prescribed value.

Moreover, with the retention fixed at $b = 0.6$, the dividend yield totally determines the P/E, and vice versa. That is,

$$P/E = \frac{1-b}{DY} \quad (6.22)$$

The first six examples in Table 6.1 are all based on the assumption of P/E stability. In Example 1, the prescribed values, $k = 12$ percent and $g = 9.14$ percent, are those that were used for the terminal phase in the two-phase example. This combination of expected market return and earnings growth rate implies a required dividend yield of 2.86 percent and leads to the same terminal P/E as obtained for the two-phase model:

$$\begin{aligned} P/E &= \frac{1-b}{DY} \\ &= \frac{0.4}{0.0286} \\ &= 14 \end{aligned}$$

The second example moves the analysis into a high-growth mode by setting g equal to 16.5 percent. Subtracting this growth rate from the specified $k = 12$ percent leads, however, to a negative dividend yield—an inconsistent result. Under P/E stability, one cannot (under standard conditions) have a growth rate that exceeds the expected return.

In the third example, $P/E = 25$ and $k = 12$ percent are prescribed, and the question becomes what growth rate provides for a consistent result. Because DY is 1.6 percent, a growth rate of 10.4 percent is needed to achieve “consistency.” Similarly, in the fourth example, if P/E is set at 25 and g at 10.4 percent, the stability condition leads back to an expected return of 12 percent.

In the fifth example, the P/E is kept at 25 and again g is set equal to 16.5 percent (i.e., the high-growth mode) but, now, the expected return is allowed to be determined by the stability condition. Adding $DY = 1.6$ percent to the growth rate $g = 16.5$ percent produces an implied return of 18.1 percent, a level that may be well in excess of consensus market return expectations. This example may be one form of P/E myopia, one in which the analyst automatically assumes a constant P/E layered on top of a high growth rate and finds—surprise, surprise—that the stock promises an exceptional return.⁹

The sixth example reflects an effort to correct the myopic overestimation by fixing the expected return at $k = 12$ percent. This specification cannot be valid, however, under conditions of P/E stability: The growth and

the dividend yield already determine the return value, $k = 18.1$ percent, as shown in the fifth example. With the simultaneous specification of P/E, k , and g , consistency can be achieved only by relenting on the need for P/E stability. As shown in Example 7, this relaxation provides the flexibility to have the required 5.24 percent decline in the P/E so that the one-year forward P/E (that is, P'/E') equals 23.69.

Finally, Example 8 is similar to Example 7 except that the growth rate is further escalated to 23.5 percent. The result is that the P/E experiences a more severe decline than in Example 7—a 10.61 percent decline to bring the P/E to 22.35 by year-end.

Thus, as shown earlier, consensus expectations of high growth rates also call for consensus expectations of a declining P/E if the return is to be aligned with reasonable market expectations. At the same time, remember that the high growth rate must itself be expected to moderate at some point in the future so as to generate an orbit that is consistent with the fundamental assumption that the initial P/E represents fair pricing.

MIXTURES OF CONSENSUS AND SUBJECTIVE ESTIMATES

The aim of many modeling efforts is to identify investment prospects that can provide *superior*—not equilibrium—returns. For such purposes, the earnings growth and/or the horizon P/E value in the model may not be based on consensus estimates but on subjective judgments. In such cases, the equilibrium conditions do not hold, and essentially, any set of estimates is theoretically defensible.

A mixture of consensus and individual estimates is quite common. For example, one often encounters studies in which the analyst uses consensus estimates for earnings growth but retains the right to choose the horizon P/E. In Appendix 6A, a simple model is developed that illustrates the interaction of subjective estimates with the consensus-implied baseline. This model provides a concrete illustration of the problem of P/E myopia: An analyst who takes the initial P/E to also be the horizon P/E should hardly be surprised that the model projects a wonderfully high return. Such a procedure clearly, however, represents a flawed analysis.

When the analyst uses the consensus earnings growth, the market expectation for the P/E is determined by the P/E orbit. The analyst may choose to apply any different P/E to determine the terminal value, but he or she should recognize that any such deviant P/E reflects a personal judgment that is a departure from the implications of the current market consensus. Therefore, any such P/E should be deliberately and thoughtfully selected. The analyst should also be prepared to defend this terminal P/E

choice in terms of what he or she sees that the market as a whole does not see. From this viewpoint, the dangers of a casual assumption of P/E stability are obvious.

CONCLUSION

Investment analysis is an attempt to provide guidance through the myriad uncertainties that permeate financial markets. At any given time, the consensus view both helps determine the market's current prices and contains implications for how those prices will evolve under inertial conditions. The concepts of P/E forwards and P/E orbits are intended to capture those consensus implications, even while recognizing that they hold only under highly restrictive conditions—conditions that are continually being confounded by the dynamic flow of market events.

Investment analysis is both an art and science. The active analyst has the twin challenge of identifying the character of upcoming developments and gauging the magnitude of their potential pricing impact. Even with valid insights, the pricing effect still needs to be assessed in terms of the relative movement away from consensus values. In such cases, there is a clear benefit to having a set of baseline values that represent the inertial pricing path implied by the unaltered consensus. The concept of P/E forwards can help delineate these baseline values.

The author would like to express gratitude for the many helpful suggestions relating to this chapter from Peter Bernstein, Benson Durham, Scott Evans, Robert Ferguson, Eric Fisher, James Fleischmann, Michael Granito, Martin Gruber, Brett Hammond, Leo Kamp, and Stanley Kogelman.

APPENDIX 6A: Formulations and Extensions

This appendix presents the exact formula for P/E forwards as well as a stochastic formulation. It also discusses bifurcated orbits, the two-phase model, various generalizations of the concept of P/E orbits, and a framework for making use of subjective estimates.

Exact Formulation for P/E Forwards

The exact expression for the holding-period return is

$$HPR = \frac{1-b}{P/E} + g + g_{P/E}(1+g) \quad (6A.1)$$

(which is presented in the text as Equation 6.7) or, under equilibrium assumptions,

$$k = \frac{1-b}{P/E} + g + g_{P/E}(1+g) \tag{6A.2}$$

From the definition of $g_{P/E}$, which is $g_{P/E} = [(P'/E') - (P/E)]/(P/E)$, we can find next year's *expected* P'/E' (that is, the forward P/E) from

$$k(P/E) = (1 - b) + g(P/E) + [(P'/E') - (P/E)](1 + g) \tag{6A.3}$$

or

$$\begin{aligned} P'/E' &= (P/E) \left(\frac{1+k}{1+g} \right) - \left(\frac{1-b}{1+g} \right) \\ &= (P/E) \left[1 + \left(\frac{k-g}{1+g} \right) \right] - \left(\frac{1-b}{1+g} \right) \end{aligned} \tag{6A.4}$$

When growth g is relatively small, $1 + g$ is approximately equal to 1 and we obtain the approximation used in the text (Equation 6.17),

$$P'/E' \cong (P/E)(1 + k - g) - (1 - b) \tag{6A.5}$$

(I used this rough approximation for illustrative purposes, but all calculations for the graphics in this article were based on the exact formulations.)

When $g_{P/E} = 0$, the exact expression given in Equation 6A.2 leads precisely to the Gordon formula for the stabilizing P/E given in Equation 6.19,

$$(P/E)_s = \frac{1-b}{k-g} \tag{6A.6}$$

as well as to the same expression as in the text for stabilizing growth rate g_s , Equation 6.20.

The Stochastic Formulation

By treating all the key values— k , g , and $g_{P/E}$ —as random variables, we can obtain a somewhat more complex structure for the expectational orbit.

Taking the expectation $E(\cdot)$ of both sides of the basic equation for holding-period returns produces

$$E(k) = \frac{1-b}{P/E} + E(g) + E(g_{P/E}) + E[(g)(g_{P/E})] \quad (6A.7)$$

The last term represents a potential source of further complexity because

$$E[(g)(g_{P/E})] = E(g)E(g_{P/E}) + \rho(g, g_{P/E})\sigma(g)\sigma(g_{P/E}) \quad (6A.8)$$

where $\rho(g, g_{P/E})$ is the correlation between g and $g_{P/E}$. This correlation term acts as an add-on to the expression derived in Equation 6A.2, so we would now have

$$\begin{aligned} \bar{k} &= \frac{1-b}{P/E} + \bar{g} + \bar{g}_{P/E} + (\bar{g})(\bar{g}_{P/E}) \\ &\quad + \rho(g, g_{P/E})\sigma(g)\sigma(g_{P/E}) \end{aligned} \quad (6A.9)$$

In most circumstances, however, even when the correlation is high, the product of the standard deviations will generally be too small to have a material effect on the P/E orbits described in the text.

Bifurcated Orbits

For growth rates within a certain range, the P/E orbits will have a bifurcated structure: That is, the orbit will rise over time for all P/E values above the stabilizing value of $(P/E)_s$, descend for all P/E values below $(P/E)_s$, and of course, be exactly stable for P/E equal to $(P/E)_s$. For example, at growth rate g of 8 percent, the stabilizing P/E becomes

$$\begin{aligned} (P/E)_s &= \frac{1-b}{k-g} \\ &= \frac{0.40}{0.04} \\ &= 10 \end{aligned}$$

Any starting P/E above 10 will find itself on the upper (rising) part of the 8 percent orbit, whereas any P/E below 10 will be on the lower (falling) part of the orbit. Only for a P/E of exactly 10 will the orbit be exactly stable. (For those enamoured of the chaos theory, this bifurcation represents one

form of unstable equilibrium: Any fair-valued P/E that departs—ever so slightly—from the stabilizing $[P/E]_s$ will continue to diverge up or down over the course of time.)

The Two-Phase Model

The basic expression for two-phase models with an initial phase duration of H is given by

$$P/E = \left(\frac{1-b}{k-g}\right) \left[1 - \left(\frac{1+g}{1+k}\right)^H \right] + \left(\frac{1+g}{1+k}\right)^H (P/E)_H \tag{6A.10}$$

where $(P/E)_H$ is the terminal P/E.

By turning this formulation around, we can solve for the horizon P/E that is “equilibrium consistent” with the initial conditions,

$$(P/E)_H = \left(\frac{1+k}{1+g}\right)^H (P/E) - \left(\frac{1-b}{k-g}\right) \left[\left(\frac{1+k}{1+g}\right)^H - 1 \right] \tag{6A.11}$$

For $H = 1$,

$$\begin{aligned} P'/E' &= \left(\frac{1+k}{1+g}\right)(P/E) - \left(\frac{1-b}{k-g}\right) \left[\left(\frac{1+k}{1+g}\right) - 1 \right] \\ &= \left(\frac{1+k}{1+g}\right)(P/E) - \left(\frac{1-b}{k-g}\right) \left(\frac{k-g}{1+g}\right) \\ &= \left(\frac{1+k}{1+g}\right)(P/E) - \left(\frac{1-b}{1+g}\right) \end{aligned} \tag{6.12}$$

which is simply the orbit-generating result that was developed earlier in Equation 6A.4.

We could proceed by iteration and also obtain the standard two-phase form of the valuation model. Both pathways demonstrate that P/E orbits such as those shown in Figure 6.4 are consistent with the standard two-phase model.

Generalizations

A number of directions exist for potential generalizations of the P/E orbit concept. As one example, suppose the market return k_t is decomposed into a market rate of interest, y_t , plus a risk premium, rp_t , so that

$$k_t = y_t + rp_t \quad (6A.13)$$

Interest rate y_t will naturally vary with market conditions that prevail at time t , whereas the risk premium rp_t might be assumed to be more stable. The iterative relationship that determines the forward P/E, $(P/E)_{t+1}$, given the preceding $(P/E)_t$, would then include a factor that depended on interest rate y_t at time t .

We could then go one step farther and develop a more sophisticated iteration based on the *forward* interest rate, y_{jt} , for future period j as of time t . Such a “term structure” model could lead to orbits with significantly different shapes from those based on the assumption of a flat yield curve. For example, with low short-term rates and a sharply rising sequence of forward interest rates, the expected market return would be low in the early years. This model would actually make the initial P/E descent for a high-growth stock steeper while somewhat flattening the orbit in the later years. This orbital twist would be exacerbated if the risk premium itself were viewed as having an ascending structure over time. (On the other hand, credible arguments can be made for a descending risk premium structure.) In an elegant paper that touches on a number of these concepts, Granito (1990) provided a sophisticated mathematical framework encompassing many fixed-income-like features that can be applied to equity valuation.

Another line of generalization entails departure from the two-phase growth model with its typical cliff drop from an initial high growth rate to the terminal rate. A more realistic model might have the initial high rate fall smoothly year by year until it coincides with the terminal level. The ultimate extension of this approach would incorporate virtually any future sequence of consensus earnings growth rates.

The behavior of P/E forwards can be interpreted in terms of the flow of franchise value. As shown in previous work (Leibowitz and Kogelman 1994), the P/E can be viewed as measuring the proportion of a stock's price that can be ascribed to the company's store of future franchise value. On the one hand, earnings growth represents a takedown of this franchise value; higher earnings growth leads to a faster depletion of the remaining franchise value and thus to lower P/Es (i.e., descending orbits). On the other hand, at the stabilizing growth rate, new franchise

value is being generated at the same pace as the takedown, so the P/E remains constant. Thus, we could try to model the rise and fall of P/E orbits in terms of the growth and depletion of the company's franchise value.

The stochastic formulation described earlier in this appendix could also be expanded to incorporate various functional dependencies and their associated correlations. In particular, one could relate the risk-premium component of holding-period returns to the expected growth rate and/or its variance. However, such analyses are not likely to lead to fundamentally different results.

Another direction for development might entail more structured modeling of the terminal phase. As one example, consider situations in which the initial-phase earnings growth pushes the company's return on equity to a high-watermark level that cannot be competitively sustained. For example, the 16.5 percent initial-phase growth rate used in the numerical illustrations implies a very high ROE on new investment, 27.5 percent. With such a high ROE embedded in the attained level of earnings, an analyst might wish to also consider scenarios in which the ROE (and perhaps even the earnings themselves) decline to levels that are more consistent with a competitive environment. Any such earnings pattern would require a downward P/E shift to achieve a consistent orbit.¹⁰

These directions for further development might make for some theoretically interesting studies, but the idea of P/E forwards is essentially a simple concept, so these extensions would probably all lead to much the same fundamental implications for practitioners that have already been described in this article.

A Return Model with Subjective Estimates

Consensus estimates typically lead to consensus returns. The prospect of incremental returns will arise when an analyst's subjective estimates of growth and valuation deviate from consensus levels. The following simple model can help clarify how such deviations determine the potential for incremental returns.

Over short periods, with the current P/E and the initial dividend yield being given, holding-period returns are largely determined by the assumed values for the horizon earnings, E_H , and the horizon P/E, $(P/E)_H$. Because, presumably, we begin with known current values for earnings and the P/E, the horizon values can be determined from the corresponding growth variables g and $g_{P/E}$. Suppose we designate an asterisk to refer to subjective estimates and a bar over a variable to refer to consensus-based estimates.

Then, the *incremental* return, ΔHPR^* , associated with subjective estimates of g^* and $g_{P/E}^*$ becomes

$$\begin{aligned}\Delta HPR^* &= HPR^* - \bar{k} \\ &\equiv (g^* - \bar{g}) + (g_{P/E}^* - \bar{g}_{P/E})\end{aligned}\quad (6A.14)$$

Note that $\bar{g}_{P/E}$ is the consensus-based percentage change in the P/E (i.e., the value associated with the forward P/E derived from the consensus-driven P/E orbit).

The outcome of virtually any valuation procedure can be characterized in terms of these two summary estimates, g^* and $g_{P/E}^*$. Consequently, the incremental return model of Equation 6A.14 can be used to describe a wide variety of judgmental analyses.

The growth estimate g^* refers to the earnings over an interim period leading up to a horizon. At the horizon, the P/E determined by $g_{P/E}^*$ can then be viewed as reflecting all subsequent growth prospects (which, of course, may be quite different from the near-term g^*). Thus, although the subjective estimates g^* and $g_{P/E}^*$ will certainly be related to some degree, the horizon P/E, P/E_H^* will depend more on the beyond-horizon growth prospects.

In the general situation, any subjective estimate of near-term earnings will also have some implications for the horizon P/E. These effects could cut both ways. On the one hand, high near-term earnings, g^* greater than \bar{g} , could certainly imply brighter long-term prospects, an elevated $(P/E)_H^*$, and hence $g_{P/E}^* > \bar{g}_{P/E}$. On the other hand, if the higher g^* simply represents an acceleration from a fixed body of future earnings, then $g_{P/E}^*$ could be less than $\bar{g}_{P/E}$.¹¹

In any case, the subjective P/E growth, $g_{P/E}^*$, should be measured relative to consensus forward growth, $\bar{g}_{P/E}$. An analyst who assumes P/E stability and applies the current P/E at the horizon is implicitly setting $g_{P/E}^*$ equal to zero, resulting in

$$\Delta HPR^* \equiv (g^* - \bar{g}) - \bar{g}_{P/E} \quad (6A.15)$$

As shown in the text, $\bar{g}_{P/E}$ will typically be negative. As a result, this $-\bar{g}_{P/E}$ term may provide an unintended boost to the subjective estimate of incremental return. Thus, Equation 6A.15 can be viewed as a quantitative expression of P/E myopia.

Even when the analyst adopts the consensus earnings forecast, $g^* = \bar{g}$,

an unthinking assumption of P/E stability will give the same unintended boost to subjective returns:

$$\Delta HPR^* \equiv -\bar{g}_{P/E} > 0 \quad (6A.16)$$

As noted previously, in high-growth situations, this erroneous term can be quite large.

For simplicity, the preceding discussion focused on short-term periods when the interaction of earnings and dividend growth could be ignored, but the basic result,

$$\Delta HPR^* \equiv (g^* - \bar{g}) + (g_{P/E}^* - \bar{g}_{P/E}) \quad (6A.17)$$

should remain a reasonable approximation for periods of several years, especially in high-growth situations, where dividend yields tend to be modest.

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Franchise Labor

In today's global environment, with the increasing emphasis on knowledge-based resources and information dissemination through high-tech channels, key employees play a crucial role in a company's profitability. Such key employees can represent an important component of a company's overall business franchise. At the same time, competitive compensation policies have begun to treat (explicitly and/or implicitly) these "franchise labor" employees as a special class of super-shareholders. The claims on profits put forward by this cadre of franchise labor can have a major impact on firm valuation.

Many businesses are becoming ever more dependent on one key factor of production—the super-skilled or “franchise” employee. Exceptional managers have always been recognized as central to a company's success, but the new franchise cadre may reach far beyond the traditional managerial levels. Its ranks are certainly broader than the usual suspects—the sports star, the dynamic lawyer, the corporate deal maker, the software guru, the (currently) renowned media hero, and so on. The role of key individuals has been greatly enhanced by the growth of large enterprises—often highly knowledge-based—that service global markets through extensive use of modern distribution and communication channels. In this environment, an incremental level of skill can be efficiently levered so as to have a major economic impact on a company's profitability.¹

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We begin by defining “franchise labor” as comprising all employees who can effectively make a claim on the profits derived from the business activities in which they are involved. Notice that the phrase is “*effectively* make a claim,” rather than the far more stringent “legitimately make a claim.” This distinction is critical because uncertainty and ambiguity generally redound to the benefit of the claimant and, therefore, may greatly augment the ranks of the “presumptively super-skilled.”

Of course, a huge body of economic literature has been devoted to studying how output is apportioned between capital and labor (Becker 1993; Bok 1993; Rosen 1981) For example, a recent study addressed the winner-take-all phenomenon (Frank and Cook 1995). The majority of these analyses focus, however, on the macro level. At the micro level, interesting questions remain regarding the effect of franchise labor on a company’s valuation.

In any given company, the franchise employee is *always* a scarce resource—almost by definition. Indeed, the employee in place who appears to be playing a significant role in generating an ample stream of profits always has a touch of uniqueness. The managers can rarely be certain that a newcomer, even one with a similar litany of resume points, will be an immediate and complete substitute for an on-board worker with the “right-on-point” experience.

The evolution of the modern business environment has swelled the ranks of super-skilled claimants. With global competition, the drive to avoid commoditization has become vital. Often, it is the ingenuity, the creativity, the leadership, or the magnetic imagery of specific individuals that is the key to the distinctiveness of a company’s products and services. With modern capital markets, the access to funding is broadly based, so capital resources (or even company size *per se*) may not be a significant barrier to competitive entry. Except where a powerful brand exists that is largely immune to technological obsolescence, any added value perceived by the consumer is often ascribable to the efforts of super-skilled employees. In other words, in a world where nuances and fine points make the difference between commodity margins and real profitability, the super-skilled worker may be the source of that critical “edge.”

Moreover, the magnitude of the claim may be increased by the natural uncertainty that surrounds many business activities. One rarely knows *for sure* how much each factor of production contributes to success. The natural response is thus to try to keep the entire team intact, especially when the business is enjoying a winning streak. This imperative to retain the once-winning team can often persist for quite a while, even after the hot streak has turned tepid. As might be expected, this understandable proclivity for stability tends to drive up the rewards to those

employees who appear to have had a hand in the success and who are relatively nonsubstitutable. If one had an x-ray device that could precisely identify who really contributed and how much, who is irreplaceable and who is not, then the rewards to the group as a whole might be less—a lot less in some cases.

This ambiguity of franchise labor often leads to a certain moral hazard for management. Managers may find themselves being judged by how effective they are in retaining the visible players on a winning team, which exacerbates the tendency to provide greater largesse, as a kind of retention “glue,” to the presumptively super-skilled.

Franchise labor can have a material effect on company valuation in a number of ways. There has been much discussion of the way in which stock options can distort the standard accounting statement of current earnings. Relatively little attention has been given, however, to the more subtle effects of franchise labor claims on the *future* profits from brand-new initiatives. These future franchise effects can be surprisingly large, even when current earnings have been properly adjusted to reflect current claims. The franchise value (FV) approach (Leibowitz 1997; Leibowitz and Kogelman 1994) provides a useful framework for exploring these effects.

In the FV approach, the value derived from the current level of earnings is distinguished from the value associated with productive new investments. The value derived from current earnings is called the company’s “tangible value” (TV); the value of future earnings is called “franchise value.” A franchise employee’s claim can have radically different impacts on a company depending on whether the claim is applied to the current book of earnings or to the incremental future earnings associated with new investment. The basic franchise factor model is explained in Appendix 7A.

As a baseline, consider a naive valuation that completely neglects any labor-based claims other than those already reflected in the standard reported cash flows. Our analysis proceeds by assuming that the company’s cash flows reflect the *benefits* derived from franchise labor but that the baseline valuation fails to take account of any incremental compensation claims. We will now try to assess the valuation effect of these franchise labor claims.

At the outset, it can be shown that when an incremental claim of L_1 percent is applied to current earnings, the valuation will be reduced by a percentage that depends critically on the stock’s P/E (see Appendix 7A). This case is illustrated by the lower curve in Figure 7.1, where the TV impact starts at 10 percent for the lowest P/E and then declines with rising P/E multiples. (In Figure 7.1, the following fixed numerical values have been used: the cost of capital, k , equals 12 percent. The return on equity

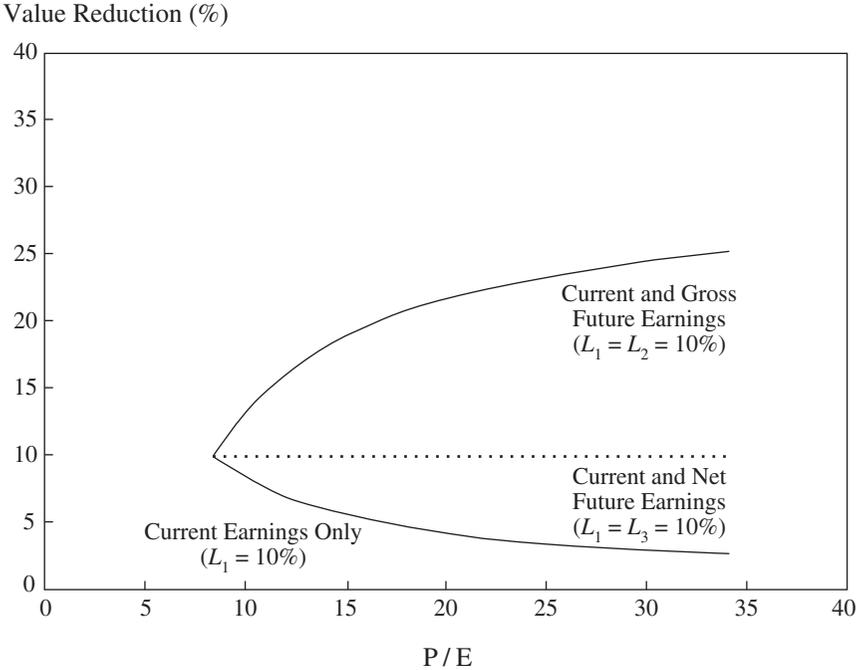


FIGURE 7.1 Combined Valuation Impact of 10 Percent Franchise Labor Claims on Various Components of Earnings

[ROE] on existing lines of business also equals 12 percent, whereas the return on new business, R , is 18 percent.) At a P/E of 25, the impact will be only slightly higher than 3 percent. This minimal effect at higher P/Es is a consequence of the firm’s value then being determined more by future growth than by current earnings.

Of course, when a franchise labor situation exists, the likelihood is strong that the earnings from future growth will also be subject to the same (or possibly even greater) labor claims. And such future claims can begin to significantly depress valuations. The upper curve in Figure 7.1 shows the explosive effect of what might be called a “gross claim” of L_2 percent on future profitability. This FV claim is modest for low P/Es, where future investments contribute relatively little to overall firm value. As the P/E—and the franchise value—become larger, however, the valuation impact of such claims rises rapidly. At a P/E of 25, the combination of L_2 and L_1 claims of 10 percent will erode firm value by almost 23 percent.

This leverage effect of FV claims is derived from the assumption that

the 10 percent L_2 claim is applied to the visible gross profits (i.e., ahead of any repayment to the shareholders who supplied the fresh capital for the new initiatives).² The key factor here is that the current shareholders begin to reap the rewards of any new initiative only after the suppliers of the new capital have been paid their due. Suppose the market rate for equity is 12 percent. Then, any supplier of such equity capital will expect the newly issued stock to be priced so that it can provide a 12 percent annual return over time. Thus, in assessing the payoff from a new project with an ROE of 18 percent, the first 12 percent should be viewed as going to the new investors (or reinvestors) who supplied the needed capital, with the remaining 6 percent going to the earlier shareholders (who theoretically owned the original “opportunity” for the high-return investment). If a 10 percent franchise labor claim is now applied to the gross 18 percent ROE, however, then the available return declines to 0.90×18 percent = 16.2 percent. Consequently, the return reserved for current shareholders shrinks from 6 percent to 4.2 percent—a significant decline indeed. This deterioration in the shared future return down to 4.2 percent, together with the 10 percent claim on current earnings, results in the 23 percent decline in firm value depicted in Figure 7.1.

A more economically reasonable (although perhaps less likely) approach would be for an L_3 claim of 10 percent to be applied only against the *net* future return of 18 percent – 12 percent = 6 percent. In this case, the net return would be reduced less, to 0.90×6 percent = 5.4 percent—a more modest impact that is represented by the flat middle line in Figure 7.1. However, it would be an unusually altruistic form of franchise labor that would bypass the visible 18 percent return and seek only to have a share of the 6 percent net return.

Appendix 7A presents the numerical analysis underlying Figure 7.1 as well as additional figures that depict how different types of labor claims can affect firm value.

These simple examples make evident that the impact of the franchise labor claim depends not only on its level but also on exactly where it falls within the value-generating structure of the company. All else being equal, for high-P/E stocks, claims on gross profits from future growth create the most severe deterioration in value. By their very nature, high-growth companies are likely to find themselves blessed with both high P/Es and a significant cadre of high-performance employees. Moreover, the claims of the key employees—both legitimate and otherwise—are likely to be aimed at the returns from future growth. And unfortunately, the more visible gross returns represent an understandably appealing target.

The much-publicized use of stock options may come to mind as a vehicle for satisfying franchise labor claims. Indeed, stock options can lay

significant burdens on current and future earnings. And there are innumerable other ways in which companies can let their key employees share in the current and future successes that they help bring about. Thus, whether or not key employees formally hold stock or options, they are always—economically speaking—silent shareholders in the company's prospects. And to the extent that such claims can be pressed against "gross" levels of future earnings, franchise employees actually enjoy a super-shareholder status.

In one sense, a claim against gross new earnings implies a priority status ahead of the "ownership inroads" required to compensate new capital suppliers. This "gross" claim is equivalent to having a position that is protected against share dilution. Antidilution protection may be provided either formally, as with a provision in a stock option contract, or informally, through new employee grants whose *issuance* (as well as payoff) is tied to the company's overall earnings growth.

Ultimately, the return to franchise labor comes out of the shareholder's return. And although the ranks of the franchise claimants may sometimes exceed the ranks of the true contributors, the role of the super-skilled can be legitimately crucial in a number of modern business venues. Shareholders should not resent the reasonable claims of this group. To the contrary, where franchise employees are indeed key to high growth rates and ample profit margins, it is very much in the shareholders' interests to see that the key employees are rewarded appropriately, that they feel happy about their part of the deal, and that they are powerfully motivated to continue working in the best interests of the enterprise. Indeed, shareholders should become concerned if management is too miserly to provide proper incentives for its franchise labor. As always, the challenge is to strike the right balance.

When much is at stake, the organization would be well-advised to expend extraordinary effort to (1) identify the true contributions of key employees, (2) reward the real rainmakers in a way that is fair and that aligns their interests with those of the shareholders (in terms of risk as well as reward), (3) properly assess the "net" payoff from new initiatives in a way that takes account of the legitimate claims of the employees needed to realize the company's promise, and (4) assure that the valuation process incorporates due consideration of such prospective claims.

In summary, the truly super-skilled employees represent a new type of asset that should be considered in firm valuation. They can have a critical positive influence on certain businesses. They can prove essential even to a country's success in this global economy. They are also a powerful force to be reckoned with.

APPENDIX 7A

The basic franchise factor model (Leibowitz and Kogelman) decomposes a company's theoretical value, P , as follows:

$$P = \frac{E}{k} + \left(\frac{R - k}{rk} \right) GE \quad (7A.1)$$

where E = current normalized earnings

k = the cost of capital

r = the ROE on existing lines of business

R = the ROE on new initiatives

G = the ratio of new capital investment (in present value terms) to current book value

In Equation 7A.1, the first term, E/k , is the tangible value and the second term, $[(R - k)/rk]GE$, is the franchise value.

For the reader to appreciate the differential effects of the three types of employee claims (on current, net franchise, and gross franchise earnings), a discussion of how each acts independently to reduce firm value will be helpful. The effects are displayed separately in Figure 7A.1. (For Figure 7A.1, as in Figure 7.1, $k = r = 12$ percent and $R = 18$ percent.) By varying G , we can span a range of P/E values. For example, with $G = 4.0$, we obtain

$$\begin{aligned} P/E &= \frac{1}{0.12} + \left(\frac{0.18 - 0.12}{(0.12)^2} \right) 4.0 \\ &= 8.33 + 16.67 \\ &= 25 \end{aligned}$$

Thus, the company's value prior to any franchise labor claim would be $P = 8.33E + 16.67E = 25E$. Now, if we assume that a 10 percent claim is exercised only against the current earnings (i.e., the first term in Equation

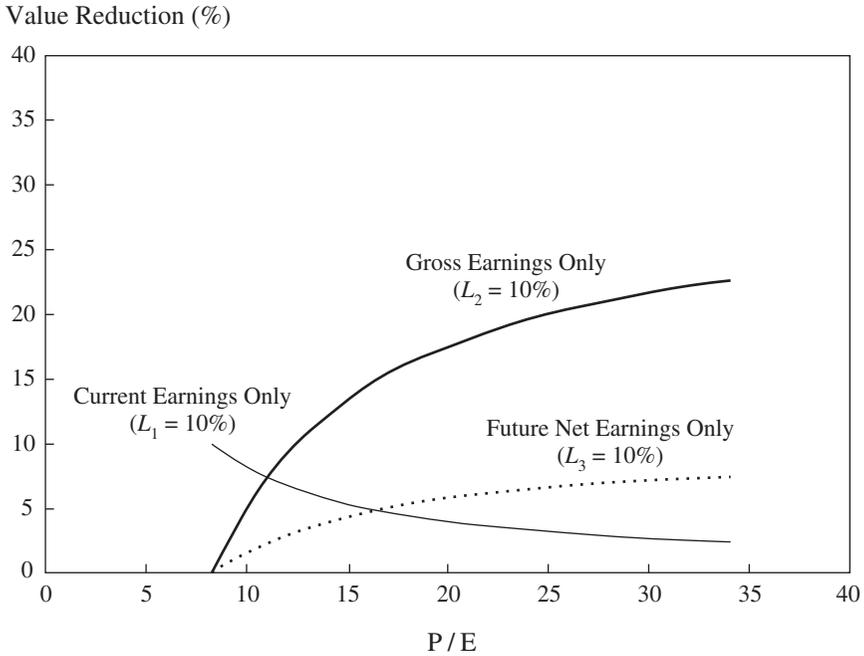


FIGURE 7A.1 Separate Effect of Independent 10 Percent Franchise Labor Claims on Various Components of Earnings

7A.1), then the reduced value becomes $P(L_1 = 10 \text{ percent})$ and the percentage reduction, $Z(L_1 = 10 \text{ percent})$, is

$$\begin{aligned} Z(L_1 = 10\%) &= \frac{P - P(L_1 = 10\%)}{P} \\ &= \frac{8.33(0.10)E}{25E} \\ &= 3.33\% \end{aligned}$$

To generalize this result, let $P(L_1)$ be the value resulting from an L_1 claim on current earnings; then,

$$P(L_1) = \frac{E(1 - L_1)}{k} + \frac{(R - k)}{kr} GE \tag{7A.2}$$

with the resulting percentage reduction

$$\begin{aligned} Z(L_1) &= \frac{P - P(L_1)}{P} \\ &= \frac{(E/k)L_1}{P} \\ &= L_1 \left[\left(\frac{1}{P/E} \right) \left(\frac{1}{k} \right) \right] \end{aligned} \quad (7A.3)$$

For all reasonable cases, in which $R \geq k$,

$$(P/E) \geq \frac{1}{k} \quad (7A.4)$$

which implies that

$$\left(\frac{1}{P/E} \right) \left(\frac{1}{k} \right) \leq 1 \quad (7A.5)$$

and it follows that the impact of the L_1 claim on current earnings should always be less than L_1 . Moreover, for higher-P/E stocks, the impact will be even lower. This result comports with the lower curve in Figure 7A.1 as well as with intuition: The effect of the L_1 claim on current earnings should be less significant if the bulk of the company's valuation is derived from future investments (i.e., if the stock carries a high P/E). Figure 7A.2 shows that this descending pattern is repeated at different levels for various values of L_1 .

In terms of the claims on franchise value, we will deal with the "net" case first because it is simpler than the "gross" case. In the net case, the firm's value after a net claim, L_3 , is

$$P(L_3) = \frac{E}{k} + \left[\frac{(1 - L_3)(R - k)}{rk} \right] GE \quad (7A.6)$$

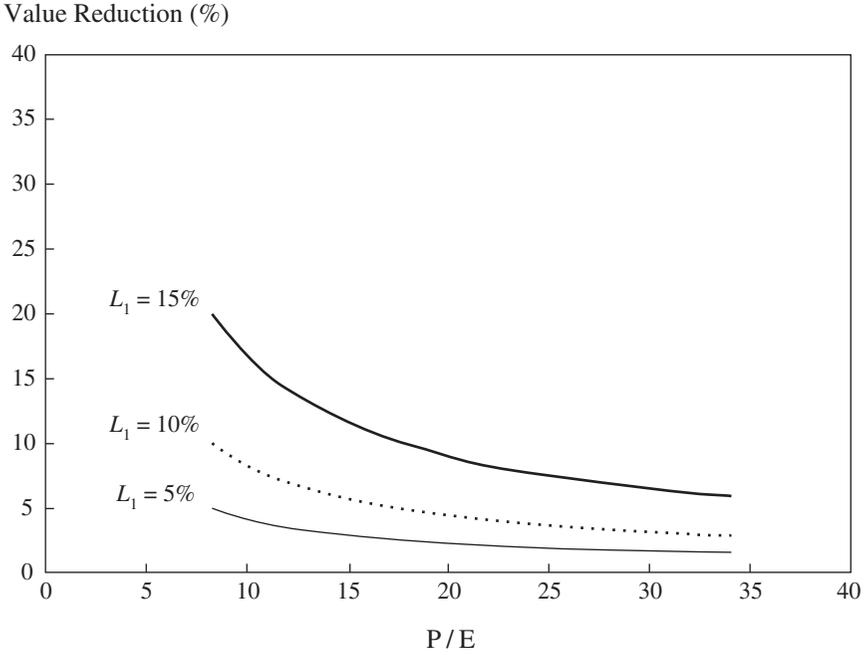


FIGURE 7A.2 Effect of Various Claims on Current Earnings Only

which leads to a percentage reduction of

$$\begin{aligned}
 Z(L_3) &= \frac{P - P(L_3)}{P} \\
 &= L_3 \frac{[(R - k)GE / rk]}{P} \\
 &= \frac{L_3(P - E/k)}{P} \\
 &= (L_3) \left[1 - \frac{E}{Pk} \right] \\
 &= (L_3) \left[1 - \frac{1}{(P/E)} \left(\frac{1}{k} \right) \right]
 \end{aligned}
 \tag{7A.7}$$

As the P/E increases, this net $Z(L_3)$ reduction increases and eventually approaches a maximum level of L_3 . Thus, $Z(L_3)$ traces out the middle curve shown in Figure 7A.1.

When this L_3 net claim on future earnings is combined with an L_1 claim on current earnings, the revised firm value becomes

$$P(L_1, L_3) = \frac{E(1-L_1)}{k} + \left[\frac{(1-L_3)(R-k)}{rk} \right] GE \quad (7A.8)$$

and the percentage reduction is

$$\begin{aligned} Z(L_1, L_3) &= \frac{L_1(E/k) + L_3[(R-k)/rk]GE}{P} \\ &= \frac{L_1(E/k) + L_3[P - (E/k)]}{P} \\ &= \frac{L_1(1/k) + L_3[(P/E) - (1/k)]}{(P/E)} \\ &= \frac{(1/k)(L_1 - L_3)}{(P/E)} + L_3 \end{aligned} \quad (7A.9)$$

In effect, the percentage reductions from the two sets of claims are simply additive. Figure 7A.3 depicts these combined effects for $L_1 = 10$ percent and L_3 levels ranging from 5 percent to 15 percent. Note in particular that when $L_1 = L_3 = 10$ percent, the reduction is simply a flat 10 percent across all P/E levels, which is also the middle line shown in Figure 7.1. This result is exactly what might be expected, because the 10 percent set-aside is applied proportionally to both sources of firm value.

Turning now to L_2 claims on future *gross* profits: The revised firm value is

$$P(L_2) = \frac{E}{k} + \left[\frac{(1-L_2)R-k}{rk} \right] GE \quad (7A.10)$$

and the revised percentage reduction is

$$Z(L_2) = \frac{(L_2)(RGE/rk)}{P} \quad (7A.11)$$

As long as $R > k$, we can write

$$G = \left[(P/E) - \frac{1}{k} \right] \left[\frac{rk}{R-k} \right]$$

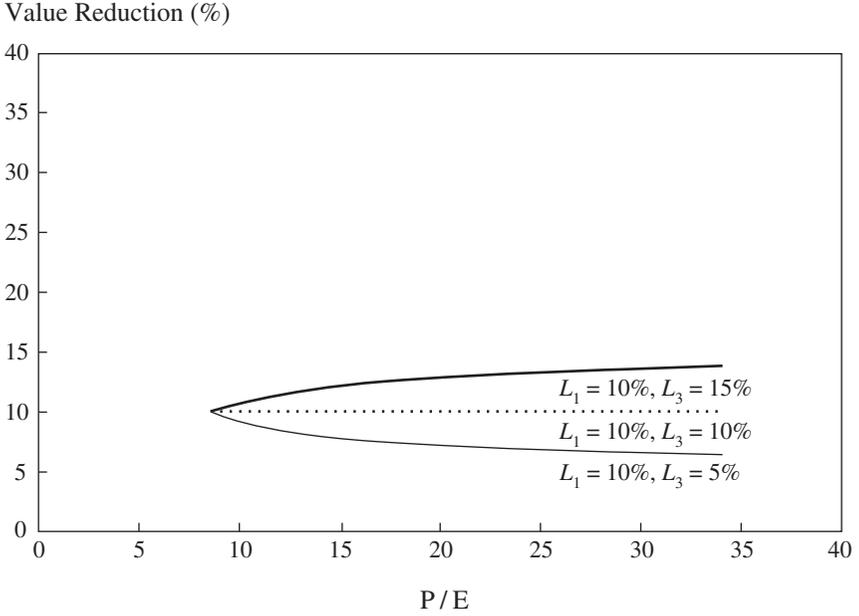


FIGURE 7A.3 Combined Effect of Various Claim Levels on Net Earnings Together with a Fixed 10 Percent Claim on Current Earnings

and the percentage reduction $Z(L_2)$ becomes

$$\begin{aligned}
 Z(L_2) &= \left[\frac{1}{k(P/E)} \right] \left[L_2 \frac{RG}{r} \right] \\
 &= \left[\frac{1}{k(P/E)} \right] \left\{ L_2 \frac{R}{r} \left[(P/E) - \frac{1}{k} \left[\frac{rk}{R-k} \right] \right] \right\} \\
 &= L_2 \left\{ \left[\frac{R}{R-k} \right] \left[\frac{(P/E) - 1/k}{P/E} \right] \right\} \\
 &= L_2 \left\{ \left[\frac{R}{R-k} \right] \left[1 - \frac{1}{k(P/E)} \right] \right\}
 \end{aligned} \tag{7A.12}$$

At the P/E of 25 used in the earlier example,

$$\begin{aligned}
 Z(L_2 = 10\%) &= 10\% \left[\frac{0.18}{0.18 - 0.12} \right] \left[1 - \frac{1}{(0.12 \times 25)} \right] \\
 &= 10\% [3] [1 - (1/3)] \\
 &= 20\%
 \end{aligned}$$

Thus, the L_2 gross claim is more potent than the L_3 net claim; a 10 percent gross claim leads to a 20 percent value reduction.

In general, the L_2 reduction will become more severe at higher P/E levels. Unlike the L_3 claim, however, which approaches a maximum limit of L_3 for high P/Es, the L_2 claim will have a limiting value of $L_2[R/(R - k)]$ that will always be greater than L_2 . Thus, for sufficiently high P/Es, the gross L_2 claim will have a leveraged impact (i.e., a value reduction that exceeds the level of the claim itself).

When combined with an L_1 claim, the joint claims reduce firm value to

$$P(L_1, L_2) = (1 - L_1) \frac{E}{k} + \left[\frac{(1 - L_2)R - k}{rk} \right] GE \quad (7A.13)$$

Once again, it can be shown that the percentage reductions are simply additive, so

$$Z(L_1, L_2) = L_1 \left[\frac{1}{k(P/E)} \right] + L_2 \left\{ \left[\frac{R}{R - k} \right] \left[1 - \frac{1}{k(P/E)} \right] \right\} \quad (7A.14)$$

Figure 7A.4 shows this combined effect with a fixed L_1 of 10 percent and L_2 claims of 5 percent, 10 percent, and 15 percent.

Finally, note the somewhat counterintuitive behavior associated with the L_2 claim. Because

$$Z(L_2) = L_2 \left\{ \left[\frac{R}{R - k} \right] \left[1 - \frac{1}{k(P/E)} \right] \right\} \quad (7A.15)$$

for a given P/E level, the reduction will be more severe for *lower* ROEs on new investments. This effect is shown in Figure 7A.5, where fixed claims of $L_1 = L_2 = 10$ percent are depicted for ROEs of 16 percent, 18 percent, and 20 percent. To understand this result, recall that the net return, $R - k$, is the key to the company's franchise value. When R alone is reduced by a given percentage (as in the gross L_2 claim), the lower net return declines by an even greater percentage, thereby magnifying the percentage erosion in the FV term. For low P/Es, this FV term will be small, so its reduction will have less impact on overall firm value. At high P/Es, the FV term will become the dominant source of firm value and its magnified reduction carries over to create the leveraged effect evident in Figure 7A.5.

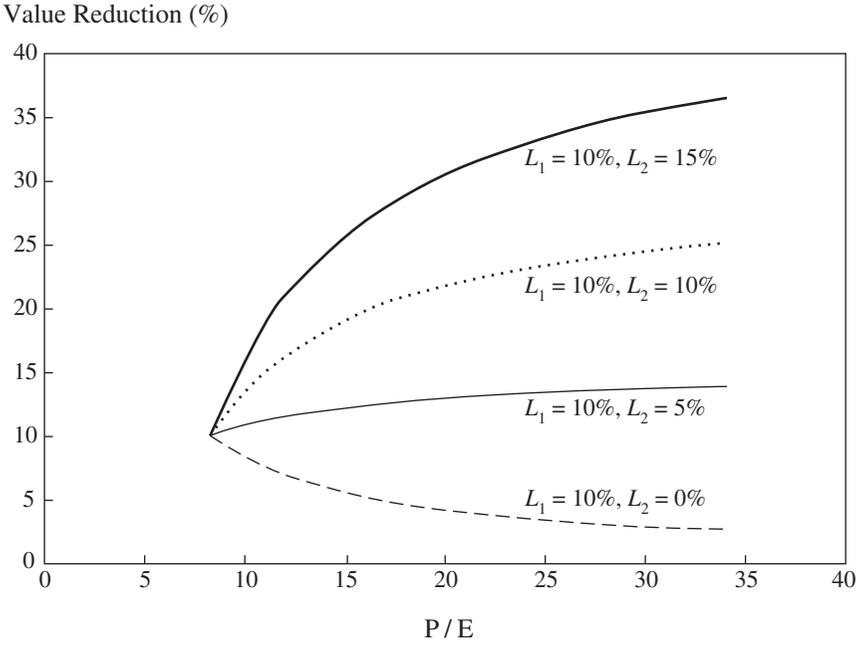


FIGURE 7A.4 Combined Effect of Various Claim Levels on Gross Earnings Together with a Fixed 10 Percent Claim on Current Earnings

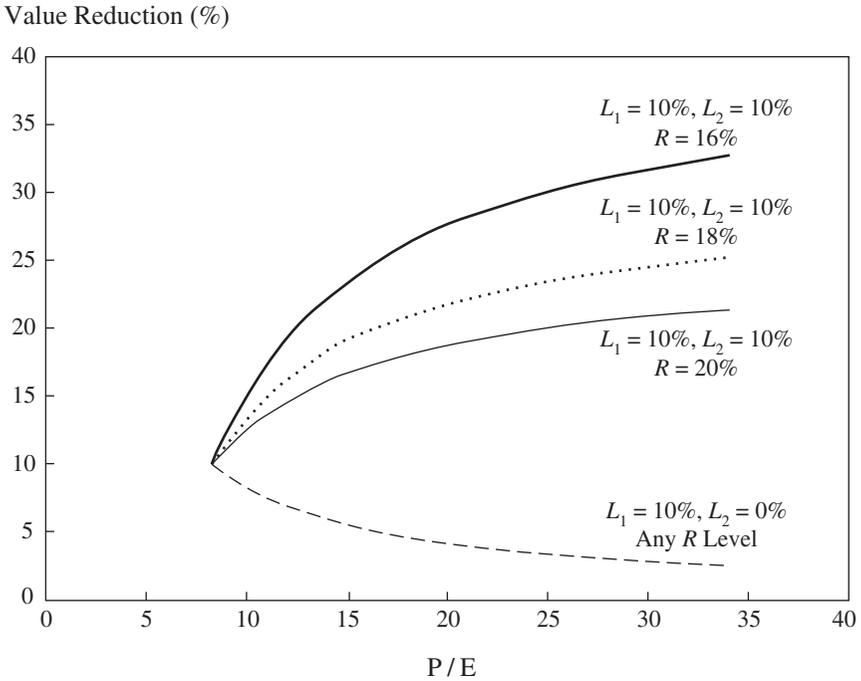


FIGURE 7A.5 Effect of Various Levels of ROE on New Investments

The author would like to express gratitude for the many helpful suggestions relating to this chapter from Peter Bernstein, Benson Durham, Scott Evans, Eric Fisher, James Fleischmann, Stuart Gillan, Brett Hammond, Leo Kamp, Jack Treynor, and Mark Warshawsky.

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Spread-Driven Dividend Discount Models

A key determinant of shareholder value is the franchise spread—the company's incremental return on new investments over the cost of capital. Explicitly incorporating this spread into the valuation process paves the way for a more compact, two-parameter formulation of the standard three-parameter dividend discount model. This transformation leads to a number of interesting implications. In particular, the spread-driven representation of the DDM (1) clarifies the role of growth-driven ROEs versus the role of spread-driven ROEs, (2) facilitates the development of two-phase models that reflect a typical company's earnings pattern, (3) shows how earnings growth and franchise spreads can underpin a wide range of P/E levels, (4) addresses the problem of artificially high P/Es being forced by low estimates for the risk premium and/or the inflation rate, (5) provides a useful expression for the growth rate of shareholder value, and (6) under certain stability conditions, leads to a pro forma equity duration that is—surprisingly—equal to the P/E itself.

The standard dividend discount model (DDM) incorporates explicit parameters for the discount return, the earnings growth, and the dividend payout ratio. In exploring equity valuations in various market environments, analysts may be tempted to adjust one or more of these three para-

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meters independently. This practice can be quite misleading because underlying relationships may link these variables. One such potential link is the franchise spread—the excess return that a corporation can earn above and beyond the cost of capital.¹

The standard single-phase DDM can readily be reformulated so as to directly incorporate this franchise spread. The resulting spread-driven representation has a number of implications for valuation theory—as it applies both to the individual company and to broad market sectors. Perhaps most significantly, a clearer distinction emerges between growth-driven and spread-driven returns than is possible in the standard DDM, and this framework leads to more flexible two-phase valuation models.

In the DDM, the franchise spread actually functions as a keystone connecting the market rate, the company's new investment level, and its earnings growth. Because of this "behind-the-scenes" role, the franchise spread is a fundamental determinant of the company's P/E. For example, high levels of reinvestment and growth will have little valuation effect unless the company has a significantly positive franchise spread.

Because the franchise spread is so central to company valuation, it is important to determine how the spread changes with various assumed levels of the market rate. Obviously, a number of models could be used to characterize this relationship. The common procedure of keeping the growth rate fixed while independently exploring various discount rates has the tacit result of implying one particular pattern of franchise-spread behavior. In this fixed-growth approach, the franchise spread actually increases with declining market rates—a characterization of franchise spread behavior that is hard to accept. Moreover, under this fixed-growth assumption, seemingly modest shifts in the cost of capital can lead to wide swings in the projected P/E. Because the cost of capital falls with reductions in either the assumed real rate, the inflation rate, or the risk premium, the single-phase, fixed-growth model allows myriad ways to justify virtually any P/E level. But because the implied franchise-spread behavior is so unpalatable, any such "justification" should be suspect.

A more comfortable approach to resolving questions about a high current P/E is to use a two-phase model with an initial phase consisting of high earnings growth for a limited period and a long-term second phase consisting of a more moderate level of sustainable growth. When viewed in terms of the franchise spread, the value-generating process may be radically different in each of the two phases. The beginning high-growth phase is typically initiated by growth opportunities; the required capital investment plays only a facilitating role. This situation leads to "growth-driven" returns on equity (ROEs) that tend to be relatively independent of the cost

of capital. For this limited growth-driven phase, one could indeed argue that the franchise spread will rise when the market rate falls. The more stable terminal phase, however, is likely to be characterized by “spread-driven” ROEs determined by hurdle rate cutoffs that, in turn, are directly related to the market cost of capital. In this more extended spread-driven phase, the franchise spread is naturally more stable than in the growth phase, even when material changes occur in the cost of capital. Thus, the two phases could experience quite different franchise-spread responses to changing market rates. When the two-phase model is recast in this framework, both the nature of the analysis and the resulting valuation estimates may vary considerably from those generated by the traditional single-phase, fixed-growth DDM.

An analytical by-product of this approach is a revised form of the DDM. The standard form makes use of three parameters—a retention factor, an earnings growth rate, and a required market return. The revised spread-driven version is a more compact function of two parameters—the market return and a new “value growth” term based on the franchise spread. In a stable-P/E context, the value-growth term corresponds to the percentage increase in the company’s value-added component (i.e., the price appreciation from earnings growth less the cost of financing that growth).

SINGLE- VERSUS TWO-PHASE DDMs

An ever-present challenge in equity valuation is to reconcile current P/E_s with reasonable long-term growth assumptions. Many studies focus on trying to show that the current P/E level can be viewed as sustainable over the long term. The presumption is that for market equilibrium to prevail, the P/E must be invariant over time. However, these “constant-P/E” single-phase models can prove awkward to reconcile with reasonable growth assumptions.

In the standard DDM, the dividend yield, DY , can be expressed as

$$\begin{aligned} DY &= \frac{(1-b)E}{P} \\ &= \frac{(1-b)}{(P/E)} \end{aligned} \tag{8.1}$$

where b is the fraction of earnings retained and $1 - b$ is the fraction paid out as dividends.

Equation 8.1 can be solved to obtain the common Gordon formula (Gordon 1962) for an “infinitely sustainable” P/E:

$$\frac{P}{E} = \frac{1-b}{k-g} \quad (8.2)$$

where k is market discount rate and g is earnings growth.

This formulation is based on heavy use of the concept of “perpetualization.” The growth rate is assumed to remain exactly the same year after year. Similarly, the same discount rate is applied to every future period, and the retention factor, b , remains constant forever, even as the earnings grow to ever higher levels. Moreover, the Gordon model is typically expressed in a simplified context of no debt leverage and no taxes.²

Single-phase DDMs can be invaluable in developing key concepts, and they can provide useful insights into company valuations when kept within the bounds of their underlying assumptions. However, when the parameters are pushed into realms where more-complex interactions are surely brought into play, simplicity alone may no longer be a sufficient virtue. A more flexible approach is to use a two-phase model in which earnings growth proceeds at some higher rate during an initial phase and then shifts to a more sustainable level in the second, perpetuity, phase. A consistent discount rate over time can still be achieved by having the P/E decline during the initial high-growth phase to ultimately reach a stable level that persists throughout the second phase.

In “P/E Forwards and Their Orbits” (Leibowitz 1999), the following approximation depicted a period-by-period equilibrium condition for multiphase DDMs:

$$k = DY + g + g_{P/E} \quad (8.3)$$

where $g_{P/E}$ is *annual percentage change* in the P/E. This term is what distinguishes Equation 8.3 from the more common single-phase formulation:

$$k = DY + g \quad (8.4)$$

In essence, the addition of $g_{P/E}$ allows the change in P/E to compensate for a growth rate in earnings that is viewed as too high (or too low) to be sustainable. Thus, during the first phase, high earnings growth could be offset by a declining P/E and still fit a reasonably chosen market discount rate. In the second phase of two-phase DDMs, the P/E is typically assumed to stabilize, so $g_{P/E}$ is zero and the standard formulation given in Equation 8.4 becomes operative.

For a numerical illustration, suppose b is 0.5, k is 10 percent, and the growth rate is 6 percent. Using Equation 8.4, the P/E becomes

$$\frac{P}{E} = \frac{0.5}{0.10 - 0.06} = 12.5$$

This low P/E, as a second terminal phase, could “support” a much higher current P/E level if the company had sufficiently high earnings growth in an initial phase. For example, consider a 10-year initial phase during which earnings growth proceeds at a “special” rate of 15 percent. With the same estimates for k and b , a current P/E of 25 becomes totally consistent with the assumption of market equilibrium. As depicted in Figure 8.1, this example has a P/E “orbit” that starts at 25, declines year by year for 10 years until it reaches 12.5, and then remains constant at this level. Throughout both the initial and second phases, this P/E pattern would provide a consistent total annual return of $k = 10$ percent.

This example demonstrates how two-phase models can be helpful in rationally relating high current P/Es to the more modest levels that are typically viewed as being sustainable over the long term.

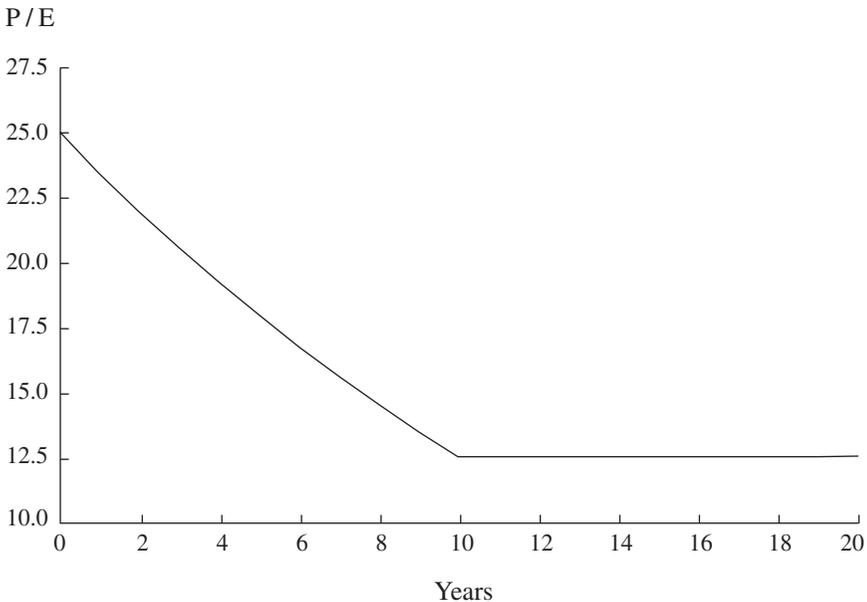


FIGURE 8.1 Two-Phase P/E Orbit with 10-Year First-Phase Growth of 15 Percent and Terminal-Phase Growth of 6 Percent

With lengthy initial phases, analysts often assume that a long period of up-front discounting may reduce the terminal P/E to a minor role. In fact, the terminal P/E plays a surprisingly powerful role, even after many years of high earnings growth in the first phase. This effect is illustrated in Figure 8.2, which shows the first-phase growth rate required to rationalize an initial P/E of 25 with a terminal P/E of 12.5. As noted previously, for an earnings retention rate of 0.5, the company needs 10 years of 15 percent earnings growth to justify an initial P/E of 25. Even if the initial high-growth phase is stretched to 15–25 years, the company still needs growth rates in excess of 10 percent to “fit” the initial and terminal P/Es. A higher terminal P/E would, of course, go a long way toward relaxing this growth requirement. For example, a terminal P/E of 17 would drop the required 10-year growth to 11.3 percent.

During a fast-growth initial phase, the earnings retention rate will often be higher than the moderate b of 0.5 assumed here for the second phase. In such cases, even more aggressive assumptions on earnings growth would be needed to “support” the initial P/E. For example, as Figure 8.2 shows, a 10-year growth phase with a b of 0.8 would call for 16.7 percent earnings growth to “connect” an initial P/E of 25 with a terminal P/E of 12.5. In this case, with so little dividend payout in the first

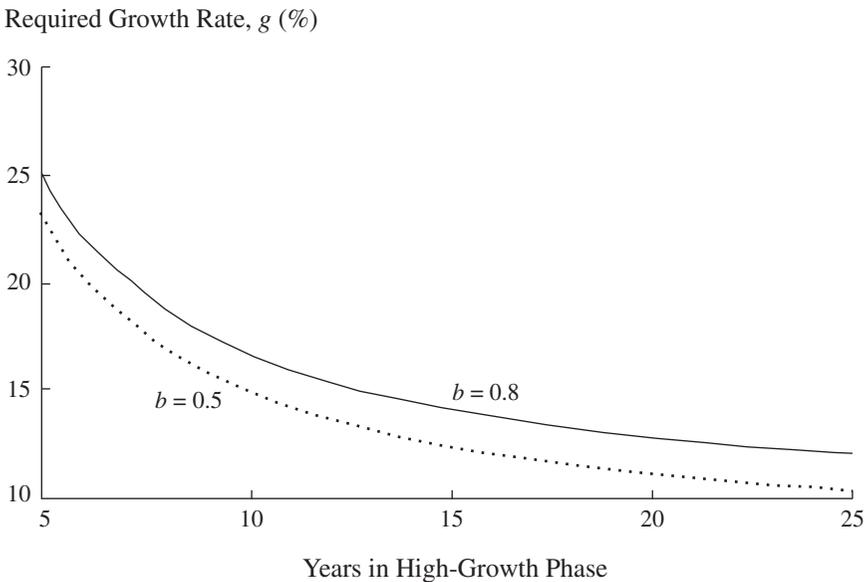


FIGURE 8.2 Required First-Phase Growth to Support an Initial P/E of 25 Given a Terminal P/E of 12.5

10 years, the bulk of the shareholder value, more than 90 percent, would remain to be garnered in the terminal phase. With $b = 0.8$, a 20-year initial phase would require growth to proceed at a 12.7 percent rate to achieve a consistent P/E orbit. This uncomfortably high initial growth requirement underscores that, even in two-phase analyses, a reasonably ample terminal P/E level is still critical to justify a high current P/E. Thus, attention must be focused on the terminal P/E level given in Equation 8.2 to ascertain what combination of parameters provides for a sufficiently high terminal value.

Figure 8.3 contains a plot of the standard Gordon model for a fixed-growth rate of 6 percent. As a further reference point, Figure 8.3 also shows the P/E curve for a g of zero with a retention rate of zero (i.e., the no-growth case in which $P/E = 1/k$). Note that this no-growth curve actually rises above the $g = 6$ percent curve for $k \geq 12$ percent. The basis for this apparent paradox will become clear when the behavior of the franchise spread under fixed-growth regimes is discussed.

In the long-term final phase, the values of g and b are generally rather circumscribed because they must reflect levels that can be sustained indefinitely. As a result, many analysts look to the discount rate as the ultimate source of higher P/Es. If the value of k declines, as a result of lower real rates, lower inflation, and/or a reduced risk premium, then the P/E could soar to very high levels. This extreme sensitivity of the P/E multiple to dropping discount rates can be seen in the curve for $g = 6$ percent plotted in Figure 8.3. Because of this supersensitivity, even a modest growth assump-

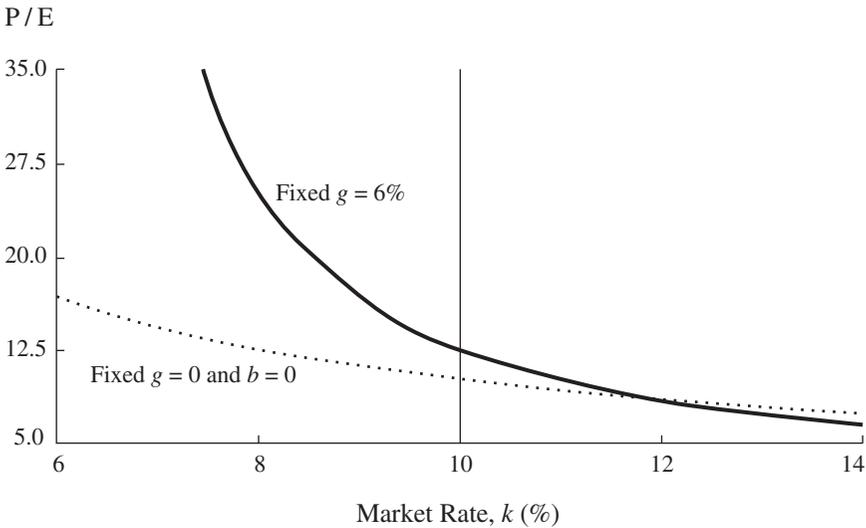


FIGURE 8.3 P/Es from Standard Fixed-Growth DDM

tion can lead to virtually any P/E level through “adjustment” of the discount rate. In other words, one could argue for low enough k values that would support any specified terminal P/E (and hence an even higher current P/E). For example, in Figure 8.3, as k moves from 10 percent to 8 percent, the terminal P/E jumps from 12.5 to 25. The P/E then soars to 50 for $k = 7$ percent.

Indeed, a frequent temptation is to use a low- k single-phase DDM P/E to match the current P/E level. For example, at $k = 8$ percent, the standard DDM as shown in Figure 8.3 would immediately yield a P/E of 25, thereby eliminating the need for an initial higher growth phase. This approach certainly has the appeal of great simplicity, but some serious problems could result from blithely applying a standard DDM model to a regime with significantly lower k values.

One such problem is that it is heroic to assume that g and b can be simultaneously held constant. Appendix 8A shows that under conditions of stable growth, $g = bR$, where R is the return on *newly* invested capital. For example, with $g = 6$ percent and $b = 0.5$, an R of 12 percent would be obtained as the long-term ROE. Thus, the curve depicted in Figure 8.3 can be equivalently expressed as either a fixed-growth case with $g = 6$ percent or a fixed-ROE case with $R = 12$ percent.³

The growth rate and the ROE on new investments can be viewed as two facets of the value-creation process. On the one hand, growth may be considered to be the primary agent, but an agent that calls for a certain level of supporting capital investment. On the other hand, the key may be the opportunity to obtain a given ROE, with the company's growth then being treated as a natural concomitant of the investment process. In either case, the basic question is the extent to which the resulting investment/growth process creates shareholder value. And as will be seen in the following discussion, a central element in the development of shareholder value is the concept of *franchise spread*.

FRANCHISE SPREADS AND THE DDM

Many authors have shown that the P/E can theoretically be segmented into two components, one term representing current investments and a second term reflecting the net present value of future investments (Williams 1938; Modigliani and Miller 1958; Miller and Modigliani 1961; Fruhan 1979; Damodaran 1994; Rappaport 1998). In previous work, Leibowitz and Kogelman (1994) characterized this segmentation in terms of (1) a tangible value (TV) component (equal to $1/k$) that represents the value of a company with zero growth prospects and (2) a franchise value (FV) component

that reflects the present value of all future growth prospects above and beyond the cost of the capital required to realize that growth. Thus,

$$\begin{aligned}\frac{P}{E} &= TV + FV \\ &= \frac{1}{k} + \left(\frac{R-k}{rk} \right) G\end{aligned}\quad (8.5)$$

where r = ROE on the *existing* book of business

R = ROE on *new* investments

G = present value of all future investment opportunities expressed as a ratio of the current book value

At this point, the focus is primarily on the FV component of the P/E:

$$\begin{aligned}FV &= \frac{R-k}{rk} G \\ &= \left(\frac{s}{rk} \right) G\end{aligned}\quad (8.6)$$

in which the franchise spread, s , is defined as

$$s \equiv R - k \quad (8.7)$$

This particular FV formulation also depends on the perpetuation approach. The two ROEs, r and R , reflect the year-by-year return on, respectively, old and new investments. Once such investments are made, the assumption is that they produce a constant stream of annual earnings at the designated ROEs. Similarly, the franchise spread takes the form of a continuing flow of excess earnings over the annual cost of capital. Such perpetuation assumptions are simplistic, to say the least, although virtually any real-life earnings stream can be modeled in terms of a corresponding “perpetual equivalent” that has the same present value (Leibowitz and Kogelman).

From Equation 8.5, one can see that when G is zero (when no growth opportunities exist), the franchise value will also be zero and the P/E will always have the simple form of $1/k$. This expression coincides with the $g = 0$ case that forms the lower curve in Figure 8.3. The equation $P/E = 1/k$ corresponds to a stock that forgoes any future earnings growth and pays out all its current earnings as a perpetual annuity. Moreover, when the franchise spread is zero, FV will also be zero—*regardless of the growth rate.*

Thus, without a positive franchise spread, a growth company will have the same valuation as a no-growth company that pays out all its earnings.

The intuition behind this finding is that new investment adds to firm value only when it provides returns that exceed the cost of capital. When $R = k$, then $s = 0$ and the requirement for excess return is not met. Any resulting growth will not be productive in terms of firm value. When $R = k$, shareholders could do just as well investing by themselves as by allowing the corporation to retain and reinvest “their” earnings. Any growth that would arise from an $R = k$ investment provides no net added value for the company’s current shareholders.

The franchise spread thus plays a crucial but often unappreciated role. Without a positive s value, no amount of growth can be productive. The franchise spread thus represents the company’s competitive edge for investing in new projects within its corporate sphere of activity.⁴ It is the incremental return associated with the company’s organization, market niche, proprietary patents, embedded capabilities, prior experience, and so on. In other words, the franchise spread is the added benefit derived through the entire complex of resources that characterize a corporation as a unique economic agent. Without this edge, the franchise spread would be zero and all the company’s investment would simply obtain the common market rate of k .

The standard DDM formula can easily be reconfigured to show explicitly the key role of the franchise spread. Proceeding with the case of a fixed retention b , g can be written as a function of k and s as

$$\begin{aligned} g &= bR \\ &= b(k + s) \end{aligned} \quad (8.8)$$

which leads to

$$\begin{aligned} \frac{P}{E} &= \frac{1-b}{k-g} \\ &= \frac{1-b}{k-b(k+s)} \\ &= \frac{1-b}{k(1-b)-bs} \\ &= \frac{1}{k-[bs/(1-b)]} \end{aligned} \quad (8.9)$$

In Figure 8.4, the P/E curves derived from this *spread-driven* DDM are plotted for various fixed values of s : $s = 0$, $s = 2$ percent, and $s = 4$ percent. As might be expected, higher franchise spreads uniformly lead to higher

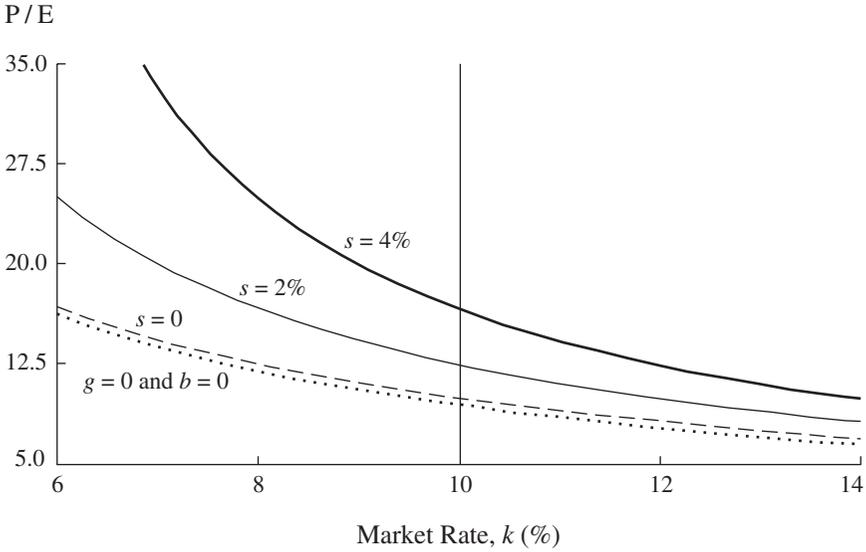


FIGURE 8.4 P/Es from Fixed-Spread DDM

P/E levels. The lowest curve, for $s = 0$, corresponds to the same no-growth curve displayed in Figure 8.3. And again, this coincidence of the two curves emphasizes that, from a P/E-value viewpoint, there is no difference between full payout with no growth on the one hand and any level of growth without a positive franchise spread on the other hand.⁵

Now, turning to the curves in Figure 8.4 that have a positive franchise spread, first focus on the curve for s fixed at 2 percent. At $k = 10$ percent, the ROE (that is, $R = k + s$) is 12 percent—the same ROE level used in the earlier example in which g was fixed at 6 percent (Figure 8.3). Thus, it is not surprising that the Figure 8.3 curve for $g = 6$ percent and the Figure 8.4 curve for $s = 2$ percent provide the same P/E of 12.5 at $k = 10$ percent. Away from this common point, however, the shapes of the two curves are quite different; the fixed- s curve is much less steeply sloped. As a result, at lower k values, the fixed- s curve leads to significantly more moderate P/E values than the stratospheric P/E levels attained from the fixed-growth case.

The relationship between the fixed- g and the fixed- s cases can be explained by considering how the franchise spread behaves in a fixed-growth regime. Because $g = bR$, when b is fixed, a fixed-growth model leads to a fixed ROE. But by definition, $s \equiv R - k$, and with a fixed R , the franchise spread will actually rise as the assumed market rate falls. Thus, at $k = 10$

percent, $s = 2$ percent, whereas at $k = 6$ percent, the spread rises to $s = 6$ percent! This seemingly perverse behavior is illustrated in Figure 8.5.

Figure 8.5 also provides an explanation of why the $g = 6$ percent curve in Figure 8.3 falls below the $g = 0$ curve for $k \geq 12$ percent. At such high k values, the franchise spread becomes negative (e.g., $k = 14$ percent implies $s = 12 - 14 = -2$ percent). At this negative spread, the 6 percent growth actually *destroys* shareholder value, thereby driving P/E below the $g = 0$ curve. Of course, no rational executive would knowingly continue to make such losing investments.

Why the standard fixed-growth P/E curve surges to such high levels at lower k rates is now clear. As k declines, all growth prospects and excess earnings streams are discounted at a lower rate, thereby increasing their present value. The discounting effect is, of course, also a factor in Figure 8.4's fixed- s curves and helps account for their ascent at lower k rates. In the fixed-growth case, however, the P/E's FV is given an additional boost from the implied movement toward the higher franchise spreads depicted in Figure 8.5. It is the combination of these two effects—the “softer” discounting and the higher franchise spreads—that leads to a fixed-growth P/E's extreme sensitivity to lower market rates.

This double effect is illustrated in Figure 8.6, where the fixed- g curve of Figure 8.3 is superimposed on the family of fixed- s curves from Figure 8.4. The fixed- g curve crosses different fixed- s curves as k varies. As noted previously, at $k = 10$ percent, the $g = 6$ percent and $s = 2$ percent curves intersect, with both curves having a P/E value of 12.5. At $k = 8$ percent, the $g = 6$ percent curve produces a P/E of 25. To attain this same P/E value from

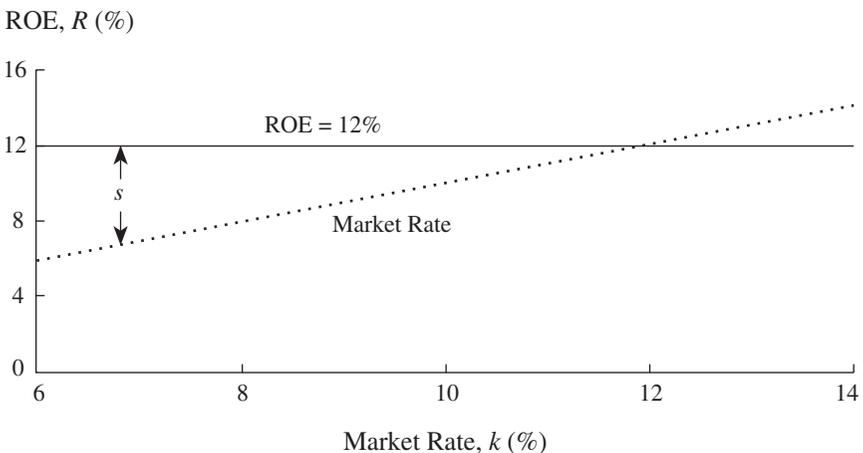


FIGURE 8.5 Spreads Associated with Fixed-Growth Model

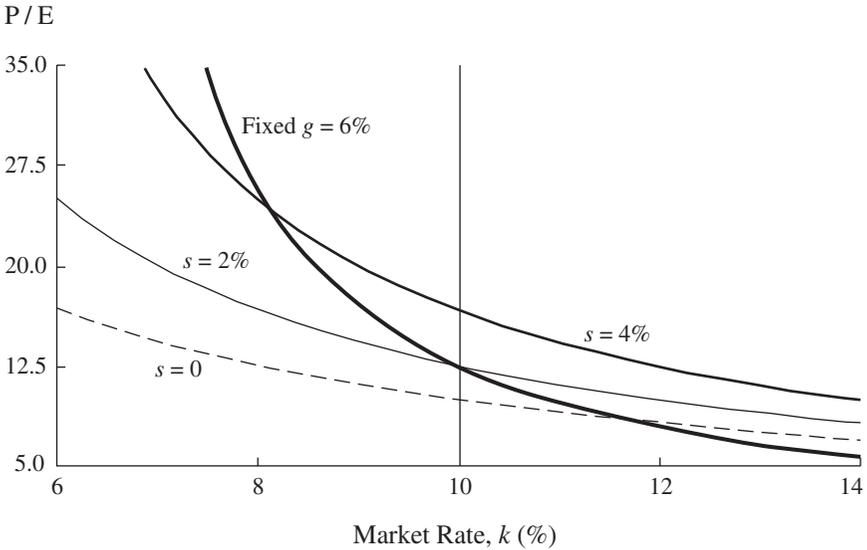


FIGURE 8.6 Fixed-Growth P/E Curve against Family of Fixed-Spread Models

a fixed- s curve, one has to jump to the fixed- s curve associated with the significantly higher $s = 4$ percent. In other words, the fixed- g curve implies an ever higher series of s values as k declines. This implication runs counter to economic reasoning: As the general long-term return available to shareholders decreases, one might expect some corresponding decrease in a company's ROE and, possibly, even some reduction in the franchise spread. At the very least, one would certainly not expect to see the inevitable consequence of a fixed ROE—a franchise spread that widens point by point with each decrement in the market rate.

Returning to the example in which the standard fixed-growth model yielded a P/E of 25 at $k = 8$ percent, note that this combination of assumptions also implies that the franchise spread must be 4 percent. At high market rates, an s of 4 percent might not be a totally unreasonable estimate, but it is a stretch under long-term (terminal-phase) conditions where the market rate would be 8 percent. At this point, the franchise spread would amount to 50 percent of the cost of capital. With low k values, the standard fixed-growth DDM always carries this tacit burden of uncomfortably wide franchise spreads.

This example illustrates one of the conceptual problems encountered in trying to use a standard single-phase DDM with low k values to “force an explanation” for high current P/Es. A related problem arises when high

P/E estimates are rationalized by assuming unsustainably high levels of earnings growth. For example, at a $k = 10$ percent level, a P/E of 25 could be obtained by pushing the fixed-growth assumption to 8 percent, implying a perpetual ROE of 16 percent (because $R = g/b = 8 \text{ percent}/0.5$) and hence an ongoing franchise spread of 6 percent—a spread that is 75 percent of the underlying market rate! Although such combinations are conceivable, it is hard to see them persisting for any long period. Thus, to obtain a P/E of 25, the standard single-phase model must be stretched toward limits that appear extreme when expressed in terms of the underlying franchise spread. Given this situation, in spite of the appealing simplicity of the single-phase model, the two-phase growth model is seen to be the more reasonable approach.

There are, of course, many ways to characterize the behavior of the franchise spread under varying discount rates. For example, instead of simply assuming that the spread remains constant, one might treat the spread as reacting *monotonically* to changes in k . In other words, if the general market rate declines, some reduction in the franchise spread should be expected, and vice versa for rising k values. As an admittedly concocted example of a monotonic relationship, consider the logarithmic spread function:⁶

$$s = 0.02 \frac{\log(17k + 0.22)}{\log(1.92)}$$

When this logarithmic spread behavior is incorporated into the P/E equation, the result is the P/E curve depicted in Figure 8.7. As expected, this “s-log” curve is far more restrained in its response to changing k values than the corresponding fixed- g curve (or even the fixed- s curve).

The purpose of this example is not to put forward this function as a literal characterization of the P/E response to changing market rates. The key point is that reasonable alternative patterns of spread behavior can lead to far more moderate P/E levels than those projected by the standard Gordon model.

Changing Role of the Retention Factor

The retention factor also undergoes a significant conceptual shift in a regime with fixed franchise spreads. In the standard Gordon model (Equation 8.2), the P/E declines with increasing retention rates. Higher retentions imply lower dividend payouts. Because standard formulations treat the growth rate as remaining invariant under changing b values, the more divi-

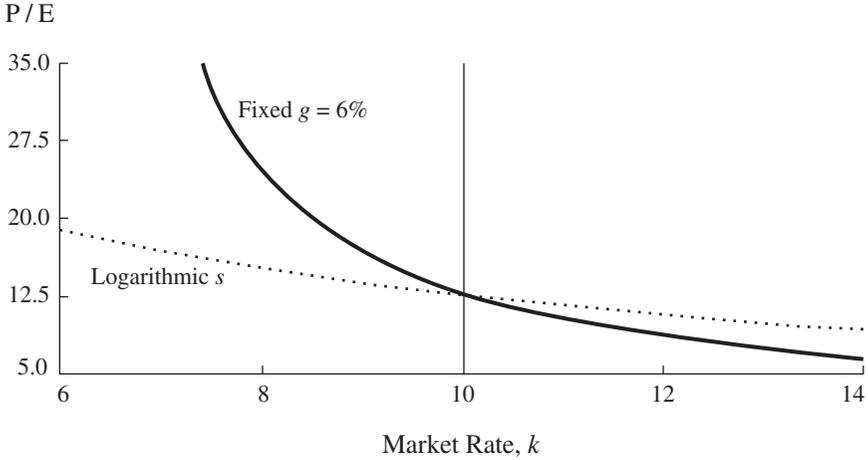


FIGURE 8.7 P/Es from Fixed-Growth DDM and from Logarithmic Spread Model

tends in the standard approach, the better. In contrast, with a fixed franchise spread,

$$g = b(k + s) \tag{8.10}$$

one can see that higher retention leads to higher growth rates. In essence, greater retention implies that more opportunities exist for periodic investment at the excess return $R = k + s$. Because of Equation 8.9, the net effect, as shown in Figure 8.8, is that the P/E rises with increasing retention—precisely the *opposite* of the standard model’s behavior. Indeed, because companies should invest only in positive-spread opportunities, one *should* expect improved P/Es from higher retention rates.

The spread-driven DDM reveals the importance of the franchise spread and its link to the retention factor. When s is zero, the retention rate is irrelevant because all new investments are made at a rate that just matches the cost of capital; hence, the P/E is 1 divided by the cost of capital, k . For s greater than zero, the retention factor is critical because it corresponds to the *magnitude* of funds that can be periodically invested at an excess return.

Of course, the assumption underlying Figure 8.8 is that even as b increases, all retained earnings can be fully invested at the fixed spread (i.e., without any spillover into lower-returning activities). Clearly, in

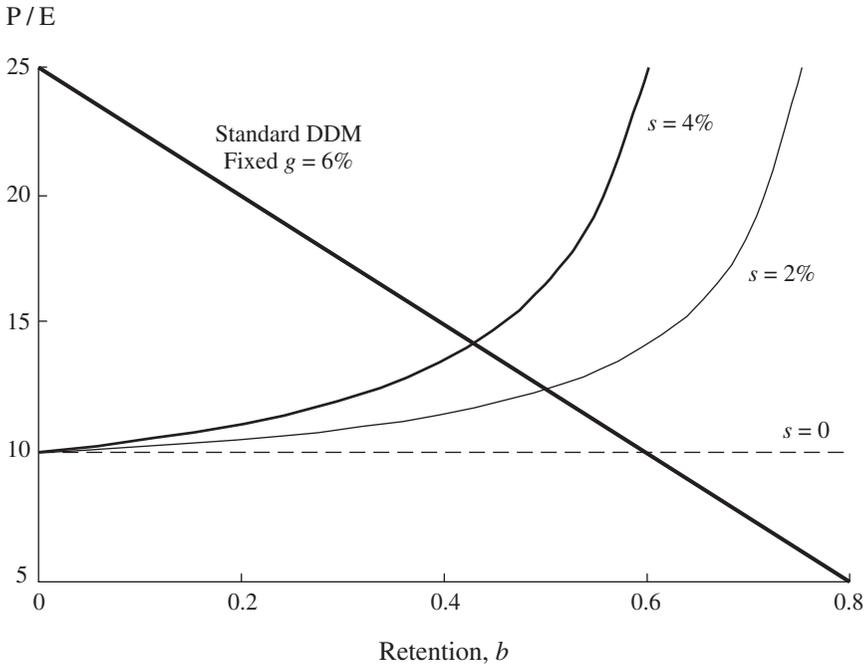


FIGURE 8.8 Contrasting P/E Responses to Changing Retention Rates with $k = 10$ Percent

such circumstances, the retention factor should be expanded to the point that all positive-spread opportunities are exploited. More generally, one could view the spread as a sort of average for all available excess returns, with bE then becoming the magnitude of investment required to fully pursue all such positive-spread situations. From this vantage point, as the retention rate increases (but remains below $b = 1$), the company's value should rise.

In effect, under a fixed-spread regime, the higher b values—although they cost more in terms of reinvested capital—lead to higher growth rates. When $b \geq 1$, however, the annual capital infusion exceeds the annual earnings. In single-phase models, in which each and every period is homogenous in structure, this net infusion without payback leads to negative valuations and other inconsistent results. But in multiphase models, one can clearly have an initial phase characterized by significant net capital consumption with the anticipated rewards being realized in future phases.

The Value-Growth Rate

The term that is central to the spread-driven DDM can be considered a new sort of growth rate, g^* , defined as follows:

$$g^* = \frac{bs}{1-b} \quad (8.11)$$

The P/E then becomes

$$\frac{P}{E} = \frac{1}{k - g^*} \quad (8.12)$$

and the expected investor return can be expressed as

$$k = \frac{E}{P} + g^* \quad (8.13)$$

This result suggests that the expected return can be expressed as the earnings yield plus this new growth rate g^* (rather than the dividend yield plus the literal earnings growth rate, g).

An earlier paper (Leibowitz 1999) showed how the standard DDM can be viewed either as a long-term equilibrium result or as a condition for P/E stability over the short term. This potential for dual interpretation also holds for the spread-driven DDM. Focusing now on the second interpretation, note that Equation 8.13 implies that the investor's short-term return can also be viewed in terms of the capture of all earnings (not simply dividends) plus a price appreciation term that corresponds to the new g^* growth rate.

To demonstrate what this implication really means, the standard short-term equation can be rewritten as

$$\begin{aligned} k &= \frac{D}{P} + g \\ &= \frac{E(1-b)}{P} + g \\ &= \frac{E}{P} + \left(g - \frac{bE}{P} \right) \end{aligned} \quad (8.14)$$

so that

$$g^* = g - \frac{bE}{P} \quad (8.15)$$

However, for the postulated case of a stable P/E, the earnings growth also corresponds to the growth in price. Hence,

$$g = \frac{\Delta P}{P} \quad (8.16)$$

and g^* can be expressed as

$$\begin{aligned} g^* &= \left(\frac{\Delta P}{P} \right) - \left(\frac{bE}{P} \right) \\ &= \frac{\Delta P - \Delta B}{P} \end{aligned} \quad (8.17)$$

where ΔB is the capital consumed in generating the price increment ΔP . Thus, g^* reflects the net amount added to value, expressed as a percentage of each year's starting price, that is derived from the company's price improvement after deducting the capital infusion needed to support that appreciation.

Finally, even though the basic development has focused on the case in which all financing is achieved through reinvested earnings, a useful digression might be to see how g^* can be interpreted in the alternative context of total *external* financing (i.e., through the issuance of new shares): Let Δn be the additional shares that would have to be sold to provide the funds needed for the company as a whole; then

$$P\Delta n = bnE \quad (8.18)$$

where n is the number of shares outstanding at the outset. The growth in shares, g_n , then becomes

$$\begin{aligned} g_n &\equiv \frac{\Delta n}{n} \\ &= \frac{bE}{P} \end{aligned} \quad (8.19)$$

and the value-growth rate can be expressed in terms of the company's overall earnings growth less the "dilution" term g_n ,

$$g^* = g - g_n \quad (8.20)$$

Thus, when growth is financed solely through new equity, g^* represents an approximate expression for the appreciation in value for the current shareholder after taking account of dilution from the newly issued shares.

EQUITY DURATION IN SPREAD-DRIVEN DDMs

A number of issues confound a P/E's response to changing market rates. The market rate is often decomposed as follows:

$$\begin{aligned} k &= y + r_p \\ &= (y_r + i) + r_p \end{aligned} \quad (8.21)$$

where r_p is the so-called risk premium and y is the nominal interest rate (which may be further parsed into a real rate, y_r , and a long-term inflation expectation, i). Variations in k can be viewed as driven by changes in any combination of the three component variables.

A rich literature addresses the sensitivity of equity valuations to interest rate changes. If fixed- g models held strictly, stocks would exhibit an extraordinarily high sensitivity to interest rate movements (referred to as the security's "duration" in fixed-income terms). Thus, as shown in Figure 8.3, a move from $k = 10$ percent to $k = 9$ percent would engender a P/E move from 12.5 to 16.67, a 33 percent increase (i.e., a duration of approximately 33). Such supersensitivity to interest rate movements far exceeds any behavior witnessed empirically; aggregate stock market durations relative to interest rate changes typically range from 2.5 to 7 (Leibowitz 1986).

As Figure 8.6 showed, the progression from a fixed- g model to a fixed- s model can ameliorate some of this supersensitivity. Moreover, the fixed- s model leads to a surprisingly simple result for the *pro forma* mathematical duration. As demonstrated in Appendix 8B, the equity duration in a fixed-spread regime corresponds exactly to the P/E itself. Thus, for the example of fixed $s = 2$ percent in Figure 8.6, the P/E rises from 12.5 at $k = 10$ percent to 14.3 at $k = 9$ percent (i.e., a 14 percent jump that roughly approximates the ending P/E of 14.3). If the move is narrowed from $k = 10$ percent

to $k = 9.75$ percent, the P/E moves to 12.9, resulting in an approximate duration of

$$\left(\frac{12.9 - 12.5}{12.5} \right) \left(\frac{1}{0.25} \right) = 12.80\%$$

—that is, converging on the P/E of 12.7 lying midway between 12.5 and 12.9.

The mathematical duration in fixed- s DDMs is much lower than in the fixed- g model, but it still remains well above the empirical values just cited. Steps toward resolving this duration paradox could follow the path of earlier studies that examined the relationship between long-term earnings growth and inflation expectations. By assuming that inflation engendered some pass-through effect on nominal earnings, these studies were able to obtain revised duration estimates that were more consistent with observed values. Some of these studies also explored how the real rate might interact with the earnings growth rate itself (Estep and Hanson 1980; Modigliani and Cohn 1979; Leibowitz, Sorensen, Arnott, and Hanson 1989; Reilly, Wright, and Johnson, 2000).

By extension of this parsing of the cost of capital, the franchise spread can be interpreted as a sort of incremental risk premium that operates “inside” the framework of individual companies. Thus, the franchise spread should bear some relationship to the market risk premium, with lower risk premiums resulting in lower franchise spreads. This observation reinforces the earlier assertion that the long-term franchise spread should decline with falling market rates, thereby moderating the standard DDM’s supersensitivity.

All these variables—real rate y_r , risk premium r_p , inflation expectation i , franchise spread s , and earnings growth rate g —could be interlinked in a complex web. The main point here, however, is that the single-phase standard DDM, even though it has undeniable appeal, can be treacherously simplistic. In particular, as one presses the underlying parameters to extremes of their historical ranges, the fixed-growth assumption embedded in the Gordon model becomes ever more suspect. In general, analysts should be sensitive to the fact that the links between b , R , g , and s , together with their potential interactions with the three components of the market rate, can have a significant impact on long-term P/E levels.

GROWTH-DRIVEN VERSUS SPREAD-DRIVEN RETURNS

To this point, the discussion of the franchise spread has focused primarily on its role in the terminal phase of a two-phase valuation model. But what is the franchise spread’s role in an initial high-growth phase?

In the earlier two-phase example, the first phase consisted of 10 years with 15 percent earnings growth to “connect” the initial P/E of 25 with the terminal P/E of 12.5. With $b = 0.5$ and $k = 10$ percent, these data imply an extremely high franchise spread for the first 10 years:⁷

$$\begin{aligned}s &= \frac{g}{b} - k \\ &= \frac{0.15}{0.50} - 0.10 \\ &= 20\%\end{aligned}$$

Such lofty franchise-spread levels may actually not be uncommon during high-growth phases. After all, the franchise spread is the source of shareholder value; hence, the incentive to invest and grow fast will generally be associated with high franchise spreads. Indeed, over the limited span of a high-growth phase, the franchise spread could be radically different from the franchise spread sustained over the longer terminal phase—different not only in level but also in its relationships to other valuation parameters. The opportunity creating the high-growth phase may carry the double-barreled promise of broad market scope together with wide profit margins. A high-growth phase may be spurred by a surge in franchise opportunities—a period of major innovations prompted by new technology or by the uncovering of whole new markets. An example is a fledgling pharmaceutical company that discovers an important drug for a widespread pathology.

Of course, with any such bursts of growth, some investment funds will be needed—for physical capital, working capital, premarketing expenses, and so forth. In general, given a clear-cut opportunity to earn excess returns, the company should be able to readily access significant sources of funding. Beyond a certain point, however, further incremental investment will not meaningfully accelerate the pace of sales or profit realization. Even with the most extraordinary opportunities, some sequence of physical and organizational events must transpire before the potential rewards can be fully harvested, and these events take time. In the example of the new drug discovery, the sequence includes the trials required for FDA approval, marketing of the drug to prescribing specialists, and so on. Thus, in valuation terms, the growth of earnings may be constrained by exogenous considerations; that is, a maximum growth rate exists such that additional funding serves no real franchise-enhancing purpose. These situations might be characterized as providing “growth-driven returns” in contrast to the spread-driven returns that form the basis for the more moderate sustainable growth of a terminal phase.

In terms of the franchise spread, the basic relationship is the same

[Equation 8.10: $g = b(k + s)$] but the flow of causality in the two regimes may be quite different. In the longer terminal phase, companies will be seeking opportunities that exceed their costs of capital on a risk-adjusted basis. Such spread-driven returns flow from a company's special resources, market access, organizational reach, or knowledge base. Some of these investments will have high ROEs, but many will have ROEs that just exceed the company's hurdle rate. In the final analysis, the cutoff from this hurdle rate will determine the magnitude of new investment. Even existing products and services that require little additional capital will face the presence or threat of competitors, and these companies also have market-related hurdles. Because company hurdle rates will always be closely related to the cost of capital, the aggregate ROE will be directly related to the market rate, which will lead to more moderate and more stable franchise spreads.

In contrast, for growth-driven projects in the initial high-growth phase, new capital investment is but one—and perhaps not even a major one—of many input factors. In the example of the drug company, the franchise value of the project is derived primarily from the company's unique position of having made the discovery and now having the patent in place. Further investment is obviously necessary but is not the main driver for the ongoing project.

For the very reason that capital is not the critical resource, these investments can garner an extraordinary return—a return so high that it bears little relationship to the market cost of capital. In a sense, rather than being the primary input, the expended capital is used to *support* the growth opportunity—hence, the term “growth-driven return.” In this case, the attained ROE bears a weak relationship to cost of capital; it has more to do with the value of the opportunity itself. Thus, high-growth ROEs are relatively independent of the cost of capital, and consequently, changes in the market rate will directly affect the franchise spread. (It is somewhat ironic that market-*independent* ROEs lead to market-*dependent* franchise spreads.) These spread effects will have the general form depicted in Figure 8.5: Lower market rates will give rise to wider franchise spreads. In this sense, the shareholder value contributed during a high-growth phase may be determined by a market-rate-sensitive function along the lines of the fixed-growth curve shown in Figure 8.3.

A DUAL-DRIVER DDM

Two further considerations moderate the shape of the P/E contribution, however, even during a high-growth phase. First, high-growth phases, by definition, have a limited span in time: Continued high growth is fundamentally infeasible within a long terminal phase. Second, the growing

earnings are reinvested for the most part, so their ultimate payoff is determined by applying the terminal phase's P/E to the attained earnings level. Thus, the sustainable margins and long-term franchise spreads associated with a terminal phase will continue to play a major role in determining net shareholder value.

Indeed, high-growth companies that reinvest all their earnings will have ROEs that approach the earnings growth rate (Leibowitz 1998). High growth rates may be maintained for some finite periods of time, but eventually, competitors will surely be attracted by the prospect of such outsized ROEs. These competitors should be willing to make significant investments in pursuit of this appealing opportunity—up to the point of driving the ROEs down to some reasonable risk-related premium over the cost of capital (i.e., toward a level characterized here by the franchise spread).⁸

The concept of two distinct forms of return generation can be articulated in the form of a “dual-driver” two-phase DDM, such as the one developed in Appendix 8C. With a growth-driven first phase and a spread-driven terminal phase, one can readily model the current high P/E of growth stocks without having to simultaneously accept an unreasonable response pattern to lower discount rates.

Figure 8.9 illustrates this point with a two-phase dual-driver model having an initial five-year earnings growth rate of 20 percent followed by a terminal phase with a 3 percent franchise spread. At $k = 10$ percent, the P/E is 25, a reasonable valuation given the inputs. If one tried to match this P/E of 25 with a standard single-phase, fixed-growth model, however, one would need a *perpetual* earnings growth rate of 8 percent. Moreover, as shown in Figure 8.9, this fixed-growth P/E would then quickly soar to impossible levels as the discount rate dropped below 9 percent.

Similarly, a single-phase, fixed-spread model would require a franchise spread of 6 percent to match the P/E of 25 at $k = 10$ percent. The fixed-spread response pattern to lower discount rates is more moderate than that of the fixed-growth case, but it is hard to accept that a franchise spread as high as 6 percent could be sustained indefinitely, even in a $k = 10$ percent environment. In contrast, the dual-driver model for this example is based on a growth rate and a spread level that are generally credible over their respective timeframes, and as shown in Figure 8.9, the P/E response to lower discount rates is much more palatable.

For purposes of exposition, the preceding discussion drew a sharp line between a high-growth phase consisting of projects with high fixed ROEs and a terminal phase consisting of spread-dependent investments. In reality, both types of projects will be simultaneously available at a given time—within a given company and throughout the economy at large. At various points in a company's or a market's cycle, however, the proportions of growth-driven returns and spread-driven returns will be different. The rela-

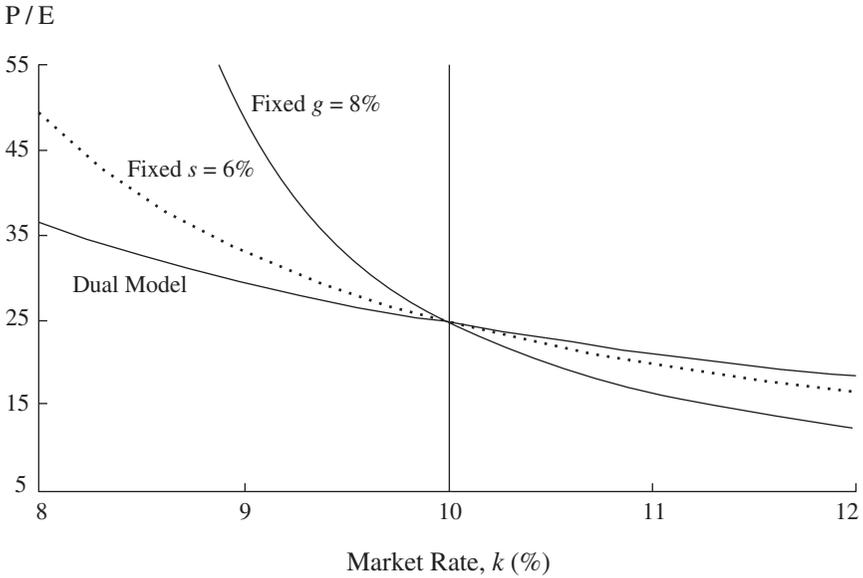


FIGURE 8.9 Dual-Driver DDM versus Single-Phase Fixed-Growth and Fixed-Spread Models

Note: For the dual-driver model depicted here, the first phase is five years with a growth rate of 20 percent; thereafter, the franchise spread is 3 percent.

tive proportions of these return opportunities will determine the extent to which a given phase should be characterized as a limited time span with high growth or as a longer period with a more moderate but more sustainable pace of growth.

CONCLUSION

It is in the nature of technological progress and a dynamic economy that companies will from time to time experience a burst of high growth, replete with growth-driven returns. It is also in the nature of competition and free markets that these high-growth periods will eventually succumb to longer spans of more moderate activity characterized by tighter franchise spreads and more modest spread-driven returns. This dual structure can be conveniently formulated as a two-phase model having a standard growth-driven DDM for the early phase and a spread-driven DDM for the long-term (terminal) phase.

In the high-growth phase, the growth rate itself is the key variable, but in the longer, terminal phase, the P/E will largely depend on the sustainable

franchise spread. Almost by definition, growth must be relatively moderate to persist over the long term, and any such growth will provide franchise value only to the extent that the franchise spread is positive.

Different characterizations of the terminal-phase spread can lead to vastly different P/E curves. The intent here is not to argue for any particular model for the interaction of the relevant parameters. The key point is that the standard fixed-growth P/E model embeds an assumption that franchise spreads rise linearly with declining market rates. This particular model of spread behavior is difficult to accept as a universal truth. Even a fixed-spread model strains credibility, because excess returns should shrink as the market rate declines. The exact nature of this relationship is less important than the general observation that in more realistic models for spread behavior, the P/E's response to lower discount rates should be considerably more moderate than the extreme values implied by the standard DDM.

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APPENDIX 8A: The Basic Investment-Driven Growth Formula

Suppose E_1 and E_2 represent earnings over two consecutive periods. If the earnings growth rate,

$$g = \frac{E_2 - E_1}{E_1} \quad (8A.1)$$

is derived from new investments in amount ΔB and at return R , then

$$E_2 = E_1 + (\Delta B)R \quad (8A.2)$$

The retention factor, b , can then be defined as the magnitude of new investments expressed as a ratio of the current earnings:

$$b = \frac{\Delta B}{E_1} \quad (8A.3)$$

Note that this definition of the factor b does not restrict its application to the case of reinvested earnings: The newly invested capital may be derived from a variety of internal or external financing sources. Indeed, for a rapidly growing company with heavy capital needs, this ratio definition could easily lead to b values that exceed 1. For the purposes of this chapter, however, the analyses are restricted to the simpler case in which all new investment is derived from retained earnings bE_1 .

Combining the preceding equations produces

$$\begin{aligned}
 g &= \frac{E_2 - E_1}{E_1} \\
 &= \frac{E_1 + (\Delta B)R - E_1}{E_1} \\
 &= \frac{(bE_1)R}{E_1} \\
 &= bR
 \end{aligned}
 \tag{8A.4}$$

Note that R in Equations 8A.2 and 8A.4 is the return on *new* investments, as opposed to the ROE on the *existing* book of business.

APPENDIX 8B: Equity Duration in Spread-Driven DDMs

The basic spread-driven representation, as developed in the chapter, is

$$\frac{P}{E} = \frac{1}{k - g^*}
 \tag{8B.1}$$

where

$$g^* = \frac{bs}{1 - b}
 \tag{8B.2}$$

and the spread, s , may, in general, be some function of the market rate, k . The *pro forma* mathematical duration, D , is given by

$$\begin{aligned}
 D &= -\left(\frac{1}{P}\right)\left(\frac{dP}{dk}\right) \\
 &= -\left[\frac{1}{E/(k-g^*)}\right]\left[\frac{-E}{(k-g^*)^2}\right]\left(\frac{d}{dk}\right)(k-g^*) \\
 &= \left(\frac{1}{k-g^*}\right)\left(1-\frac{dg^*}{dk}\right) \\
 &= \left(\frac{1}{k-g^*}\right)\left[1-\left(\frac{b}{1-b}\right)\left(\frac{ds}{dk}\right)\right]
 \end{aligned} \tag{8B.3}$$

Now, in the standard fixed-growth DDM, the ROE, R , is also fixed, so

$$s(k) = R - k \tag{8B.4}$$

and

$$\frac{ds}{dk} = -1 \tag{8B.5}$$

which leads to a duration of

$$\begin{aligned}
 D &= \left(\frac{1}{k-g^*}\right)\left[1-\frac{b(-1)}{1-b}\right] \\
 &= \left(\frac{1}{k-g^*}\right)\left(\frac{1}{1-b}\right) \\
 &= \frac{1}{(1-b)k-bs} \\
 &= \frac{1}{k-b(k+s)} \\
 &= \frac{1}{k-g}
 \end{aligned} \tag{8B.6}$$

because

$$\begin{aligned}
 g &= bR \\
 &= b(k+s)
 \end{aligned} \tag{8B.7}$$

This result is the standard mathematical duration associated with the Gordon DDM. As pointed out and referenced in the text, more refined statistical models lead to quite different formulations.

When the franchise spread (rather than the growth rate or the ROE) is assumed to be the constant parameter, however, then

$$\frac{ds}{dk} = 0 \tag{8B.8}$$

and the mathematical duration becomes

$$\begin{aligned} D &= \left(\frac{1}{k - g^*} \right) \left[1 - \left(\frac{b}{1-b} \right) \left(\frac{ds}{dk} \right) \right] \\ &= \frac{1}{k - g^*} \\ &= \frac{P}{E} \end{aligned} \tag{8B.9}$$

In other words, the mathematical equity duration under a fixed-spread assumption is simply the P/E itself!

APPENDIX 8C: A Dual-Driver DDM

The initial phase consists of H years of earnings growth g_1 with a retention of b_1 . This period provides a stream of dividends having the present value

$$\sum_{i=1}^H \frac{E_1(1-b_1)(1+g_1)^{i-1}}{(1+k)^i} = \frac{(1-b)E_1}{g_1 - k} \left[\left(\frac{1+g_1}{1+k} \right)^H - 1 \right] \tag{8C.1}$$

where k is the market rate of return.

After H years of growth, earnings over year $H + 1$ will have risen to the level

$$E_{H+1} = E_1(1 + g_1)^H \tag{8C.2}$$

At this point, the company moves into the terminal phase, where it earns a spread s_2 on a capital retention amounting to b_2 of each year's earnings. The earnings growth rate now becomes g_2 , where

$$g_2 = b_2(k + s_2) \quad (8C.3)$$

So, today's present value of the dividend stream from year H forward becomes

$$\begin{aligned} \frac{1}{(1+k)^H} \sum_{i=1}^{\infty} \frac{E_{H+1}(1-b_2)(1+g_2)^{i-1}}{(1+k)^i} &= \left[\frac{E_{H+1}(1-b_2)}{(1+k)^H} \right] \left(\frac{1}{1+k} \right) \\ &\quad \left\{ \frac{1}{1 - [(1+g_2)/(1+k)]} \right\} \\ &= \frac{E_{H+1}(1-b_2)}{(1+k)^H(k-g_2)} \\ &= E_1 \left(\frac{1+g_1}{1+k} \right)^H \left(\frac{1-b_2}{k-g_2} \right) \end{aligned} \quad (8C.4)$$

with the assumption that $k > g_2$.

The total present value of the two dividend streams gives

$$\begin{aligned} \frac{P}{E_1} &= \left(\frac{1-b_1}{g_1-k} \right) \left[\left(\frac{1+g_1}{1+k} \right)^H - 1 \right] + \left(\frac{1+g_1}{1+k} \right)^H \left(\frac{1-b_2}{k-g_2} \right) \\ &= \left(\frac{1+g_1}{1+k} \right)^H \left[\left(\frac{1-b_1}{g_1-k} \right) + \left(\frac{1-b_2}{k-g_2} \right) \right] - \left(\frac{1-b_1}{g_1-k} \right) \end{aligned} \quad (8C.5)$$

If the first phase is growth driven at the rate g_1 and the second phase is spread-driven at the spread s_2 , then

$$\begin{aligned} \frac{P}{E_1} &= \left(\frac{1+g_1}{1+k} \right)^H \left\{ \left(\frac{1-b_1}{g_1-k} \right) + \frac{1}{k - [(b_2 s_2)/(1-b_2)]} \right\} - \left(\frac{1-b_1}{g_1-k} \right) \\ &= \left(\frac{1+g_1}{1+k} \right)^H \left[\left(\frac{1-b_1}{g_1-k} \right) + \left(\frac{1}{k-g_2^*} \right) \right] - \left(\frac{1-b_1}{g_1-k} \right) \end{aligned} \quad (8C.6)$$

When the s_2 spread is stable (i.e., has no k dependence) and when all other parameters can be treated as fixed no matter what variations occur in the discount rate, one obtains the response pattern depicted in Figure 8.9.

A number of special cases deserve mention. First is the case of the two phases merging with a common set of parameter values; Equation 8C.6 then devolves to the standard one-phase DDM:

$$\frac{P}{E_1} = \frac{1 - b_1}{k - g_1} \quad (8C.7)$$

A second special case is when the length, H , of the growth phase shrinks to zero, resulting in the spread-driven formulation

$$\frac{P}{E_1} = \left(\frac{1}{k - [(b_2 s_2) / (1 - b_2)]} \right) \quad (8C.8)$$

In the other direction, when the initial growth phase continues indefinitely (i.e., when $H \rightarrow \infty$), the result is the standard DDM, given in equation 8C.7, under the convergence requirement that $k > g_1$.

Finally, a common special case entails complete reinvestment in the first phase (i.e., $b_1 = 1$) so that

$$\begin{aligned} \frac{P}{E_1} &= \left(\frac{1 + g_1}{1 + k} \right)^H \left(\frac{1}{k - [(b_2 s_2) / (1 - b_2)]} \right) \\ &= \left(\frac{1 + g_1}{1 + k} \right)^H \left(\frac{1}{k - g^*} \right) \end{aligned} \quad (8C.9)$$

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The Levered P/E Ratio

A vast literature examines the role of debt in corporate valuation, but most of these works proceed from the vantage point of corporate finance (i.e., ascertaining the effects of adding debt to a previously unlevered company). The investment analyst, however, confronts an already-levered company with already-levered return parameters. The analyst's challenge is to estimate the stock's theoretical value by inferring the company's underlying structure of returns. This shift in vantage point leads to results about the effect of leverage that are surprisingly different from the results of studies from the corporate finance angle. Whereas corporate finance studies find only a moderate effect of leverage, when viewed from the analyst's perspective, a company's value has such a high degree of sensitivity to the leverage ratio that it can significantly alter the theoretical P/E valuation. Moreover, from the analyst's vantage point, leverage always moves the P/E toward a lower value than that obtained from the standard formula.

The classic Modigliani–Miller study (1958a) gave rise to a vast literature on the role of debt in corporate valuation (Miller 1977; Modigliani 1982; Modigliani and Cohn 1979; Modigliani and Miller 1958b, 1959, 1963a, b; Myers 1974, 1984; Taggart 1991). Many of these studies focused on incorporating the effects of taxes, bankruptcy costs, credit spreads, and inflation into the basic Modigliani–Miller framework relating cost of capital, corporate finance, and the theory of investment.¹ Virtually

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all of these academic works, however, proceed from the *corporate finance* vantage point (i.e., ascertaining how various debt levels affect the company's value).

In contrast, there is a paucity of work that addresses the problem from the *market perspective* of an investment analyst. To describe the market's perspective using a medical analogy, one might say a company "presents" a variety of symptoms that can reveal an underlying condition. In other words, it has certain observable growth characteristics, with the required funding supplied by a given combination of equity and debt. The investment analyst's role is akin to that of a clinical practitioner who has the challenge of diagnosing the underlying condition from the "presented" symptoms. And just as the conjunction of two symptoms may have far more important implications than either one by itself, so the combination of a given growth rate and a given equity absorption rate can, depending on the magnitude of debt incorporated in the funding process, have vastly different valuation effects. The analyst's problem is to estimate the stock's theoretical value, typically in terms of some comparative metric, such as a P/E.

In light of the growth of corporate debt in modern financial markets, as shown in Figure 9.1, it is surprising that so little attention has been paid to the issue of the P/E of the already-levered company. In the practitioner literature, there is essentially a total vacuum on how various levels of debt interact with such key valuation measures as P/E. Clearly, market participants need to incorporate this debt effect more routinely into analyses at both the micro level (e.g., cross-sectional comparison of individual stocks) and the macro level (e.g., the role of the recent surge in corporate debt on the aggregate market risk premium). Indeed, given the evolving role of cor-

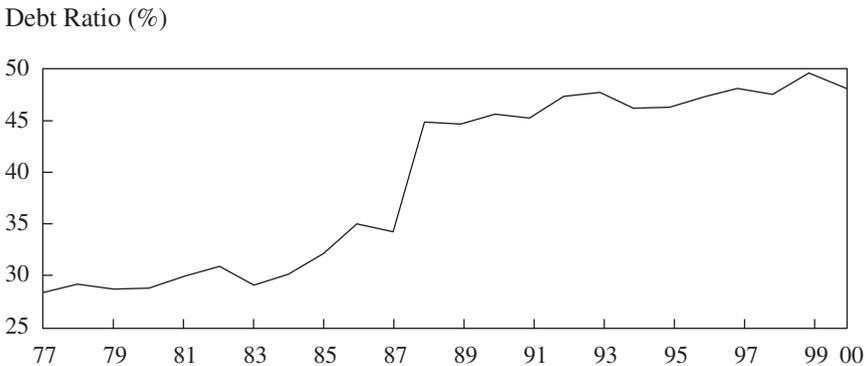


FIGURE 9.1 Debt Ratio of S&P 400: 1977–2000
(long-term debt/long-term debt plus book value)

porate debt, historical analysis of the equity risk premium might be better framed in terms of the more fundamental risk associated with a notionally unlevered equity position.

In a 1991 study with Kogelman, we explored the debt problem within the franchise value framework. Although we did target the P/E, this study still followed the corporate finance approach of using the return parameters of the unlevered company as the starting point. Our basic finding was that the use of leverage produces two effects that tend to offset each other. Moreover, it turned out that debt could increase or reduce the P/E, depending on the unlevered company's return structure. For normal levels of investment-grade debt, however, all of these P/E effects were relatively modest.

This finding may have been theoretically correct from a corporate finance viewpoint (i.e., the effect of leverage on a given company with *known* return characteristics). The problem encountered in investment analysis, however, is that of an already-levered company with its already-levered return parameters. In this setting, the analyst must infer the company's underlying fundamental structure of returns.

The corporate finance approach deals with a single company—that is, exploring the impact on a company of varying degrees of leverage. In contrast, this current chapter looks at a number of distinct companies that display the same overt characteristics but differ in their debt levels. This shift in vantage point leads to results that are surprisingly different from those of the earlier corporate finance study, which found only a moderate impact from increasing debt loads. The present study, by focusing on the parameters that companies present to the marketplace, finds such a high degree of sensitivity to the leverage ratio that it can significantly alter a company's estimated P/E valuation. Moreover, in this market context, the P/E always moves toward a *lower* theoretical value than that obtained from the standard formula.

This sensitivity can be illustrated through three numerical examples. Consider three companies, each retaining 40 percent of earnings and achieving 8 percent growth. The only differences among the companies are that the first is debt free, the second has a debt ratio of 40 percent, and the third has a somewhat higher debt ratio, 50 percent. Suppose that the market discount rate for the unlevered company is 10 percent and the interest rate is 6 percent. (This article uses these same values for the retention rate, the earnings growth, the market rate, and the interest rate in all the numerical examples except when specifically noted.) Using the basic Gordon model with these assumed values, one finds that the theoretical P/E for the debt-free company is 30. In contrast, the 40 percent debt load of the second company drives its theoretical P/E down to 23. An even more realistic comparison would be that the company's 40 percent debt load is represen-

tative of a particular market sector. To illustrate the continued sensitivity to debt levels beyond the sector average P/E of 23, consider the third company, which has identical earnings retention and growth characteristics but has a slightly higher debt load, 50 percent. In this case, the theoretical P/E drops to 20, a significant difference from the sector average.

In fairness, these examples tend to overstate the magnitude of the leverage effect. In practice, a number of other considerations, such as the presence of taxes, act as moderating factors. Nevertheless, the widespread and increasing role of debt in modern financial markets suggests that leverage factors should play a larger role in the analytical process. This concern may be particularly relevant in today's market because the valuation impact of debt grows at a rapidly accelerating pace once debt increases beyond the 50 percent level.²

THE GORDON GROWTH MODEL

The two most obvious effects of debt are (1) the reduction of earnings because of interest charges and (2) the intrusion of the creditor's claim on the company's assets. Although the 1991 franchise value study (Leibowitz and Kogelman) took these two effects into account, this earlier work overlooked an important third effect—how debt changes the appearance of the company's characteristics. This third effect is the focal point of the present chapter.

The starting point for this analysis is the framework of the basic Gordon growth model (Williams 1938; Gordon 1962, 1974; Damodaran 1996).³ Although clearly a simplistic formulation, the Gordon model and its multiphase variants remain in common use by market participants. Moreover, the basic Gordon model serves as a short-term equilibrium condition for P/E stability.

For an unlevered company, the Gordon model expresses a company's value, P' , as

$$P' = \left(\frac{1 - b'}{k' - g} \right) E' \quad (9.1)$$

where b' = fraction of earnings that must be retained and reinvested to generate growth g

k' = equity discount rate

g = uniform annual earnings growth rate

E' = current annual level of economic earnings

The “primed” symbols identify variables that apply strictly to the unlevered company.

Because the company is unlevered, its earnings can be viewed as the product of current assets, A , and return on assets, r' :

$$E' = r'A \quad (9.2)$$

In the general development of P/E sensitivity to leverage, the new investments that are retained and invested each year, $b'E'$, are assumed to attain a return on investments (ROI) of R' .⁴ This new ROI may be quite distinct from the return on assets (ROA) on the company's current assets, r' . A material gap between R' and r' can have a significant impact on the company's valuation, but to attain the simplicity of the basic Gordon model, one must assume ROA/ROI equivalence, so $R' = r'$. This assumption has the further advantage that it forces the earnings growth rate, g , to coincide with the growth of investment opportunities. Moreover, when each year's earnings growth can be ascribed to the prior year's investment, it can also be shown that

$$g = b'r' \quad (9.3)$$

so, the Gordon model can be written

$$\begin{aligned} P' &= \left(\frac{(1-g)/r'}{k'-g} \right) E' \\ &= \frac{1}{r'} \left(\frac{r'-g}{k'-g} \right) E' \end{aligned} \quad (9.4)$$

Thus, the P/E rises with increasing return on assets, r' , as shown in Figure 9.2 for fixed values of $k' = 10$ percent and $g = 8$ percent.

Incorporating Debt

Now, consider a company with debt. If b is the fraction of debt relative to the current capitalization, the first adjustment to the standard Gordon model framework is that the earnings will be reduced by the annual interest cost, resulting in an after-interest earnings, E , of

$$\begin{aligned} E &= E' - ybA \\ &= (r' - yb)A \end{aligned} \quad (9.5)$$

where y is the interest rate on debt and b is the debt load.

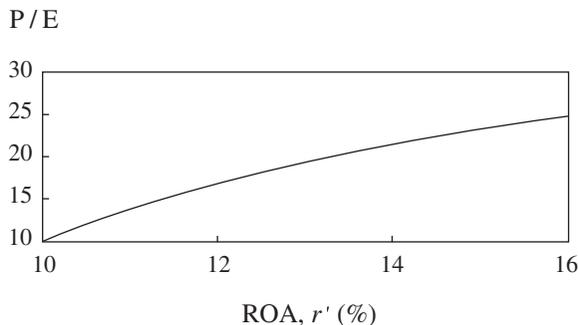


FIGURE 9.2 Standard Gordon Model for Various Unlevered ROA Levels ($k' = 10$ percent; $g = 8$ percent)

A second adjustment is that the value of stockholders' equity now becomes

$$\begin{aligned} P &= P' - D \\ &= P' - bA \end{aligned} \quad (9.6)$$

where D is the value of the debt.

This formulation adopts the market convention of using the company's book value as the basic *numeraire* for the ROA and debt load b . This approach casts the development in the argot of the market practitioner. Identical results could be obtained by using more observable parameters—earnings, earnings growth, and retention rates—as the basic inputs.

The Gordon model can be readily modified to reflect these reductions from earnings and from shareholders' equity as follows:

$$\begin{aligned} \frac{P}{E} &= \frac{P' - D}{E} \\ &= \left(\frac{1 - b'}{k' - g} \right) \left(\frac{E'}{E} \right) - \frac{D}{E} \\ &= \left(\frac{1 - b'}{k' - g} \right) \left(\frac{r'}{r' - yb} \right) - \frac{b}{(r' - yb)} \end{aligned} \quad (9.7)$$

Note that this approach allows continued use of unlevered rate k' as the key discounting variable. (This approach avoids the need to invoke a risk model for the levered discount rate—an escalation that becomes increasingly problematic for more-complex cash flow patterns.)

Equation 9.7 is consistent with the corporate finance results obtained in the 1991 Leibowitz-Kogelman study. As shown in Figure 9.3, for a *given* ROA, r' , these revisions lead to P/Es that are only slightly affected by the leverage levels typically encountered in the market. This outcome led to the conclusion in the corporate finance study that normal levels of debt will have only a modest effect on a company's P/E. Figure 9.3 also illustrates the somewhat curious result that with increasing leverage, the P/E can fall or rise, depending on the magnitude of the unlevered P/E. More precisely, when the fundamental returns are such that the unlevered P/E exceeds the reciprocal of debt rate y , the P/E rises with leverage; otherwise, it falls. But whatever the direction, the effect remains moderate.

Table 9.1 presents a numerical example of this "corporate finance" effect. The first column represents the unlevered Company A with an ROA of 20 percent on a book value, B , of \$100. With the earlier assumption of $g = 8$ percent earnings growth and an unlevered discount rate of $k' = 10$ percent, the basic Gordon model (Equation 9.4) yields a P/E for Company A of 30, an "enterprise value" (or unlevered equity value) of \$600, and a price-to-book ratio (P/B) of 6.

In the next column, Company A is subjected to a financial restructuring with a 50 percent debt load that reduces the book equity value to \$50. Because the value of the overall enterprise is unaffected by the addition of the debt, the theoretical equity value declines only to \$550. After an annual interest charge of \$3, the earnings drop to \$17, so the adjusted P/E increases to $550/17 = 32.35$. This result reflects the moderate effect to be expected in this "corporate finance" case. (Note that, at the same time, however, the P/B soars to 11.)

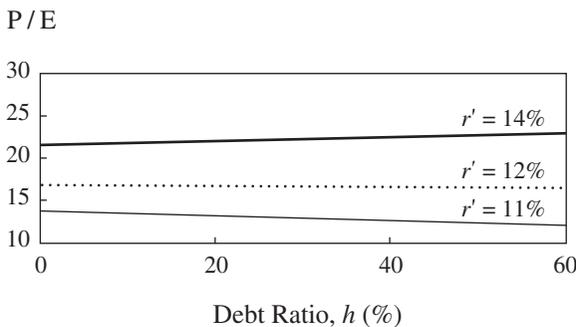


FIGURE 9.3 P/E versus Debt Ratio for Specified Unlevered ROA

The Market Perspective

The pattern presented so far in Table 9.1 and Figure 9.3 is theoretically sound as long as the debt policy in question is posed in the framework of a single company's fundamental (i.e., unlevered) return characteristics, r' . The investment analyst, however, must deal with an already-leveraged company. In such situations, the all-too-natural approach is to focus on the leveraged company's growth rate and either its return on equity (ROE), r , or its retention factor, b . As I will show, this very different starting point can lead to significant misestimation if the levered numbers are naively plugged into the standard Gordon model together with an unlevered discount rate.

To see this shift to the investment analyst's framework, first consider

TABLE 9.1 Contrasting Effects of Leverage

Measure	Company A		Levered Company B
	Unlevered	Levered	
Book value, B	\$100	\$ 50	\$100
Earnings after interest, E	<u>20</u>	<u>17</u>	<u>20</u>
ROE, r	20%	34%	20%
Debt, D	<u>0</u>	<u>50</u>	<u>100</u>
Total assets, A	\$100	\$100	\$200
Annual interest	0	3	6
Earnings before interest, E'	<u>20</u>	<u>20</u>	<u>26</u>
ROA, r'	20%	20%	13%
Enterprise value ratio ^a	×30	×30	×19.23
Enterprise value, $P' = (P'/E')E'$	\$600	\$600	\$500
Less debt, D	<u>0</u>	<u>50</u>	<u>100</u>
Equity value, P	\$600	\$550	\$400
After-interest earnings	<u>÷\$ 20</u>	<u>÷\$ 17</u>	<u>÷\$ 20</u>
Levered P/E	30×	32.35×	20×
Levered P/B	6×	11×	4×

Note: Growth rate = 8 percent; unlevered discount rate = 10 percent; and interest rate = 6 percent.

^aEnterprise value ratio: $P'/E' = (1/r')(r' - g/k' - g)$.

how the levered parameters relate to the unlevered ones. Then, the Gordon model can be revised to appropriately reflect the leverage case.

The first step is to define the levered company's book equity, B , as

$$\begin{aligned} B &\equiv A - D \\ &= (1 - b)A \end{aligned} \quad (9.8)$$

and the ROE on this book equity as

$$\begin{aligned} r &= \frac{E}{B} \\ &= \frac{E' - ybA}{(1 - b)A} \\ &= \frac{r' - yb}{1 - b} \end{aligned} \quad (9.9)$$

Figure 9.4 shows the plots of this ROE, r , as a function of debt levels b for $r' = 11$ percent, 12 percent, and 14 percent. This figure illustrates the well-known result that debt really does “lever” the ROE to levels that far exceed the basic ROA. Although this leverage effect has itself been widely described, however, its implications for the P/E have seemingly been overlooked—especially in the practitioner literature, where the P/E valuation ratio continues to play such a fundamental role.

Equation 9.9 can be reversed, as follows, to express r' in terms of r ,

$$r' = (1 - b)r + yb \quad (9.10)$$

Figure 9.5 plots the implied unlevered ROA for given values of r . As might be expected, this relationship is monotonically decreasing. Thus, for

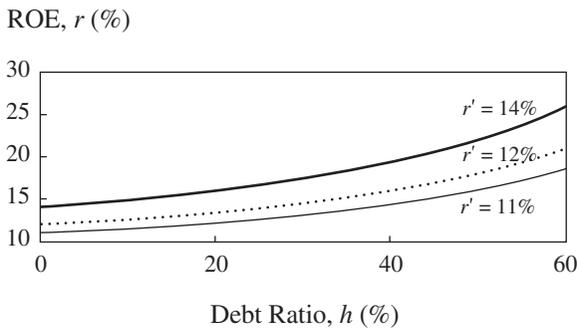


FIGURE 9.4 Levered ROE versus Debt Ratio for Specified Unlevered ROA

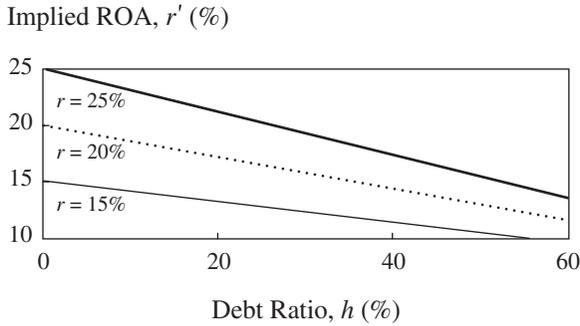


FIGURE 9.5 Implied Unlevered ROA versus Debt Ratio for Specified Levered ROE

a given ROE observed in a levered company, one can induce that the unlevered ROA will always be lower. Moreover, the higher the company's debt ratio, the lower the underlying ROA of that company.

For a numerical example of this "market perspective," consider two companies that happen to have the same ROE (20 percent), the same book value (\$100), and the same annual earnings (\$20). The sole difference is their debt load. As before, the first column for Company A in Table 9.1 represents the unlevered company. In the third column is Company B, which on the outside, appears to be the same as Company A. But Company B has a capital structure that already includes a 50 percent debt load. Because Company B has the same \$20 earnings and 20 percent ROE as Company A, its book value must also be \$100. But with this book value and the specified 50 percent debt load, the total asset base of Company B must be \$200. In tracking Company B's observable results back to a hypothetically unlevered structure, one finds that the pre-interest earnings of \$26 on an unlevered asset value of \$200 would produce an ROA of 13 percent. Plugging these values into Equation 9.4, one obtains a ratio of the enterprise value to pre-interest earnings of 19.23. Multiplying this ratio by the \$26 of pre-interest earnings gives an enterprise value, P' , of \$500. Now, moving back to Company B's current levered format, the enterprise value of \$500 is preserved but the debt level of \$100 must be deducted to obtain an equity value of \$400. After dividing by the after-interest earnings of \$20, one obtains a P/E of 20—significantly lower than the unlevered Company A's P/E. (Note the lower P/B also.) This significant reduction in the theoretical P/E is representative of the difference between the "market perspective" on two superficially similar companies and the "corporate finance view" that applies to a single company undergoing leverage.

Figure 9.6 provides a general illustration of the “market perspective.” As can be seen, for a given value of the levered ROE, the P/E declines significantly as the debt ratio rises. This pattern is in stark contrast to the P/E’s response to ROA shown in Figure 9.3, where for sufficiently high ROAs, the P/E rises—gently—with increasing debt levels. Moreover, even at fairly common debt levels, the downward slopes of Figure 9.6’s P/E curves far exceed the more moderate rise or fall of Figure 9.3’s curves. For example, with $r = 20$ percent, a move from a debt ratio of $h = 40$ percent to $h = 50$ percent results in a decline in the theoretical P/E from 23 to 20. Moreover, as one moves to higher debt levels, the P/E impact becomes even more marked; for example, for $r = 20$ percent, the move from $h = 50$ percent to $h = 60$ percent brings the theoretical P/E down from 20 to 15!

These somewhat paradoxical results appear more natural once one recognizes that the visible ROE must, in effect, be unlevered to uncover the underlying ROA and that it is this unlevered ROA that is the fundamental source of economic value.

The Levered Gordon Model

Now, a form of the Gordon model can be developed (see Leibowitz 2002) that explicitly makes use of the levered ROE, r (or the levered retention, b), and the equity risk premium, r_p , which is defined here as simply the premium over the debt rate:⁵

$$r_p = k' - y \tag{9.11}$$

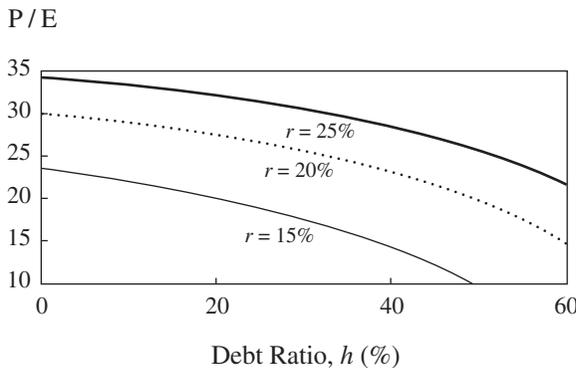


FIGURE 9.6 The Market Perspective: P/E versus Debt Ratio for Specified Levered ROE

For this formulation, certain standard Gordon model assumptions are maintained—that growth is constant in every period and that the return on old and new investments is coincident. A requirement is then added—that the ongoing debt ratio is the same as the current debt level.

Incorporating Equation 9.6 and Equation 9.10 into Equation 9.4 yields

$$\begin{aligned}
 \frac{P}{E} &= \frac{P'}{E} - \frac{D}{E} \\
 &= \left(\frac{P'}{E} \right) \left(\frac{E'}{E} \right) - \frac{D}{E} \\
 &= \left(\frac{1}{r'} \right) \frac{r' - g}{k' - g} \left(\frac{E'}{E} \right) - \frac{D}{E} \\
 &= \left(\frac{r' - g}{k' - g} \right) \frac{A}{E} - \frac{D}{E} \\
 &= \left(\frac{1}{k' - g} \right) \left\{ (r' - g) \frac{A}{r(1-h)A} - \frac{bA(k' - g)}{r(1-h)A} \right\} \\
 &= \left(\frac{1}{k' - g} \right) \frac{1}{r(1-h)} \{ [r(1-h) + by - g] - b(k' - g) \} \\
 &= \left(\frac{1}{k' - g} \right) \frac{1}{r(1-h)} [(1-h)(r-g) - b(k' - y)] \\
 &= \left(\frac{1}{k' - g} \right) \left(1 - \frac{g}{r} \right) - \frac{br_p}{r(1-h)}
 \end{aligned} \tag{9.12}$$

With the assumptions already stated, it can be shown that

$$\begin{aligned}
 g &= b'r' \\
 &= br
 \end{aligned} \tag{9.13}$$

so

$$\begin{aligned}
 \frac{P}{E} &= \left(\frac{1}{k' - g} \right) 1 - b - \frac{br_p}{(1-h)r} \\
 &= \left(\frac{P}{E} \right)_u - \left(\frac{b}{1-h} \right) \frac{r_p}{r(k' - g)}
 \end{aligned} \tag{9.14}$$

where $(P/E)_u$ is the unadjusted P/E obtained from applying the Gordon model to the market observables without considering the debt load.

Because

$$\frac{bA}{(1-b)rA} = \frac{D}{E} \quad (9.15)$$

the levered P/E can also be expressed as

$$\frac{P}{E} = \left(\frac{P}{E} \right)_u - \left(\frac{D}{E} \right) \frac{r_p}{k' - g} \quad (9.16)$$

The formulation in Equation 9.16 shows that when the debt level is high or when the issuer's incentive to use debt is significant—as represented by a large risk premium—the debt-adjustment term can become quite important. The risk premium in this context represents the relative cost of financing to the company. With a low after-tax cost of debt, this premium can be large, leading to a substantial P/E impact.

Moreover, using $g = rb$, Equation 9.14 could have been expressed as

$$\frac{P}{E} = \frac{1 - b^*}{k' - g} \quad (9.17)$$

where b^* , the *effective* retention factor, is defined as

$$b^* = b \left[1 + \frac{hr_p}{(1-b)g} \right] \quad (9.18)$$

Thus, all the revisions can be boiled down to a certain enhanced value for retention factor b^* . As shown in Figure 9.7, this enhancement can become significant, even for relatively modest debt ratios. In essence, this enhancement reflects the added assets required in the form of debt to support the specified growth rate. With increasing debt, a given observed retention b (or observed r) implies an even lower underlying ROA. And because this ROA determines the economic value of the growth prospects in the case of fixed investment opportunities, the enhanced retention factor means that a uniformly lower P/E is appropriate. In essence, this finding suggests that overstated P/E estimates may result from blithely using Gordon models (or perhaps any present value models) without taking the company's debt structure into account.

Another way of conceptualizing this somewhat paradoxical behavior is to consider how a company's increasing leverage affects its most "visible"

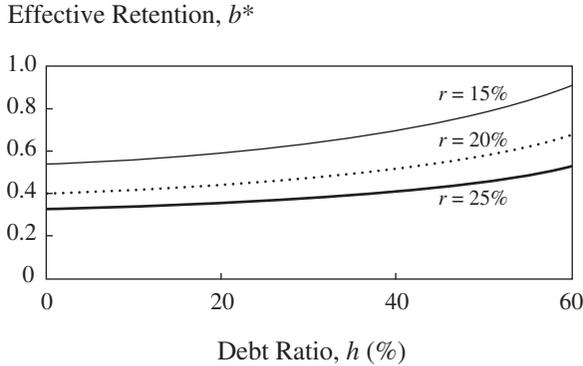


FIGURE 9.7 Effective Retention versus Debt Ratio for Specified Levered ROE

characteristics. Recall the initial assumption that the magnitude of investment opportunities remains invariant (hence, the growth rate remains constant). That is, as the company's leverage rises, it invests the same amount of new funds each year. The composition of these funds changes, however, with debt replacing some of the equity capital that would otherwise be obtained from retained earnings. Even though the earnings also decline with leverage, the substitution of debt for equity proceeds at a faster pace. The net effect is a decline in the fraction of earnings needed to support the fixed level of growth. This retention factor—or perhaps its complement, the payout ratio—is one of the overt parameters that the company presents to the investor. The higher dividend payout, together with the given level of growth, gives the stock the external appearance of being more attractive than otherwise.

This framework for considering leverage effects overlooks, however, the incremental debt liability that is required each year to supplement the more visible capital infusion from reinvested earnings. Thus, in using common valuation methodologies that incorporate only the overt earnings parameters, one can easily overestimate the value of a highly leveraged company.

Cost of Capital under Gordon Model Assumptions

In using the standard Gordon model for levered companies, the proper theoretical procedure is to determine the appropriate levered discount rate, $k(h)$, that can be applied to the after-interest earnings, E ; that is,

$$\frac{P}{E} = \frac{1-b}{k(h)-g} \quad (9.19)$$

The problem is that, without introducing an additional model framework, $k(b)$ is really not known. Without a risk model, $k(b)$ should perhaps be viewed more as an “effective levered discount rate.” (All of the preceding cash flow manipulations were carried out independent of any risk model assumptions.) Nevertheless, the ability to use the preceding results to relate this effective discount rate to the levered company’s characteristics would be helpful.

It turns out that for the highly restrictive conditions that led to the simple levered Gordon formula, the effective discount rate can be shown to be equivalent to the levered equity rate derived from the common weighted-average cost of capital (WACC) formulation (Taggart; Brealey and Myers 2000; Grinblatt and Titman 1998; Ross, Westerfield, and Jaffe 1988).⁶

To show this equivalence in the normal framework, first define the WACC to be

$$k' = \frac{Pk(b) + Dy}{P + D} \quad (9.20)$$

or

$$\begin{aligned} k(b) &= \frac{(P + D)(k') - Dy}{P} \\ &= k' + \frac{Dr_p}{P} \end{aligned} \quad (9.21)$$

Then, if Equation 9.21 is inserted into Equation 9.19, the result is

$$\begin{aligned} \frac{P}{E} &= \frac{1 - b}{k(b) - g} \\ &= \frac{1 - b}{k' + \frac{D}{P}r_p - g} \end{aligned} \quad (9.22)$$

or

$$\begin{aligned} 1 - b &= \frac{P}{E} \left(k' - g + \frac{D}{P}r_p \right) \\ &= \frac{P}{E}(k' - g) + \frac{D}{E}r_p \end{aligned} \quad (9.23)$$

and finally,

$$\frac{P}{E} = \frac{1-b}{k'-g} - \frac{D}{E} \left(\frac{r_p}{k'-g} \right) \quad (9.24)$$

which is equivalent to the previously derived Equation 9.16. Keep in mind that this (risk-model-free) consistency with the familiar WACC formulation holds for only the restrictive Gordon framework.

GENERAL CONSIDERATIONS

All of the preceding analysis was based on the assumptions of the narrow Gordon growth model and a simple prescription for the many complex facets that surround the general problem of leverage. This section offers a few comments on some of the other considerations that can affect the interaction between the company's debt ratio and its P/E valuation.

Tax Effects

Corporate taxes reduce the effective cost of debt and affect the company's valuation in a number of complex ways (Myers 1984; Altman and Subrahmanyam 1985; Stern and Chew 1992). From a market perspective, the effect of taxes on P/E valuation may take a number of forms, but under a basic set of assumptions, the tax effect tends to significantly moderate the impact of debt on the P/E calculation. Figure 9.8 illustrates this moderating effect. The figure assumes that the marginal investor in corporate debt is a

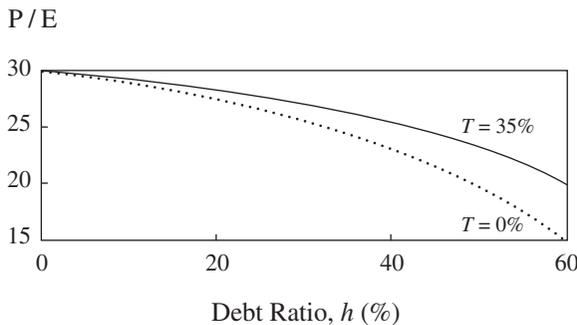


FIGURE 9.8 Moderating Effect of Corporate Taxes
($b = 0.4$, $r = 20$ percent)

tax-free fund and that the corporate tax rate, T , is 35 percent and the levered ROE is 20 percent.⁷

Inflation Effects

As pointed out in the classic Modigliani articles (Modigliani 1982; Modigliani and Cohn 1979, 1982), inflation can greatly complicate the analysis of both current and ongoing debt policies. Moreover, all inflation adjustments depend critically on the specific model chosen to represent the interest rate impact of movements under expected and unexpected inflation.

Differential Returns and Differential Growth Rates

Additional potential confounding factors are differential returns and growth rates.⁸ When a growing company has a rich set of extraordinary new opportunities, typically associated with earnings growth rates well in excess of the growth of assets, debt can enhance the valuation increment and somewhat offset the general tendency of debt to depress P/E.

This effect can have a darker side, however, for mature companies whose best days are in the past. In situations where future investment returns are falling (a situation typically associated with asset growth exceeding earnings growth), the differential return can exacerbate the leverage-induced lowering of the theoretical valuation.

Asset Structure

Rarely are a company's assets homogenous in nature. An example is the fundamental distinction between short-term liquid assets and long-term physical capital. Moreover, the type of debt (and equity) liability corresponding to each asset category can make a material difference in the leverage effect. For example, it often makes sense for an analyst to carve out the short-term assets and the associated liabilities and concentrate on the long-term debt ratio relative to the company's capitalization. The key "unlevered" return parameters, as well as the debt ratio, should then be defined in terms of the company's capitalization.

"Matched" Leverage

A related situation arises when leverage is applied against a given asset segment. This practice can actually *reduce* the company's risk level. The classic example is the financial institution that uses maturity-matched funding to lower its interest rate risk and thereby offset some (but not all) of its

overall asset risk. This “risk-reducing leverage” requires a very different analysis from that presented in this study.

Relative Leverage

The model presented in this article presumes a basic market discount rate that reflects a totally unlevered company. In fact, however, the equity market as a whole has always been a levered market to varying degrees; hence, our notion of the equity risk premium is already based on a certain level of leverage. Clearly, in assessing any given company, the valuation should turn on the “relative leverage” (i.e., the extent to which the specific company is more or less levered than the standard market norm that generated the estimate for the risk premium). The computation for accommodating this notion of relative leverage is straightforward.

The Capital-Constrained Case

One of the major assumptions in the model is that the company’s future “growth-opportunity set” remains fixed and that the use of debt acts only as an alternative funding vehicle. More precisely, the company is treated as though it were able to earn a prescribed excess return on a given range of current and future investments, with varying debt ratios having no impact on the magnitude of those opportunities. This framework was key to how debt was incorporated in a simplified Gordon model: The growth rate was assumed to remain fixed across all debt ratios.

An alternative situation is a company that is truly capital constrained and can usefully invest as much capital as it can garner. In addition to young, rapidly growing companies, many financial institutions are probably able to earn roughly the same spread on as many assets as they can fund. In such situations, funding is constrained by various regulatory limits, the company’s credit rating, and/or the level of access to the equity and venture capital markets.

Required Interim Financing Rounds

The analytical framework underlying the Gordon model conveniently partitions a company’s earnings stream into a segment based on past investments and a second segment derived from future investments. In practice, however, this division is not so neat—especially for companies experiencing or anticipating rapid growth. These companies may require significant interim financing in anticipation of future earnings. The analyst may hope that the interim financing can be achieved at ever-improving valuation levels, but these rounds of financing can dilute the current shareholders’ par-

icipation in the company's overall valuation. Consequently, future financing rounds (even of pure equity) can create a "wedge" that is tantamount to a debtlike incursion into current shareholders' interests.

CONCLUSIONS

When a market perspective is applied to the effect of leverage on P/E, the results are quite different from the results of taking a corporate finance point of view. From a corporate finance study, leverage has a modest P/E effect and one that can move the P/E slightly up or down. From a market perspective, in contrast, the effect of leverage can be significant and increasing leverage *always* moves the P/E downward. Although paradoxical, these results are theoretically consistent; the critical difference is the vantage point. From the corporate finance vantage point, the given parameter is the company's fundamental unlevered return. From the market vantage point, the levered return is already given and a debt ratio is specified. In such a case, as the debt ratio increases, the given levered ROE implies an ever-lower fundamental unlevered ROA. The result is a lower economic value and, hence, uniformly lower theoretical P/Es. This situation—not the situation of an unlevered company that faces a corporate manager or an investment banker—is what typically confronts the securities analyst. For this reason, market analysts should pay careful attention to a company's debt structure as they try to determine the appropriate theoretical P/E for valuation purposes.

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The Franchise Value Approach to the Leveraged Company

This chapter is intended to explain the general development of P/E sensitivity to leverage and, in that sense, to be a companion piece to “The Levered P/E Ratio,” published in the November/December 2002 Financial Analysts Journal (Leibowitz 2002). “The Levered P/E Ratio” examines how analysts should go about valuing an already-levered company with already-levered return parameters. This chapter also places the leveraged-P/E work in the more general context of the franchise value approach.

FRANCHISE VALUE

The franchise value approach and its many ramifications for judging corporate value have been examined in a series of research reports and analyses.¹ In particular, Leibowitz and Kogelman (1991) explored the debt problem within the franchise value framework but still took the corporate finance viewpoint of using the return parameters of the unlevered company as the starting point. The basic finding of Leibowitz and Kogelman was that the use of leverage leads to two P/E effects, which tend to offset each other. Moreover, debt can, depending on return parameters of the unlevered company, increase or reduce the P/E. For normal levels of investment-grade debt, however, all of the P/E effects were relatively modest.

This finding may have been theoretically correct from a corporate finance viewpoint—that is, given a company with known return characteris-

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tics. But the investment analyst must induce the company's underlying fundamental structure of returns from the return parameters of an already-levered company.

The two most obvious effects of debt are (1) the reduction of earnings because of interest charges and (2) the intrusion of the creditor's claim on the company's assets. These two effects were taken into account in the earlier 1991 franchise value study, but we overlooked an important third effect—how debt changes the appearance of the company's characteristics. It is this third effect that is the focal point of the present chapter.

The franchise value technique is a particularly productive framework for exploring the effect of leverage. In this approach, the company is conceptually segmented into two components: (1) a tangible value (TV) that represents the value derived from all past investments and (2) a franchise value (FV) that incorporates the value associated with all future investments. Because leverage has a very different impact on each of these two components, the FV approach greatly facilitates the analysis of leverage's effect on valuation.

Specifically, the FV decomposition underscores that the current shareholder's participation in the company's growth component depends totally on the excess return on new investment. This excess return can be further parsed into the (1) gross return on assets associated with new investments (or return on investment, ROI) and (2) the capital costs required to fund these future investments.

For an unlevered company, the basic FV structure is that shareholders' value, V' , is simply the sum of tangible value and franchise value:

$$V'(r', R') = TV'(r') + FV'(R') \quad (10.1)$$

where $TV'(r')$ is the tangible value from the return on current assets, r' , and $FV'(R')$ is the franchise value derived from new investments, R' .

The first step is to apply the Modigliani–Miller theorem (1958a, b) to the first component to obtain a revised tangible value:²

$$TV(b|r) = TV'(r') - bA \quad (10.2)$$

where b is the current debt ratio relative to the current assets, A , and r is the after-interest return on the company's current book value.

The next step is to present an argument that the company's franchise value should remain invariant under any future debt policy, b^* , so that

$$FV(b^*|R) = FV'(R') \quad (10.3)$$

where R is the *levered* company's return on equity in new investments.

A key advantage of this approach is that by maintaining the value components of the unlevered company “intact,” it allows continued use of the unlevered discounting rate, k' , and thereby avoids the issues associated with ascertaining a new risk-adjusted discount rate.

Earlier studies (Leibowitz and Kogelman 1991, 1994) computed the company’s equity value, $P(b, b^* | r', R')$, in terms of (presumably known) characteristics—that is, r' , R' , and so on—of the underlying unlevered company. In the present study, the challenge is to restate the two value components in terms of the return characteristics of the *leveraged* company to develop an expression that contains only the overt parameters— r , R , and so on—of the leveraged company:

$$P(b, b^* | r, R) = P(b, b^* | r', R') \quad (10.4)$$

With the Equation 10.4 formulation in hand, we can explore how leverage affects the theoretical valuation of a company as the market and analysts perceive it—that is, with a given after-interest return on equity, r , growth rate, g , and earnings retention rate, b . The extension of this approach to the important case of valuation in a taxed environment then becomes relatively straightforward.

LEVERED TANGIBLE VALUE

To effect the translation from unlevered to levered parameters, we begin with the *unlevered* earnings, E' , before any interest charges. With leverage, the after-interest earnings, E , will be simply

$$\begin{aligned} E &= E' - ybA \\ &= (r' - yb)A \end{aligned} \quad (10.5)$$

where y is the corporate interest rate on borrowed capital. The *levered* company’s return on equity then becomes

$$\begin{aligned} r &\equiv \frac{E}{B} \\ &= \frac{(r' - yb)A}{(1 - b)A} \\ &= \frac{(r' - yb)}{1 - b} \end{aligned} \quad (10.6)$$

and the unlevered return on assets is

$$r' = (1 - b) + yb \quad (10.7)$$

The levered tangible value then becomes

$$\begin{aligned} TV(b|r) &= \left(\frac{r'}{k'} - b \right) A \\ &= \frac{A}{k'} (r' - k'b) \\ &= \frac{A}{k'} [r(1 - b) + yb - k'b] \\ &= \frac{A}{k'} [r(1 - b) - b(k' - y)] \end{aligned} \quad (10.8)$$

LEVERED FRANCHISE VALUE

Now, as for the results from future investments, the unlevered FV component can be expressed, for a wide range of conditions, as

$$FV'(R') = \left(\frac{R' - k'}{k'} \right) GA \quad (10.9)$$

where GA represents the magnitude of future investment opportunities (in present value terms) on which an *unlevered* return, R' , can be earned. At the outset, note that the future return on investment R' can differ from the current return on equity, r' . Every such dollar of opportunity generates a theoretically perpetualized stream of future annual earnings R' that has a discounted present value of R'/k' . By definition, however, a dollar capital investment is required to realize this earnings stream, so the net present value is

$$\frac{R'}{k'} - 1 = \frac{R' - k'}{k'} \quad (10.10)$$

per dollar of investment opportunity.

To consider the FV component in a leveraged context, first note that

leverage b^* applied to future investments may be quite different from the debt ratio in the company's current capital structure. The next major assumption is that the magnitude of future investment opportunities, GA , remains invariant. In essence, this assumption is tantamount to presuming that the company is "opportunity constrained" (rather than capital constrained). In other words, even the *unlevered* company is assumed to have access to the equity capital needed to pursue every investment opportunity with a positive net present value. (In today's global capital markets with multiple channels for public, private, and venture capital, this assumption is more reasonable than it would have been in earlier years.) Under this invariance condition, the total gross value generated by all future investments becomes $(R'/k')GA$, regardless of how these opportunities are financed.

Turning now to the cost of financing these future investments, recall that the all-equity route would simply result in the financing cost obtained above. Now, if some level of debt, b^* , is used, the debt will have a lower financing cost but the increased leverage will raise the cost of future equity. If the Modigliani–Miller theorem is again invoked, the combined cost of financing for all such future debt-plus-equity investments must be based on the underlying risk of the enterprise itself (i.e., it must coincide with the *unlevered* all-equity financing rate, k'). (In the interest of simplicity, the standard practice is adopted of assuming that the same risk-based all-equity rate k' applies to both current and future investment activities.) Thus, because future investments both generate a return and incur a financing cost that remains invariant across all levels of leverage, the franchise value for a given future debt ratio simply equals the unlevered franchise value:

$$\begin{aligned} FV(b^*|R) &= FV'(R') \\ &= \left(\frac{R' - k'}{k'} \right) GA \end{aligned} \quad (10.11)$$

This invariance result illustrates the convenience of using the FV approach to explore the effects of leverage.

The two value components can now be combined to provide an estimate of the theoretical value $P(b, b^*|r, R)$ for the leveraged company:

$$\begin{aligned} P(b, b^*|r, R) &= TV(b|r) + FV(b^*|R) \\ &= [TV'(r') - bA] + FV'(R') \end{aligned} \quad (10.12)$$

THE CASE OF CONSTANT ASSET GROWTH

Recall that the initial objective was to obtain a valuation when given the observed parameters of the already-leveraged company. Equation 10.9 has already provided the unlevered valuation; now, the task is to find a way to estimate the company's franchise value, $FV'(R')$, in terms of market observables. The two most fundamental factors in a company's future progress are its growth in earnings, g_E , and the retained earnings, bE , required to fund that growth. Our challenge is to find a representation for the franchise value that explicitly incorporates these two parameters.

To move forward, recall our requirement that the company is opportunity-constrained (not capital-constrained). We now further refine this assumption so that all useful investment opportunities grow in perpetuity at a common constant rate g —regardless of whether or not the company uses leverage to fund them. In other words, the total new investment in a given period would be the same for both the *levered* and the *unlevered* company. Leibowitz and Kogelman (1994) showed that such a growth pattern corresponds to a present value of future investment opportunities that is a multiple, G , of the current book value, where

$$G = \frac{g}{k - g} \quad (10.13)$$

Note that g is the growth of the asset base that is available for investment at the new return on investment R' . At the current level of generality, this growth rate need not be the same as either the rate of unlevered earnings growth rate, g_E , or the levered earnings growth, g_E .

With this basic growth assumption for the company's assets, the franchise value becomes,

$$FV'(R') = \left(\frac{R' - k'}{k'} \right) \left(\frac{g}{k' - g} \right) A \quad (10.14)$$

Of course, Equation 10.14 is still based on the return characteristics of the unlevered company— r' and R' . To proceed to the next step, we must express these parameters in terms of the corresponding variables for the levered company.

We define the levered company's return on equity in new investments to be

$$R \equiv \frac{\Delta E}{\Delta B} \quad (10.15)$$

where ΔB is the change in book value, or $(1 - b^*)\Delta A$. Thus,

$$\begin{aligned}\Delta E &= (R' - b^*y)\Delta A \\ &= (R' - b^*y)\left(\frac{\Delta B}{1 - b^*}\right)\end{aligned}\quad (10.16)$$

so

$$\begin{aligned}R &\equiv \frac{\Delta E}{\Delta B} \\ &= \frac{R' - b^*y}{1 - b^*}\end{aligned}\quad (10.17)$$

and

$$R' = R(1 - b^*) + b^*y \quad (10.18)$$

Equations 10.17 and 10.18 for the levered company's franchise value correspond to, respectively, Equation 10.6 and Equation 10.7 for the company's current investment base.

LEVERED VALUATION WITH DIFFERENTIAL RETURNS

The franchise value can now be expressed in terms of the levered parameters:

$$\begin{aligned}FV(b^*|R) &= FV'(R') \\ &= \left(\frac{R' - k'}{k'}\right)\left(\frac{g}{k' - g}\right)A \\ &= \left[\frac{R(1 - b^*) + b^*y - k'}{k'}\right]\left(\frac{g}{k' - g}\right)A\end{aligned}\quad (10.19)$$

At this point, one might question how the going-forward debt policy, b^* , enters the formula after we went to such great lengths to point out that future leveraging should not affect value for a given initially unlevered company. For an answer, remember that the key to the invariance condition is return on new investments, R' . On the one hand, all companies with the same R' and the same growth prospects will have the same franchise

value, regardless of current or future levels of debt. On the other hand, *levered* companies that have the same growth rate and the same return on equity, R , may, depending on their debt policies, have very different franchise values. The distinction is that the different debt policies imply different underlying values of R' and hence different franchise values.

It is important to recognize the real nature of this relationship. For a given unlevered return on investment, the addition of leverage does lead to a higher levered return on equity, but a current shareholder's value is based on the excess return from new investments. As noted previously, leveraging does not really change the magnitude of this excess return; hence, the franchise value remains invariant. That is, Equation 10.11 holds.

When the starting point is a levered company with a given R , however, the unlevered return on investment R' must be induced. The greater the leverage ratio, the lower the underlying R' associated with the given R . Consequently, higher leverage implies lower franchise value and, therefore, lower valuation for the overall company.

In other words, the basic problem is to look through the confounding influence of the debt policy and "find" the franchise value of the underlying company. Once this FV magnitude is found, a changing assumption regarding the future debt level will certainly alter the levered return on equity, but it will have absolutely no theoretical impact on the unlevered return on investment, the excess return, or the franchise value itself.

Now, the shareholder value formulation can be expressed totally in terms of the levered company:

$$\begin{aligned}
 P(b, b^*|r, R) &= TV(b|r) + FV(b^*|R) \\
 &= \left[\frac{r(1-b) - b(k' - y)}{k'} \right] A + \left\{ \left[\frac{R(1-b^*) + b^*y - k'}{k'} \right] \left(\frac{g}{k' - g} \right) \right\} A \\
 &= \frac{A}{k'(k' - g)} \left\{ [r(1-b) - b(k' - y)](k' - g) + [R(1-b^*) + b^*y - k']g \right\} \\
 &= \frac{A}{k'(k' - g)} \qquad \qquad \qquad (10.20) \\
 &\quad \times \{ k'[r(1-b) - b(k' - y)] + g[R(1-b^*) + b^*y - k' - r(1-b) + b(k' - y)] \} \\
 &= \frac{A}{k'(k' - g)} \\
 &\quad \times \{ k'[r(1-b) - b(k' - y)] + g[-(1-b)k' + R(1-b^*) - r(1-b) + y(b^* - b)] \} \\
 &= \frac{A}{(k' - g)} \left\{ [(1-b)(r - g) - b(k' - y)] + \frac{g}{k'} [(R - r) - (Rb^* - rb) + (b^* - b)y] \right\}
 \end{aligned}$$

Finally, to obtain the P/E, divide by $E = (1 - b)rA$ to obtain the general FV formulation:

$$\frac{P(b, b^* | r, R)}{E} = \left(\frac{1}{k' - g} \right) \frac{1}{r} \times \left\{ \left[(r - g) - \left(\frac{b}{1 - b} \right) r_p \right] + \frac{g}{k'(1 - b)} [(R - r) - (Rb^* - rb) + (b^* - b)y] \right\} \quad (10.21)$$

where r_p is the risk premium, defined as $k' - y$.

This generality carries with it certain costs, however, even beyond obvious intractability. For example, in the most general case, the parameters R and g are assumed constant through time, but this assumption implies that the return on existing assets will change over time [i.e., r will converge toward R over time (Leibowitz 1998)]. Similarly, although g represents a constant growth rate of assets, the growth of earnings, g_E , must change each year. By the same token, for the unlevered company, the general case means that, over time, the value of return on equity r' , as well as growth of earnings, will change.

At a given point in time, each of these variables has a well-specified value, so the valuation formulas are valid at that point, which justifies development of this general expression. But these variables—and the associated P/E—will migrate over time, even when the central ongoing parameters— g , R , and b^* (or g , R' , and b^*)—are kept fixed.

MULTIPLE FACETS OF LEVERED GROWTH

In the general FV model given in Equation 10.21, the parameter g represents constant annual growth in investable assets (i.e., growth in the opportunity to earn the excess returns associated with the fixed return on investment, R'). The asset growth can be related to the current return on assets as follows:

$$\begin{aligned} g &= \frac{\Delta A}{A} \\ &= \frac{b'E'}{A} \\ &= b'r' \end{aligned} \quad (10.22)$$

Note that the retention factor, b' , as used here, serves only to scale the incremental annual investment in terms of the earnings level. The actual

source of the capital may be total or partial external financing (i.e., it need not literally be reinvested earnings). Moreover, when $r' \neq R'$, then r' will change year by year as more assets are invested at the new fixed rate, R' . The retention factor will also move each year as just enough earnings are “reinvested” to fund constant asset growth g .

In this situation, the earnings growth can be related to the current level of r' as follows:

$$\begin{aligned} g_{E'} &= \frac{\Delta E'}{E'} \\ &= \frac{R' \Delta A}{r' A} \\ &= \left(\frac{R'}{r'} \right) g \end{aligned} \quad (10.23)$$

Again, keep in mind that r' will trend toward the fixed value of R' . Hence, growth rate, $g_{E'}$, which represents the next year's earnings growth as of a given point in time, will converge toward the fixed rate of asset growth, g .

Moreover, applying Equation 10.22 to Equation 10.23 produces

$$\begin{aligned} g_{E'} &= \left(\frac{g}{r'} \right) R' \\ &= b' R' \end{aligned} \quad (10.24)$$

Thus, as might be expected, asset growth g relates to current return on assets r' whereas earnings growth $g_{E'}$ is tied to return on new investments R' . Equations 10.22 and 10.24 imply that the two return parameters can always be expressed as the appropriate growth rates divided by retention factor b' . Indeed, all this analytical development could have proceeded by eliminating the return variables and relying only on the retention factor and the two growth rates.

Turning now to the levered company, retain the fundamental assumption of a fixed annual growth rate in investable assets. At the outset, the growth in book value is

$$\begin{aligned} g_B &\equiv \frac{\Delta B}{B} \\ &= \frac{(1 - b^*) \Delta A}{(1 - b) A} \\ &= \left(\frac{1 - b^*}{1 - b} \right) g \end{aligned} \quad (10.25)$$

With a fixed new debt policy, the level of current debt b will migrate over time toward new debt b^* . In such situations, the book growth will also be period dependent.

Similarly, for the growth in the after-interest earnings,

$$\begin{aligned}
 g_E &= \frac{\Delta E}{E} \\
 &= \frac{(R' - b^*y)\Delta A}{(r' - by)A} \\
 &= \left(\frac{R' - b^*y}{r' - by} \right) g \\
 &= \left(\frac{R}{r} \right) g
 \end{aligned} \tag{10.26}$$

which is an analogous result to Equation 10.23. To relate g_E to the earnings retention factor for the levered company requires recognition that b reflects only the equity portion of the incremental investment. That is,

$$\Delta A = bE + b^*\Delta A \tag{10.27}$$

so

$$\Delta A = \frac{bE}{1 - b^*} \tag{10.28}$$

The growth rate of (fixed) assets can also be expressed as a multiple of this retention rate and the levered return on equity, r :

$$\begin{aligned}
 g &= \frac{\Delta A}{A} \\
 &= \frac{bE}{(1 - b^*)A} \\
 &= \frac{br(1 - b)A}{(1 - b^*)A} \\
 &= br \left(\frac{1 - b}{1 - b^*} \right)
 \end{aligned} \tag{10.29}$$

Inserting the relationship given in Equation 10.29 into Equation 10.25 yields the following useful result for the book value's growth rate:

$$\begin{aligned}
 g_B &= \left(\frac{1-b^*}{1-b} \right) g \\
 &= \left(\frac{1-b^*}{1-b} \right) br \left(\frac{1-b}{1-b^*} \right) \\
 &= br
 \end{aligned}
 \tag{10.30}$$

As a next step, Equation 10.26 can be combined with Equation 10.29 and the growth in levered earnings can be expressed in terms of the levered return on investment, as follows:

$$\begin{aligned}
 g_E &= \left(\frac{R}{r} \right) g \\
 &= \left(\frac{R}{r} \right) \left[br \left(\frac{1-b}{1-b^*} \right) \right] \\
 &= bR \left(\frac{1-b}{1-b^*} \right)
 \end{aligned}
 \tag{10.31}$$

Again, note that, as in the unlevered situation, the levered return parameters can be eliminated through appropriate use of the retention factor and the growth rates.

Finally, the levered earnings growth (Equation 10.26) can be tied to the unlevered earnings growth (Equation 10.23):

$$\begin{aligned}
 g_E &= \left(\frac{R}{r} \right) g \\
 &= \left(\frac{R}{r} \right) \left(\frac{r'}{R'} g_E \right) \\
 &= \left(\frac{R}{R'} \right) \left(\frac{r'}{r} \right) g_{E'}
 \end{aligned}
 \tag{10.32}$$

Also, the two retention factors can be related by using Equations 10.22 and 10.29:

$$\begin{aligned}
 b' &= \frac{g}{r'} \\
 &= \frac{1}{r'} \left[br \left(\frac{1-b}{1-b^*} \right) \right] \\
 &= b \left(\frac{r}{r'} \right) \left(\frac{1-b}{1-b^*} \right)
 \end{aligned}
 \tag{10.33}$$

THE LEVERED GORDON MODEL

For an unlevered company, the familiar Gordon model expresses a company's value, P (Damodaran 1997), as³

$$P = \left(\frac{1-b'}{k'-g} \right) E'
 \tag{10.34}$$

where b' is the fraction of earnings that must be retained and reinvested to generate growth g .

This Gordon formula can be rewritten to provide insight into the key drivers of value:

$$\begin{aligned}
 \frac{P}{E} &= \frac{1}{r'} \left[\left(\frac{s'}{k'-g} \right) \right] + 1 \\
 &= \left(\frac{1}{k'+s'} \right) \left[\left(\frac{s'}{k-g} \right) + 1 \right]
 \end{aligned}
 \tag{10.35}$$

where s' is the “franchise spread,” defined as the spread between the unlevered company's return on assets and the unlevered discount rate—that is, $s' \equiv r' - k'$. This expression underscores the central importance of the franchise spread as the key source of value associated with the company's growth. Without a positive franchise spread, the P/E devolves to a bland ($1/k'$), regardless of how fast the company grows (Leibowitz 2000).

The discussion in preceding sections illustrated the complications that arise when the current values for the return and the debt ratios differ from the future values. Even though the general FV formulation (Equation 10.21) may be calculated at a point in time, an analyst may have under-

standable qualms about developing estimates about so many intrinsically uncertain parameters. As an alternative, trying to simplify the basic Gordon growth model itself is certainly a reasonable way to achieve an intuitive framework and a better basis for subjective judgments.

As an interim step toward a more simplified form, the common convention is now adopted that the debt policy remains unchanged over time—that is, $b^* = b$ —while the generality of R and r is retained. This step leads to the following reduced form for the franchise value P/E :

$$\begin{aligned} \frac{P(b, b|r, R)}{E} &= \left(\frac{1}{k' - g} \right) \frac{1}{r} \left[(r - g) - \left(\frac{b}{1 - b} \right) r_p + \frac{g}{k'} (R - r) \right] \\ &= \frac{P(b, b|r, r)}{E} + \left(\frac{g}{k' - g} \right) \left(\frac{R - r}{rk'} \right) \end{aligned} \tag{10.36}$$

and the alternative expression,

$$\begin{aligned} \frac{P(b, b|r, R)}{E} &= \frac{P[(0, 0)|r, R]}{E} - \left(\frac{1}{k' - g} \right) \left(\frac{b}{1 - b} \right) \left(\frac{r_p}{r} \right) \\ &= \frac{P[(0, 0)|r, r]}{E} + \left(\frac{g}{k' - g} \right) \left(\frac{R - r}{rk'} \right) - \left(\frac{1}{k' - g} \right) \left(\frac{b}{1 - b} \right) \left(\frac{r_p}{r} \right) \end{aligned} \tag{10.37}$$

Equation 10.37 makes the point that the “connections” between leverage and distinct ROA/ROI values can be viewed as additive terms. Moreover, both terms can have a powerful impact that does not show up in a naive Gordon computation. In particular, an underestimation of the ongoing return on new investments, R , can compensate for P/E overestimation caused by overlooking the leverage effect. Because the current return on assets (based on historical investments), r , is always the more visible parameter and because return on investment R should reflect the best choices among a spectrum of potential new investments, one might expect R to generally exceed r —possibly, by a significant margin. In this case, a naive Gordon P/E based solely on current ROA could lead to underestimation of the theoretical P/E, whether or not leverage is present.

In addition, a stable debt policy leads to an immediate simplification of the various growth rates. Thus, when $b = b^*$, then from Equation 10.25,

$$\begin{aligned} g &= br \\ &= g_B \end{aligned} \tag{10.38}$$

that is, growth in book value coincides with the constant rate of asset growth. Also, from Equation 10.31,

$$g_E = bR \quad (10.39)$$

which is now analogous to Equation 10.24 for the unlevered company. Note that with differential returns, $r' \neq R'$, however, earnings growth rates g_E and $g_{E'}$ will both differ from fixed-asset growth rate g , although they should move toward g as time passes.

To obtain a more tractable form for the levered P/E than Equation 10.21, the next step is to adopt the (admittedly restrictive) assumption that allows the FV model to devolve into the Gordon format. Basically, what is required is that the ROA and the ROI coincide (that is, R' must equal r') and also, from Equations 10.7 and 10.18 (together with the understanding that the debt policy is stable), R is assumed to equal r . This assumption also provides the enormous added benefit that all growth variables will then coincide; that is, from Equations 10.23 and 10.32, $g_{E'} = g = g_E$.

Returning now to the levered P/E, by applying the $R = r$ and $b^* = b$ conditions to Equation 10.21, we can finally obtain a tractable and informative levered version of the Gordon model:

$$\begin{aligned} \frac{P(h, b | r, r)}{E} &= \left(\frac{1}{k' - g} \right) \left[1 - \frac{g}{r} - \frac{hr_p}{(1-h)r} \right] \\ &= \frac{1 - b - \{hr_p / [(1-h)r]\}}{k' - g} \\ &= \frac{1 - b\{1 + [h / (1-h)](r_p / g)\}}{k' - g} \\ &= \frac{1 - b^*}{k' - g} \end{aligned} \quad (10.40)$$

where b^* functions as an effective retention factor—

$$\begin{aligned} b^* &= b + \left(\frac{h}{1-h} \right) \left(\frac{r_p}{r} \right) \\ &= b \left[1 + \left(\frac{h}{1-h} \right) \left(\frac{r_p}{g} \right) \right] \end{aligned} \quad (10.41)$$

The importance of levered P/Es is now clear. The danger in using the naive form of the Gordon model arises in the temptation to improperly combine *levered* retention b with *unlevered* discount rate k' , as in

$$\frac{P(0,0|r,r)}{E} = \frac{1-b}{k'-g} \tag{10.42}$$

This computation would overstate the theoretical P/E by

$$\frac{\left(\frac{b}{1-b}\right)\left(\frac{r_p}{r}\right)}{k'-g}$$

which becomes quite significant at higher leverage ratios.

LEVERED "GORDON COMPONENTS"

Another interesting angle is how the levered Gordon model parses out in terms of the tangible value and the franchise value. With all the Gordon assumptions intact, the tangible value becomes

$$\begin{aligned} \frac{TV(b|r)}{E} &= \left[\frac{A}{k'r(1-b)A} \right] [r(1-b) - b(k'-y)] \\ &= \frac{1}{k'} \left[1 - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) \right] \\ &= \frac{TV(0|r)}{E} \left[1 - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) \right] \end{aligned} \tag{10.43}$$

where the expression in the last brackets can be viewed as a “connection factor” applied to a naive TV computation. The FV component can be found from

$$\begin{aligned}
 \frac{FV(b|r)}{E} &= \frac{P(b|r)}{E} - \frac{TV(b|r)}{E} \\
 &= \frac{1-b - [b/(1-b)](r_p/r)}{k'-g} - \frac{1}{k'} \left[1 - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) \right] \\
 &= \frac{1-b}{k'-g} - \frac{1}{k'} - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) \left(\frac{1}{k'-g} - \frac{1}{k'} \right) \\
 &= \frac{1}{k'(k'-g)} \left\{ [(1-b)k' - (k'-g)] - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) [k' - (k'-g)] \right\} \\
 &= \frac{1}{k'(k'-g)} \left[(g - bk') - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) g \right] \\
 &= \frac{g}{k'(k'-g)} \left[1 - \frac{k'}{r} - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r} \right) \right] \\
 &= \left(\frac{g}{k'-g} \right) \left(\frac{1}{k'r} \right) \left[r - k' - \left(\frac{b}{1-b} \right) r_p \right] \\
 &= \frac{FV(0|r)}{E} \left[1 - \left(\frac{b}{1-b} \right) \left(\frac{r_p}{r-k'} \right) \right]
 \end{aligned} \tag{10.44}$$

Thus, one can see that both components of company value that an analyst sees are reduced by the use of debt. The form of the “correction factors” clearly shows, however, that the FV term will be more severely affected on a proportional basis. In particular, companies with high growth rates but modest franchise spreads could have the unfortunate combination of a sizable FV with a significant downward correction factor.⁴

WACC UNDER GORDON MODEL ASSUMPTIONS

In using the standard Gordon model to calculate the weighted-average cost of capital (WACC) for levered companies, the proper theoretical procedure

is to use the appropriate levered discount rate $k(b)$ that can be applied to after-interest earnings E :

$$\frac{P(b, b|r, r)}{E} = \frac{1 - b}{k(b) - g} \tag{10.45}$$

The problem is that, unless an additional model framework is introduced, $k(b)$ is really not known. Thus, because we have not introduced any risk model, $k(b)$ should perhaps be viewed more as an “effective” levered discount rate than a “risk-adjusted” discount rate.⁵

Nevertheless, it would be helpful to be able to use the results of this analysis to relate this effective discount rate to the levered company’s characteristics. This exercise might be problematic for the more complex general case, but for the highly restrictive conditions that led to the simple revised Gordon formula, the effective discount rate can be shown to be the appropriate rate used in the common calculation of WACC (Ross, Westerfield and Jaffe 1988; Taggart 1991; Grinblatt and Titman 1998; Brealey and Myers 2000). To see this connection, the first step is to set

$$\frac{P}{E} = \frac{1 - b - (b / 1 - b)(r_p / r)}{k' - g} \tag{10.46a}$$

and obtain

$$\frac{P}{E}(k' - g) = 1 - b - \left(\frac{b}{1 - b} \right) \left(\frac{r_p}{r} \right) \tag{10.46b}$$

Then, using the defining equation for $k(b)$ (Equation 10.43) produces

$$\begin{aligned} k' &= \frac{E}{P} \left[1 - b - \left(\frac{b}{1 - b} \right) \left(\frac{r_p}{r} \right) \right] + g \\ &= \left[\frac{k(b) - g}{1 - b} \right] (1 - b) - \left(\frac{E}{P} \right) \left(\frac{b}{1 - b} \right) \left(\frac{r_p}{r} \right) + g \\ &= k(b) - \frac{E}{P} \left(\frac{b}{1 - b} \right) \frac{r_p}{r} \\ &= k(b) - \frac{[r(1 - b)A]br_p}{P(1 - b)r} \\ &= k(b) - \frac{D}{P}(k' - y) \end{aligned} \tag{10.47}$$

which leads to

$$k' = \left(1 + \frac{D}{P}\right) = k(b) + \frac{Dy}{P} \quad (10.48a)$$

and

$$\begin{aligned} k' &= \frac{k(b) + y(D/P)}{1 + (D/P)} \\ &= k(b) \frac{P}{P+D} + y \frac{D}{P+D} \end{aligned} \quad (10.48b)$$

which is the basic WACC equation. Keep in mind that this discussion demonstrates only that consistency of the (risk-model-free) Gordon growth model with the familiar WACC formulation holds for only the most restrictive Gordon framework.

Another interesting observation is that the simple Gordon model (Equation 10.30) can be rearranged to provide insight into the nature of the return equilibrium that it represents. First, solve Equation 10.30 for required return k' as follows:

$$\left(\frac{P}{E}\right)(k' - g) = (1 - b) - \left(\frac{b}{1 - b}\right)\left(\frac{k' - y}{r}\right) \quad (10.49a)$$

or

$$k' \left[\left(\frac{P}{E}\right) + \left(\frac{b}{1 - b}\right) \frac{1}{r} \right] = (1 - b) + g \left(\frac{P}{E}\right) + \left(\frac{b}{1 - b}\right) \left(\frac{y}{r}\right) \quad (10.49b)$$

And then express k' as

$$\begin{aligned} k' &= \frac{(1 - b) + g(P/E) + \{bAy / [r(1 - b)A]\}}{P/E + \{bA / [r(1 - b)A]\}} \\ &= \frac{(1 - b) + g(P/E) + by(D/E)}{(P/E) + (D/E)} \\ &= \frac{(1 - b)(E/P) + g + (Dy/E)(E/P)}{1 + (D/E)(E/P)} \\ &= \frac{(1 - b)(E/P) + g + (Dy/P)}{1 + (D/P)} \\ &= \frac{(1 - b)E + gP + Dy}{P + D} \end{aligned} \quad (10.50)$$

Equation 10.50 shows that market return k' is the sum of the dividend, price growth gP , and the interest payments—all divided by enterprise value. In other words, just as one would expect, the totality of the flows generated by the enterprise corresponds to the equilibrium return.

Here, the term “equilibrium” can be taken as signifying that the P/E is stable over time. In the preceding analysis, when this stable (P/E) equilibrium condition was not met, the percentage change in the P/E had to be present in the numerator. Consequently, $g_{E'}$ would not equal g and would not equal g_E , nor would the simple Gordon formulation (Equation 10.30) or the WACC formula (Equation 10.37) hold. This condition underscores the point that all such simple results are valid only under the highly restrictive Gordon assumptions.

FIXED-EARNINGS-GROWTH MODEL

The previous development of the general FV formulation was based on the assumption of a fixed rate of growth for investment opportunities. The earnings growth rate was then treated as a dependent variable. This approach seems to be natural in an opportunity-constrained environment, but a common approach is for the fixed rate of earnings growth to be taken as the starting point. Obviously, when the Gordon assumption that $r = R$ is met, all growth rates coincide and this distinction is irrelevant. When returns are different, however ($r \neq R$), the selection of a fixed rate of earnings growth does matter, which leads to a different general formulation.

When a fixed earnings growth—as opposed to a fixed growth of investment opportunities—is taken as the starting point, the following formulation can be shown to be the analog to Equation 10.36 and Equation 10.37:

$$\begin{aligned} \frac{P(h, b | r, T)}{E} &= \left(\frac{1}{k' - g_E} \right) \left\{ (1 - b) - \left(\frac{b}{1 - b} \right) \left[\frac{r_p}{r} - b \left(\frac{R - r}{r} \right) \right] \right\} \\ &= \left\{ \frac{P(0, 0 | r, r)}{E} - \left(\frac{1}{k' - g_E} \right) \left(\frac{b}{1 - b} \right) \left(\frac{1}{r} \right) [r_p - b(R - r)] \right\} \quad (10.51) \\ &= \left\{ \frac{P(0, 0 | r, r)}{E} - \left(\frac{1}{k' - g_E} \right) \left(\frac{b}{1 - b} \right) \left(\frac{1}{r} \right) [r_p - (g_E - g_A)] \right\} \end{aligned}$$

Comparing this result with Equation 10.37 shows that the impact of differential returns is more intertwined with the leverage effect in the fixed-

earnings-growth case. Indeed, without leverage, no differential return effect is evident in the P/E. But clearly, where leverage is present and returns are coincident (i.e., $r = R$), both growth assumptions will lead to exactly the same levered Gordon model, Equation 10.40.

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Retirement Planning and the Asset/Salary Ratio

The fundamental concept underlying the franchise value approach is the differentiation between current flows and future growth prospects. This chapter co-authored with J. Benson Durham, P. Brett Hammond, and Michael Heller, departs from the subject of equity valuation to apply this discipline to the analysis of a defined contribution (DC) pension plan. It also draws an analogy between a DC plan's characteristics and the more formal measures employed in the more institutionalized area of defined benefit (DB) retirement plans.

In this era of individual responsibility for retirement security, interest in retirement income adequacy is at an all-time high. Concern over low U.S. personal savings rates and the possibility of social security system insolvency prompt this interest, in concert with the growth of popular alternatives to traditional defined benefit plans, the introduction of retirement savings education programs, and the development of new individual retirement software products. Such interest has generated a wide array of research studies. A first group asks whether Americans in specific age cohorts, employment situations, pension plans, and income and wealth categories are saving enough for retirement (e.g., Moore and Mitchell 2000; Gale and Sabelhaus 1999; Samwick and Skinner 1998). The second type of research focuses on how retirement savers allocate contributions and accumulations among asset classes and investment vehicles, and the ef-

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fects of such allocations on future retirement income (e.g., Ameriks and Zeldes 2000). Finally, a third set of studies asks how individual workers or families ascertain whether they are in the retirement savings “ballpark,” especially when retirement may be years away (e.g., Bernheim et al. 2002).

This chapter seeks to extend thinking about asset adequacy by constructing and testing a simple measure of retirement savings adequacy that is analogous to (but not identical to) the *funding ratio* concept used in defined benefit pension plans. Our hope is that this measure, which compares required assets-in-hand to salary, will provide retirement savers with a rough indication of where they stand on the path to adequate retirement income.

We call our measure the *Asset/Salary Ratio*, a breakeven number similar to but simpler than tools such as an income replacement ratio, a life cycle consumption model, or a stochastic asset return model. It does not embody the sophistication of these other tools, but it does have the advantage of enabling individuals to determine at a glance whether they are on track for a faroff retirement. As such, it has the advantages of simplicity, and all attendant caveats associated with simplifying the complexities of nature and finance.

FUNDING MEASURES IN THE DEFINED BENEFIT ENVIRONMENT

The Asset/Salary Ratio reflects, but is not identical to, concepts and methods widely used to measure the overall funding status of a defined benefit (DB) pension plan. In the DB world, a plan manager is responsible for ensuring that future annual revenues cover future annual pension payments. In other words, the job of the pension manager is to match required assets to the present value of future liabilities for all covered employees, where the liabilities depend on all employees’ eventual credited service, final or final average salary, and an accrual percentage (Leibowitz, Bader, and Kogelman 1996b). There are several ways to define a defined benefit plan’s funding ratio (*FR*), but a common one is the current market or actuarial value of a pension fund’s assets (i.e., a weighted average of book versus market value) divided by the discounted value of the plan’s future liabilities (actuaries often call this the “actuarial accrued liability”).¹ For example, a state government DB retirement system might use a variation of the following basic measure to determine funding progress and the overall financial status of the plan:

$$FR_t = \frac{\text{Assets}_t}{\text{PV Future Liabilities}_t} \quad (11.1)$$

If $FR > 1$, this could indicate that the plan currently enjoys a funding *surplus* (an excess of assets over liabilities). A plan with $FR > 1$ should theoretically be well funded as long as the investment and actuarial assumptions that underlie it continue to be validated by subsequent experience. In contrast, when $FR < 1$, there is a need for incremental funding to bring the required level of assets up to match the estimate of discounted future liabilities.

Over time a plan's funding ratio may change as it is affected by new experience, such as changes in inflation, mortality, retirement rates, salaries, and other actuarial gains and losses, all of which can affect future liabilities. Also, unexpected changes in investment returns could affect the future value of the assets. As a result, the funding ratio should be examined regularly to assess the probability of a shortfall due to investment or actuarial experience differing from the model's initial characterization (Leibowitz, Bader, and Kogelman 1996a). Even at its most basic, this concept can direct a plan manager's attention to a crucial issue associated with pension plan solvency, namely the ability of the plan to meet the obligations it has incurred. The DB funding ratio, as well as expected and unexpected changes in it, can provide signals for managers, such as the need to consider whether contribution rates and/or investment strategy should be adjusted.

FUNDING MEASURES IN A DEFINED CONTRIBUTION CASE

In the defined contribution (DC) pension plan case, we would like to construct a simpler measure of an individual retirement saver's retirement funding adequacy. We suggest that a DC funding ratio can be conceived of, under normal circumstances, as the relationship between assets and a present-value liability measure. A key difference between DB and DC pensions, of course, is that different parties bear responsibility for achieving and maintaining the asset-liability match. Another difference between the plan types is how the liabilities are characterized. Usually, DB plans are characterized by the pooling of investment and actuarial risk, whereas DC plans do so in very limited ways or not at all. DC plans trade off pooling of retirement income certainty for a greater individual investment and actuarial control.

In the DC context, our interest focuses on the role of the individual saver rather than the employer or employer pension plan. This is because, even though DC plan rules apply to all covered employees, any given employee can be thought of as acting as his or her own plan sponsor and provider. As such, the individual takes on certain increased risks in a DC plan, making investment choices and facing market risks associated with

those choices (within plan limits). On the other hand, DC participants do retain the choice of whether or not to join the mortality pool by annuitizing their accumulated assets at retirement. If they choose not to annuitize, they face greater mortality risk since the “pool” would then essentially represent a sample of one (Brown et al. 2001, 2002).

Thus in a DC plan it is the individual rather than his or her employer who must be responsible for and concerned with retirement plan “solvency,” i.e., the match between an individual’s assets and liabilities at retirement. Therefore, we believe that an individual’s DC pension income can be related to a kind of Asset/Salary Ratio. Taking the DB funding ratio relationship in (1) as a starting point, we translate the asset figure or numerator directly into the DC context: the individual’s current marked-to-market pension accumulations or assets are equivalent to the DB plan assets. An analogous individual liability figure for the denominator in (1), however, is less transparent. Unlike a DB plan, there is no formula that tells an individual in a DC plan exactly how much income he will receive at retirement, based on service and salary. In the strict sense, the asset-liability ratio in a DC plan, unlike a DB plan, is always inherently equal to 1, since by definition the individual’s liabilities are always equal to his or her accumulated assets in the plan. Nevertheless we seek to measure what would indicate whether the individual was “on track” for achieving an adequate retirement income, in the spirit of a DB funding ratio.

Despite the lack of a specific, contractual promise in the DC context, some well understood and often recommended targets are helpful in projecting retirement income needs. A useful one is the income replacement ratio (RR), or the proportion of preretirement income that a retiree can replace with a payout annuity purchased at the time of retirement (Heller and King 1989, 1994). The replacement ratio is, of course, closely related to the notion of a funding ratio at the point of retirement, in that both are dependent on projections of salary growth, investment returns, annuity purchase costs, contribution rates, and lengths of covered employment. A precise mathematical relationship can be used to calculate the income replacement ratio (see Appendix 11A). We note that the replacement ratio is particularly sensitive to the difference between investment earnings rate and salary growth rate. For example, with an annual contribution rate of 10 percent of salary and a retirement payout annuity based on a 6 percent interest rate, a person who spends 30 years in a DC plan where investment returns exceed salary growth by 3 percent per year will achieve an income replacement ratio of about 40 percent of final preretirement income. This compares to only a 20 percent replacement ratio if salary growth and investment returns were equal to each other.

In addition to its use in making projections, the replacement ratio can be used to set retirement saving and investment goals. For example, the

American Association of University Professors and the American Association of Colleges recommend that educational institutions design pension plans to enable employees to replace about two-thirds of their inflation-adjusted annual disposable salary (averaged over the last few full-time work years) through a combination of pension annuity income and social security benefits (American Association of University Professors 1990). This policy was reaffirmed by a National Academy of Sciences committee in 1991 (Hammond and Morgan 1991). This two-thirds clearly is a “one-size-fits-all” approach that overlooks variations in life cycle circumstances, though it does provide a starting point for planning purposes. Slightly higher targets were recommended by Palmer (1993), using tax and social security benefit rules and consumer expenditure data. He proposed that required income replacement ratios for individuals and married couples range from 70 to 80 percent of gross preretirement income.²

Building on this work, we take a conservative approach by selecting an overall retirement income target of 75 percent. If we further assume that social security benefits will pick up about 25 percent of the total, then an average individual or couple with a DC plan would need the pension to produce about 50 percent of annual preretirement income. Low income workers might need a lower ratio than the 50 percent target, and very high income workers might require a higher ratio to achieve an overall 75 percent replacement ratio, because social security benefits are progressive. Starting with 50 percent as a target pension replacement ratio, it is then possible to solve for any one of the other variables that go into it—the needed contribution rate, years of service, or difference between investment earnings and salary growth rates.

Nevertheless, a key challenge facing a retirement planner is to evaluate how alternative circumstances and actions can influence future financial viability. For this reason we propose that the DB plan funding ratio approach could help people develop a sense of whether they are on track for retirement. Accordingly, we recast the DB funding ratio for a participant in a DC plan as follows:

$$ASR_t = \frac{A_t}{S_t} \quad (11.2)$$

This says that the Asset/Salary Ratio (ASR) is the liability (assets) divided by an individual’s annual salary S at t before retirement.³ This Asset/Salary Ratio can be thought of in two ways: as a person’s *current* Asset/Salary Ratio or as the Asset/Salary Ratio *required* to achieve a target income replacement ratio in the future.

What does the Asset/Salary Ratio mean? How can a ratio of assets to

salary tell an individual anything about the adequacy of his or her retirement savings? It should be noted that, although the DB Funding Ratio may hover near 1, the required Asset/Salary Ratio (RASR) will increase over time, since the accumulated assets needed to fund future retirement income must grow faster than a person's salary. But a worker who knows his current ASR can roughly estimate the ratio that would be *required*, to fund retirement income years into the future and then assess whether the current ratio is "on track" for retirement. Both current salary and current savings can be brought forward through working life to retirement with some assumptions (e.g., an asset growth rate and a salary growth rate). Hence, at any point t years prior to retirement, it can be determined whether current ASR equals the required ASR and thus whether current savings rates might eventually produce assets sufficient to fund an annuity that would provide an income equal to 50 percent of salary at retirement (or whatever target replacement ratio is desired).

The mathematical relationships between the elements making up the RASR include the desired replacement ratio (RR), pension contribution rate, investment rate of return on pension contributions, salary growth rate, investment rate of return on annuity assets, and the respective number of years remaining prior to and following retirement. Using these variables, someone with a current ASR equal to his or her RASR could be said to be "on track" for retirement, other things being equal (see Appendix 11B). A person whose current ASR is currently higher than the required ratio enjoys a cushion to protect against unforeseen trends or events (unexpected stock market declines, better-than-expected retiree life spans, etc.). And someone with a current ASR lower than required might need to take corrective action (e.g., increase plan contributions, start other kinds of retirement savings, change investment strategies, or delay retirement).

IMPLEMENTING THE ASSET/SALARY RATIO

We next illustrate how the RASR works with a few simple assumptions listed in Table 11.1, all of which will vary depending on an individual's circumstances and appetite for risk.

First, we assume an income replacement ratio target of 50 percent. Second, we use a DC pension plan contribution rate of 10 percent.⁴ Third, although the formula for RASR does not require knowing the worker's current income, it does require projecting growth. We use a real rate of percent on top of a 2 percent inflation rate, since aggregate salaries in higher education have grown at about this rate over time (*Academe* 1998). Fourth, we must project asset returns, and we begin by assuming that assets are invested in either government bonds, long-term

TABLE 11.1 Baseline Asset/Salary Ratio
Modeling Assumptions

Target income replacement ratio RR	50%
Plan contribution rate P	10%
Salary growth w	4%
Pre-retirement rate of return r	6%
Annuity length years K	25
Annuity rate of return r_{AN}	6%

Source: Authors' calculations.

inflation-indexed bonds, or a partially guaranteed, fixed income account such as the traditional TIAA account. Fifth, we assume that at retirement the individual purchases a 25-year certain annuity (a date-certain annuity was chosen instead of a life annuity for standardization and ease of replication). In this case, the payout annuity interest rate is similarly set at 6 percent.

The base-case RASR appears in Table 11.2 for calculations based on assumptions in Table 11.1. Reading across, it starts with a desired income replacement ratio. It then displays the future value of replacement income (i.e., for the 50 percent income replacement ratio target, half of the future salary of \$1.80 or \$.90 for every \$1.00 of current income). The next column displays the corresponding future cost of an annuity sufficient to provide the replacement income and the following column shows the future value of all future pension contributions. The fifth column is the difference between the cost of the annuity and the future contributions, while the sixth column is the present value of that difference. The final column shows the RASR for the corresponding target replacement ratio.

For example, for an individual 15 years from retirement, the RASR is as follows:⁵

$$\text{RASR}_{15} = \frac{(AC - \text{FV}_p)/(1+r)^{15}}{S_{15}} \quad (11.3)$$

where AC = the cost of a 25-year annuity at retirement assuming a 50 percent income replacement ratio

FV_p = the future value of premium contributions until retirement

r = investment rate of return

S = current salary

TABLE 11.2 Required Asset/Salary Ratios for Various Replacement Ratios 15 Years from Retirement

Target Income Replacement Ratio (%)	Future Value Replacement Income (\$)	Annuity Cost (\$)	Total Premium Payments (\$)	Future Value Annuity		Present Value Annuity		Required (par) Asset/Salary Ratio
				Cost Less Future Value Premiums	Cost Less Future Value Premiums (\$)			
30	0.54	6.91	3.10	3.81	1.59	1.59	1.59	1.59
40	0.72	9.21	3.10	6.11	2.55	2.55	2.55	2.55
50	0.90	11.51	3.10	8.41	3.51	3.51	3.51	3.51
55	0.99	12.66	3.10	9.56	3.99	3.99	3.99	3.99
60	1.08	13.81	3.10	10.72	4.47	4.47	4.47	4.47
70	1.26	16.12	3.10	13.02	5.43	5.43	5.43	5.43
80	1.44	18.42	3.10	15.32	6.39	6.39	6.39	6.39
100	1.80	23.02	3.10	19.92	8.31	8.31	8.31	8.31

Source: Authors' calculations.

Note: Calculations use assumptions in Table 11.1 and current salary = \$1.

Plugging in the numbers from Tables 11.1 and 11.2, we obtain

$$\text{RASR}_{15} = \frac{(\$11.51 - \$2.98) / (1 + .06)^{15}}{\$1.00} = 3.56$$

(For ease of calculation, salary is set at \$1.00. Since we are using the required ASR, salary level does not affect this ratio.)

Figure 11.1 shows a set of required Asset/Salary Ratios calculated in a similar fashion for several points prior to retirement. For each year, the funding ratio shown is associated with a 50 percent retirement income replacement ratio. For example, a 65-year-old about to retire, who began saving at age 25 with a salary of \$30,000, should by now have accumulated about \$885,000 (\$138,500 times the RASR of 6.39) in order to purchase an annuity with a 50 percent income replacement ratio.⁶ Fifteen years prior to retirement, the same individual would have needed about \$274,000 (\$76,900 times the RASR of 3.56) to be on the pathway to re-

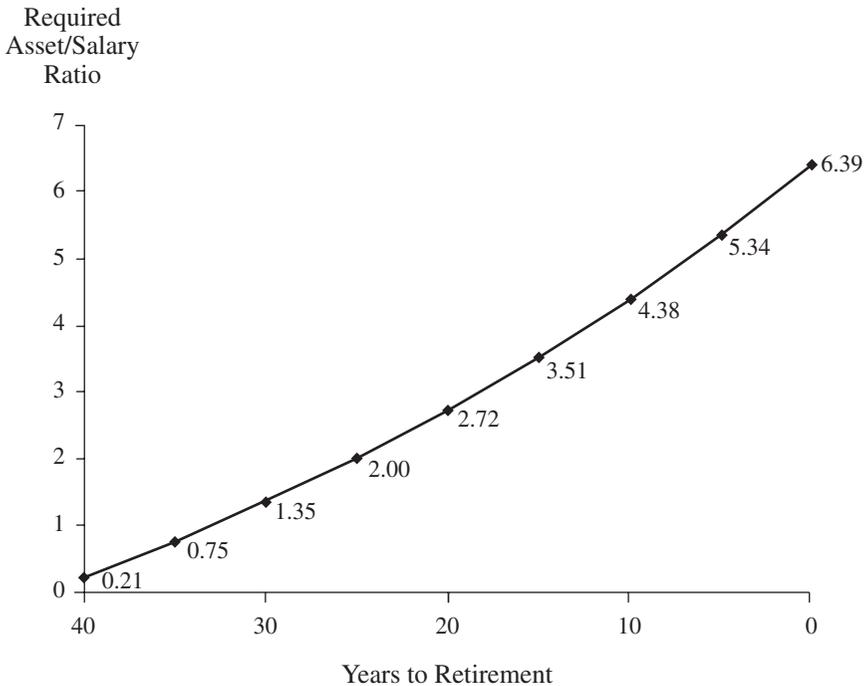


FIGURE 11.1 Required Asset/Salary Ratio for 50 Percent Replacement Ratio
Source: Authors' calculations.

irement. With 25 years to go, he would have needed about \$108,000 (\$52,000 times the RASR of 2.08).

SURPLUS AND DEFICIT RELATIVE TO THE RASR CURVE

The required Asset/Salary Ratio curve defines the Asset/Salary Ratios needed to be on track for meeting a relatively conservative retirement goal using a conservative low risk investment approach. Someone whose circumstances place him or her exactly on the line would be deemed to be neither over nor underfunded for retirement. On the other hand, a current ASR that falls below the line implies a projected retirement income shortfall, or an income replacement ratio less than the standard 50 percent target. Note that this is meant to be a crude rather than a precise signal, since circumstances might vary considerably from the assumptions used in the base case. For example, participation in a DB plan and the presence of other personal savings would effectively raise the current ASR. Unusually high temporary income might depress the current ASR for a time, until future income dropped back into line with past income. A person's contribution rate might be over 10 percent, so assets would accumulate more quickly than in the base case, and the person's current funding curve would rise more steeply through time. Conversely, a current ASR below the line could provide warning of a future shortfall, a signal to expand the asset base through increased retirement plan contributions or other savings. Of course, having a longer time horizon offers opportunity and can avoid crises that demand precipitous action.

DEVELOPING A RISK CUSHION

A worker with a current ratio substantially above the RASR curve could expect that assets are in excess of those needed to fund the desired retirement annuity. In essence, he or she would have a *risk cushion* for retirement. This is useful because the ASR as described here is deterministic, while risk will influence retirement planning over an extended period of time. Such uncertainty might be associated with employment (i.e., under- or unemployment risk), investment returns (e.g., allocation choices or market risk), pension contributions, and special needs such as expensive health conditions or unforeseen family expenditures. So a risk cushion could be a luxury or a necessity, depending on how well the assumptions behind the RASR match an individual's future circumstances.

If a risk cushion exists, it might be used in at least four ways. First, the "extra" assets could be used to project the target income replacement

ratio. For example, a drop in future contributions below the 10 percent rate assumed here would cause the current ASR to fall relative to the RASR. The presence of a risk cushion would help to protect against a dip in the current ASR for whatever reason.⁷ Second, a risk cushion could permit the replacement target to be raised. Figure 11.2 displays several families of retirement funding ratio curves that reflect the effect of boosting the target income replacement ratio. It shows that if an individual can sustain a position above the RASR curve over the years (e.g., through a consistently higher contribution rate), then he or she will achieve a higher retirement income replacement ratio.

The risk cushion could also be used to provide a safety net under a higher risk investment strategy. That is, some or all of the assets corresponding to the risk cushion could be invested in riskier assets that hold the possibility of higher returns. Alternatively, having a risk cushion through time might accumulate enough assets to retire earlier while still meeting the 50 percent income replacement goal. Finally, a risk cushion could be used to make gifts or leave legacies to charities or to children, depending on the individual's tax status and predilections.

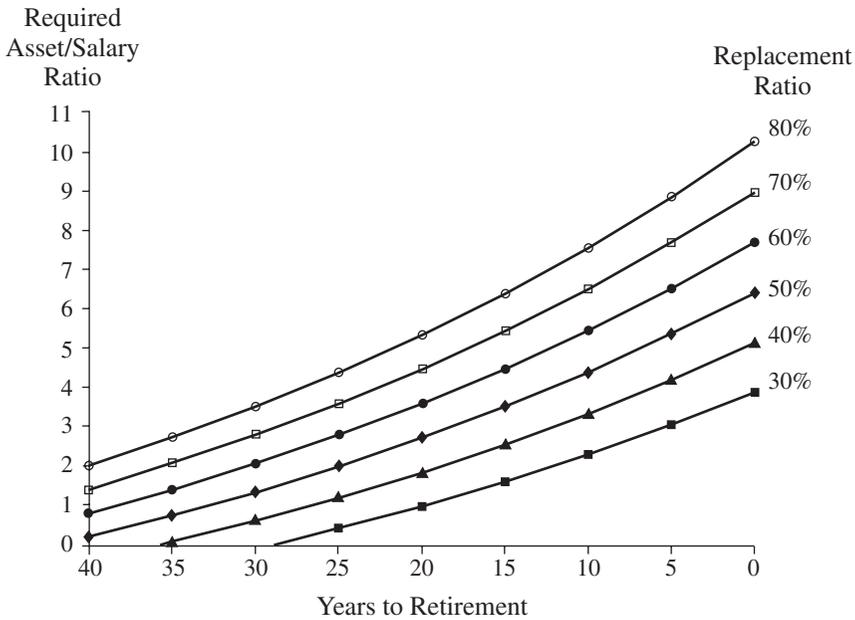


FIGURE 11.2 Required Asset/Salary Ratio for Alternative Replacement Rates
Source: Authors' calculations.

PORTFOLIO IN HAND

Sometimes people stop making DC plan contributions well before retirement, and in this instance it is interesting to examine the future value of what they have already accumulated. Alternatively, we might wish to know the future value of future contributions as a proportion of total accumulations. To see the nonlinear nature of the relationship between required assets and salary, we turn to Table 11.3, which uses the same numbers as those behind the RASR curve in Figure 11.1 to show the proportion of final (total) retirement accumulations a person would have in hand for selected years prior to retirement. For example, a low risk RASR 35 years before retirement implies that the accumulated assets, as well as the future earnings on those assets, will represent only about 23 percent of total projected accumulations at retirement. This implies that over 75 percent of a person’s final accumulation is associated with future contributions and the earnings on those contributions. This suggests that the young investor may consider the effect of taking on additional risk in his or her portfolio. For example, if current assets experienced a one-time 20 percent loss 35 years from retirement, this would reduce final accumulations by about 4 percent (.23 times .20). This is because most of the final accumulation is represented by *future* contributions.

Conversely, someone nearing retirement might be less able to stomach a sharp reduction in assets. An individual 5 years from retirement who is at the RASR would have about 92 percent of his or her final portfolio in hand. If there were a significant market loss—say, the same 20 percent one-time reduction—he or she would end up with 18 percent less assets at retirement (.20 times .92). These numbers suggest that we may need to adjust the familiar admonition that the power of compounding over a long time period makes retirement saving early more valuable than similar contributions later. Although it is important to save early in one’s career, it also appears easier to recover from market downturns and other events that

TABLE 11.3 Portfolio in Hand (% of final accumulation)

Returns	Years to Retirement								
	0	5	10	15	20	25	30	35	40
6 (“Par”)	100	92	83	73	62	50	37	23	7
8	100	92	81	69	54	36	14		
10	100	91	80	64	44	17			

Source: Authors’ calculations.

cause asset losses. This may explain the finding that young people in recent years have placed a higher percentage of their retirement savings in higher risk equities than did older people (Ameriks and Zeldes 2000).

EFFECT OF HIGHER EXPECTED RETURNS ON THE ASR

The RASR curve assumes a relatively low risk 6 percent rate of return, but few people in DC plans invest all their savings at or near a risk-free rate. We next explore how investing at higher returns affects the RASR as well as the portfolio in hand. Figure 11.3 shows that if retirement savings average 10 percent per year, then the RASR or ASR needed to achieve a 50 percent retirement income replacement ratio drops considerably in the earlier years, as compared to the base percent case. At 25 years from retirement, the RASR would be a little over two times salary, if investment returns average 6 percent. At 10 percent return, the ASR drops to less than 30 percent of current salary. At 15 years from retirement, the 6 percent return par

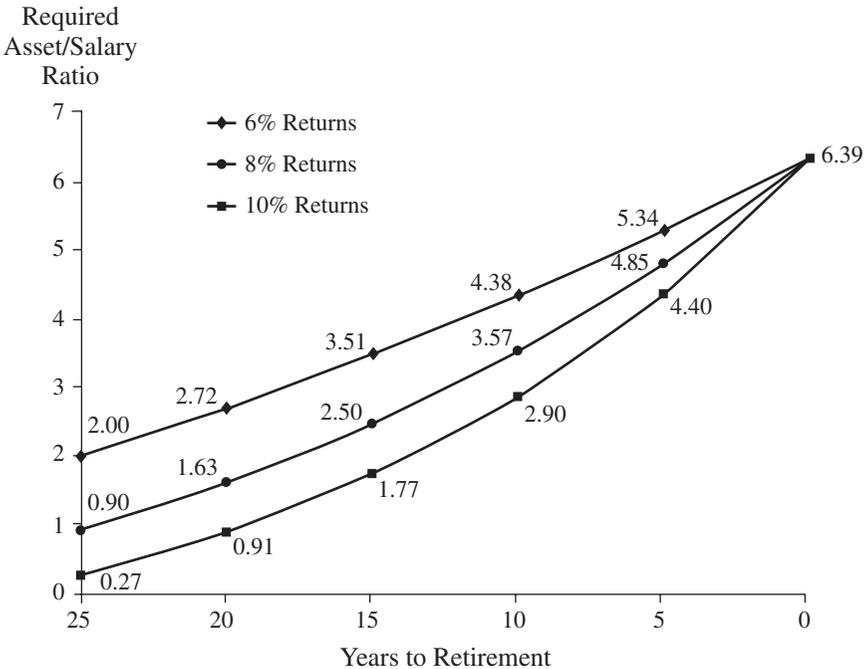


FIGURE 11.3 Required Asset/Salary Ratio for Alternative Rates of Return
 Source: Authors' calculations.

ASR ratio would be 3.5 times salary, while the 10 percent return funding ratio would be only 1.8 times salary.

With higher asset returns, the portfolio in hand calculation shows a similar decline. As shown in Table 11.3, a 10 percent asset return would imply only about 17 percent of final accumulations in hand 25 years from retirement, compared to 50 percent in the 6 percent return case. This means that asset gains (or losses) on early career savings would have less influence on final accumulations, than in the more conservative case.

Higher asset returns could also be used to get to a higher retirement income replacement ratio. Figure 11.4 assumes that at 15 years prior to retirement, the individual has achieved a RASR of 3.5 (e.g., prior to that point, assets were invested at the RASR, low risk rate of 6 percent).

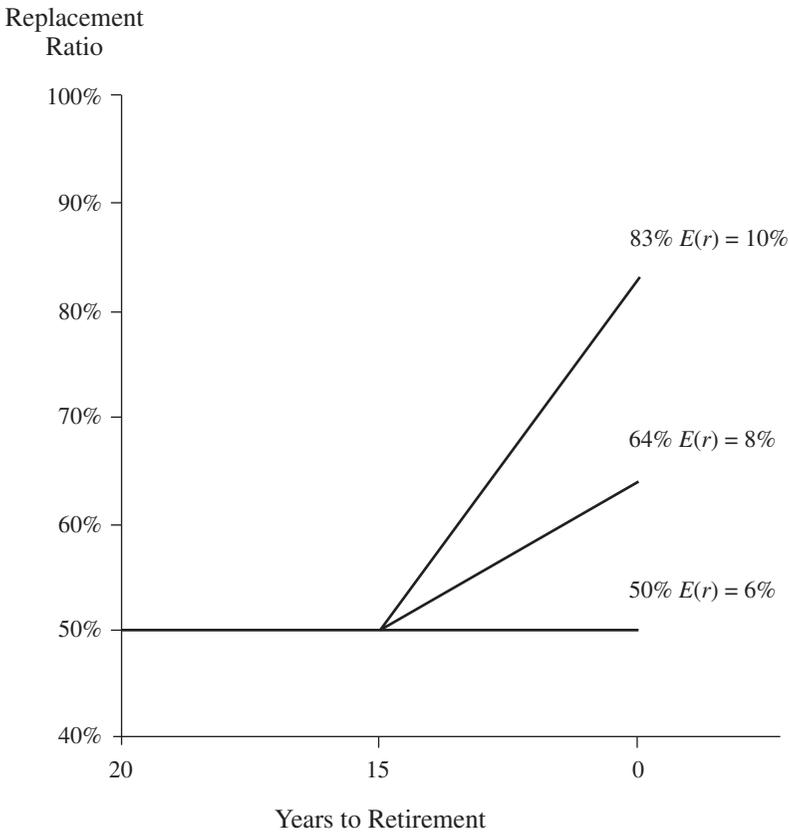


FIGURE 11.4 Projected Replacement Rates with Alternative Portfolio Returns
 Source: Authors' calculations. Note: $E(r)$ refers to the expected value of portfolio returns.

Thenceforth all assets and future contributions are invested in assets whose expected returns average 10 percent. If assets did provide 10 percent returns, the individual could achieve much higher expected retirement income replacement ratios: over 80 percent in the case of the pure 10 percent return, and over 60 percent in the case of a portfolio that blended riskier and low-risk assets.

INVESTMENT RISK IMPLICATIONS OF HIGHER RETURNS

There is, of course, additional investment risk that could lead to retirement income lower (or higher) than the “expected” result. For example, to boost expected returns from the 6 to the 10 percent range, an investor could purchase stocks that have enjoyed historically higher average rates of return than bonds or money market returns. An investor who had held the Ibbotson index of large capitalization U.S. stocks for all (overlapping) 15-year periods since 1926 would have experienced annual returns averaging 10.75 percent, well in excess of our low risk 6 percent rate. Yet about half the time, the Ibbotson large cap stock index return was lower than the 10.75 percent average. And about 15 percent of the time, the Ibbotson return was less than or equal to 6 percent per year, the same annual return as the low risk, fixed income investment used in the previous examples. (For 10 percent of the 15-year returns, the annual return was less than four percent.)

How would this variability of equity returns affect our Asset/Salary Ratio and the individual’s chances of achieving his or her retirement income target? To examine this question, we simulated a case in which a worker 15 years from retirement had achieved the par Asset/Salary Ratio of 3.5. If he continued to save and invest at the 6 percent low risk rate, he or she would achieve the target 50 percent income replacement ratio at retirement in the certainty case. To see what the range of outcomes and probabilities might be if that person selected a riskier portfolio, we undertook Monte Carlo simulations using four different mixes of a low risk fixed-income asset and higher risk equities with a savings and investment period of 15 years.⁸ For every individual iteration, each investment year’s return was drawn independently from a normal distribution of equity returns with an expected nominal annual return of 10 percent (instead of the 10.75 percent historical return for a large-cap all-equity portfolio) and a standard deviation of 17 percent. Assets were rebalanced at the beginning of each year.

Figure 11.5 illustrates the resulting Asset/Salary Ratio and target replacement ratio, showing the probability of achieving a range of income replacement ratios using 100 percent equities with a 15-year retirement

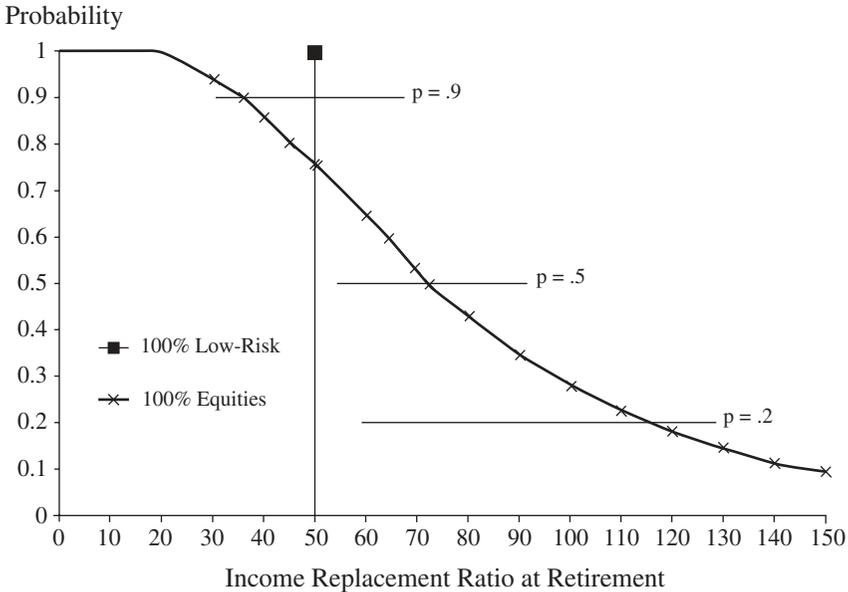


FIGURE 11.5 Probability of Alternative Asset/Salary and Replacement Rate Outcomes (Stochastic Simulation) with 100 Percent in Equities
 Source: Authors' calculations.

horizon. Recall that the original target replacement ratio was 50 percent, which was the “expected” outcome for an individual with a par Asset/Salary Ratio investing in assets using six percent. By investing 100 percent in equities, the individual could increase his or her expected replacement ratio from 50 to over 80 percent. Using stochastic simulation, Figure 11.5 shows that there is a 50 percent chance of attaining at least a 72 percent income replacement ratio at retirement, and a 20 percent chance of reaching nearly 120 percent of preretirement income.⁹ However, the figure also shows that there is a 25 percent chance that the replacement income will fall short of the original 50 percent target, and a 10 percent chance that the individual will have to settle for an income replacement ratio of less than 36 percent.

What alternative blend of risky and low risk assets could balance those expected risks and rewards of equity investment? Answering this question depends on the individual’s tolerance for shortfall risk, but several alternatives appear in Figure 11.6 using three mixed portfolios along with the original 100 percent low risk and 100 percent higher risk portfolios. For example, a mix of 20 percent equities and 80 percent of the fixed-income asset falls short of the 50 percent replacement ratio 10 percent of the time.

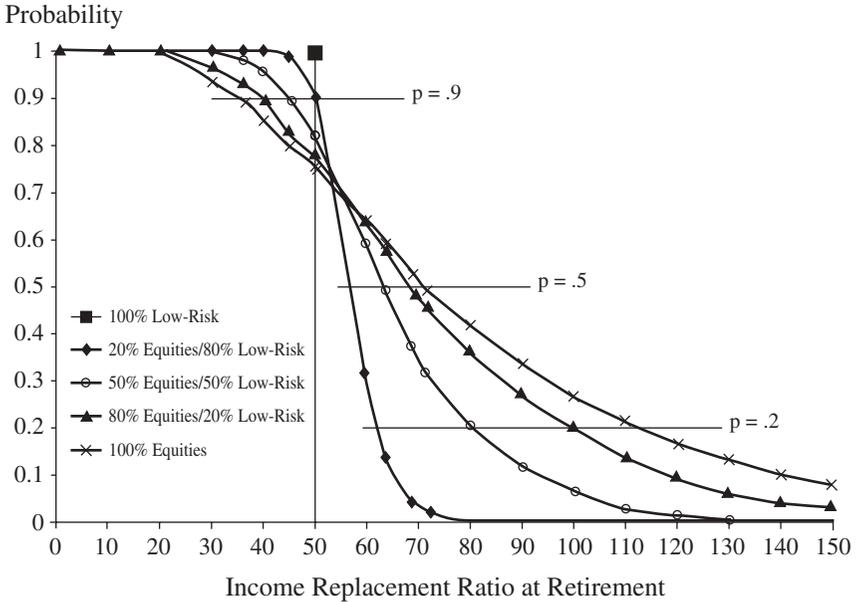


FIGURE 11.6 Probability of Alternative Asset/Salary and Replacement Rate Outcomes (Stochastic Simulation) with Alternative Investment Portfolio
Source: Authors' calculations.

All the same, this portfolio has limited potential for doing better than the low risk alternative, in that about half the time it would achieve a replacement ratio of 58 percent or less (compared to 72 percent replacement ratio in the 100 percent equity case). A 50–50 mix of equities and the fixed income asset, one which returned 8 percent, would do better. On average, it would achieve a 64 percent replacement ratio and would reach the 45 percent replacement ratio or even better about 90 percent of the time.

Someone who could tolerate a little more risk might wish to adopt an allocation policy that would limit the income risk to a 10 percent chance of falling 10 percent below the target income replacement ratio (RR = 40 percent). An 80–20 mix of equities and the low-risk asset would achieve this goal. Such a portfolio would also have a 50 percent chance of achieving at least a 70 percent income replacement ratio, and a 20 percent chance of matching 100 percent of preretirement income. Such an asset allocation strategy might be a good way of at least partially “immunizing” a portfolio against the chance of a retirement income shortfall, while still participating in the possibility of achieving a retirement income “cushion.”

IMPLICATIONS OF OTHER RISKS

Of course investment volatility and asset allocation choice are not the only sources of risks facing a retirement saver: Others include under or unemployment, health or family consumption needs, and inflation. Even modest inflation, for example, can seriously erode the real value of retirement savings and retirement income (Brown et al. 2001, 2002). The Asset/Salary Ratio does recognize some inflation effects prior to retirement, in that it assumes a nominal salary growth of 4 percent, which in current circumstances implies an inflation rate of 2 to 2.5 percent (long-term wage growth for workers in the U.S. has been about one percent in real terms). Similarly, nominal investment returns of 6 percent for the low risk case and 10 percent for the higher risk case incorporate a comparable inflation rate.

Nevertheless the damaging effects of inflation are not built into the retirement payout annuity income, and the impact can be significant. As Figure 11.7 shows, if inflation remains steady at 2.5 percent, an individual whose first year retirement income was \$40,000 would after 10 years have an inflation-adjusted income of only about \$31,000. After 25 years, a little more than the median unisex lifespan for a person age 65, real income would be only \$21,500, which is more than a 45 percent decline. If

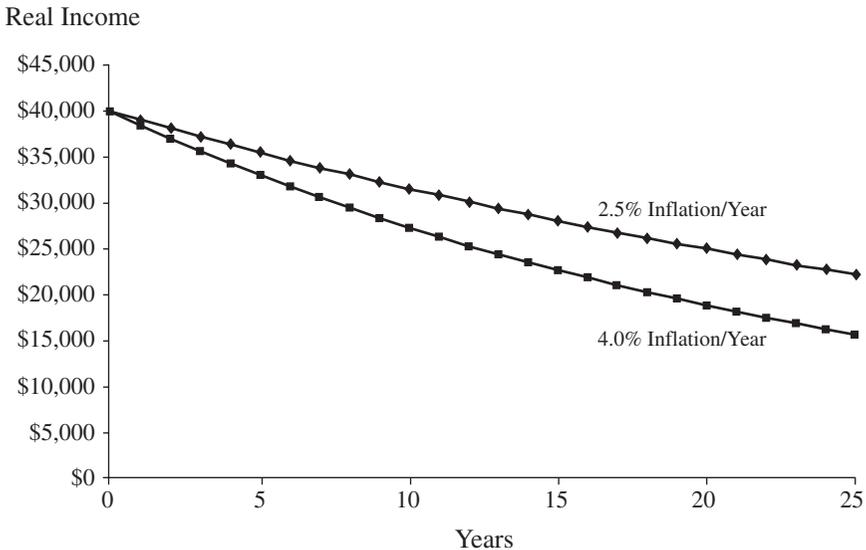


FIGURE 11.7 Effect of Alternative Inflation Rates on Retirement Income
Source: Authors' calculations.

inflation were higher, say 4 percent, then the same \$40,000 would be worth only about \$27,000 after 10 years and \$15,000 after 25 years, a 62.5 percent decline.

To cope with inflation in retirement, the RASR calculation could be adjusted to assume a “real” payout annuity interest rate in retirement (for a discussion of the cost of real annuities, see Brown et al. 2000). For example, inflation-linked bonds currently carry a coupon of about 4 percent with a built-in inflation adjustment. Figure 11.8 shows the effect on the required Asset/Salary Ratio of purchasing an annuity based on a long-term inflation bond at 4 percent coupon. The required Asset/Salary Ratio 15 years prior to retirement increases by more than 1 (from 3.56 to 4.63) as compared to the nominal 6 percent annuity par ASR curve. In essence, this means that to purchase inflation protection, the saver would need to have 30 percent more assets at that time. Because the Asset/Salary Ratio curve is not linear, the required Asset/Salary Ratio would increase by nearly 50 percent at 25 years prior to retirement. With five years to go before retirement, the required Asset/Salary Ratio would increase by 24 percent. Taking future inflation into account re-

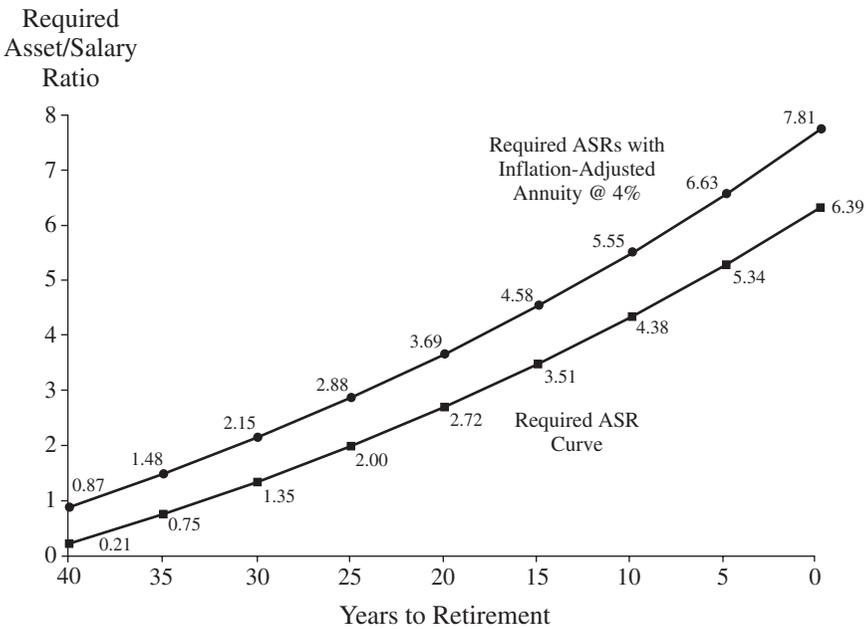


FIGURE 11.8 Asset/Salary Ratio Required to Purchase Inflation Protection
Source: Authors’ calculations.

quires more saving or a higher return, higher risk investment strategy that involves a greater probability of not achieving the target income replacement ratio.

CONCLUSIONS AND DISCUSSION

Knowing years in advance whether one is on track to achieving a retirement goal is one of the most fundamental and, at the same time, most challenging issues any individual or couple faces. Sophisticated efforts have been made to construct better tools for estimating the adequacy of retirement income strategies. Our measure, the Asset/Salary Ratio, is less sophisticated than some of these, in that it uses a number of projections and does not attempt to estimate stochastic returns and risk levels from a portfolio of actual assets. Nevertheless, our approach has the advantage of clarity with respect to the assumptions that an individual makes or needs to make in setting goals and achieving an adequate retirement income.

No matter what the approach, assessing retirement income adequacy involves projecting how much annual income people need for retirement; what proportion of that income social security will provide; what other sources of retirement income—such as a spouse's defined benefit plan—they can expect; and what their tolerance is for retirement income shortfall risk. Having ascertained all that, the ultimate question is how much in the way of assets they need to accumulate to produce an adequate retirement. The more years away from retirement, the more uncertain the answers to all these questions can seem.

The Asset/Salary Ratio, when used in conjunction with a target income replacement goal, employs numbers that people commonly have at hand—current salary and assets—to arrive at a rough estimate of current savings adequacy that can be used as a snapshot view for further retirement income planning. An actual Asset/Salary Ratio that is substantially below the required par ASR curve could provide a signal that the individual or couple should start saving more, examine other sources of retirement income, work longer, or plan lower consumption in retirement. An actual Asset/Salary Ratio that is significantly above the par ASR curve could be a sign of a risk cushion or could permit riskier asset allocations. Finally, the Asset/Salary Ratio can inform investment strategies to reduce the risk of a retirement income shortfall. We could imagine, for example, an electronic Asset/Salary Ratio calculator that allowed people to customize assumptions about target replacement ratios, salary growth, and investment return and risk.

APPENDIX 11A: The Income Replacement Ratio

The replacement ratio can be summarized as follows (Heller and King 1989 and 1994):¹⁰

$$RR = \frac{P}{AC} \sum_{n=1}^{N-1} \left[\frac{1+r}{1+w} \right]^n \quad (11A.1)$$

- where
- P = plan contribution rate as a percentage of salary
 - r = annual preretirement investment earnings rate
 - w = annual salary increase rate
 - N = total number of years in the DC plan
 - AC = annuity purchase cost, or the cost per \$1 of an income for life or for a specified period

We can rewrite this formula as follows:

$$RR = \left(\frac{FV_{\text{Assets}}}{AC} \right) \frac{1}{S(1+w)^{N-1}} \quad (11A.2)$$

- where FV_{Assets} = future value of all plan contributions, which depends on a contribution rate (percentage of salary) and an investment return rate
- S = first-year annual salary, and $S(1+w)^{N-1}$ = salary in the final working year before retirement

APPENDIX 11B: The Asset/Salary Ratio

We define the *Asset/Salary Ratio* as the ratio of current retirement assets to current salary at time t years before retirement.

$$ASR_t = \frac{A_t}{S_t} \quad (11B.1)$$

where S is the salary earned over the previous year.

The Asset/Salary Ratio can be thought of in two ways: the existing Asset/Salary Ratio or the asset/salary that would be *required* to achieve a target income replacement ratio. Taking the latter meaning of the Asset/Salary Ratio, we can say that without any future contributions (i.e., pension premiums) beyond the current moment, the *required* current level of assets or

initial principal would be equal to the discounted present value of the cost of an annuity at retirement divided by future salary growth.

$$A_t \text{ (no contributions)} = \frac{FV_A}{(1+r)^t} \tag{11B.2}$$

where FV_A = the discounted present value of the cost of an annuity at retirement that would be sufficient to produce the desired replacement ratio and r = the rate of investment return on the existing assets.

If we add future pension contributions and any other incremental savings, then required current assets is reduced accordingly to:

$$A_t \text{ (with contributions)} = \frac{FV_A - FV_P}{(1+r)^t} \tag{11B.3}$$

where FV_P is the accumulated value of annual premium payments (and any other retirement savings) at retirement. These in turn depend on initial salary, salary growth, and investment return on premiums such that:

$$FV_P = \sum_{n=1}^t PS_t (1+w)^{n-1} (1+r)^{t-n} \tag{11B.4}$$

and w = nominal salary increase rate, including a real salary increase and an inflation component.

Substituting equation (11B.4) into equation (11B.3), the required assets size becomes:

$$A_t = \frac{FV_A - \sum_{n=1}^t PS_t (1+w)^{n-1} (1+r)^{n-t}}{(1+r)^t} \tag{11B.5}$$

Now the future value of an annuity can be recast in terms of the replacement ratio (RR), salary, salary growth, and an annuity purchase cost:

$$FV_A = [S_t (1+w)^t \text{RR}] \text{AC} \tag{11B.6}$$

where

$$\text{AC} = \frac{1 - (1/(1+r_{AN})^K)}{r_{AN}}$$

r_{AN} = investment rate of return on annuity assets, and K = total number of years in the annuity. Substituting (11B.6) into (11B.5) yields

$$A_t = \frac{S_t}{(1+r)^t} \left[[RR(1+w)^t AC] - \sum_{n=1}^t P(1+w)^{n-1}(1+r)^{t-n} \right] \quad (11B.7)$$

Simplifying further yields

$$\frac{A_t}{S_t} = \frac{RR(1+w)^t AC}{(1+r)^t} - \frac{P(1+w)[(1+r)^t - (1+w)^t]}{(r-w)(1+r)^t} \quad (11B.8)$$

or

$$ASR_t = \frac{A_t}{S_t} = RR * AC \left(\frac{1+w}{1+r} \right)^t - \frac{P(1+w)}{r-w} \left[1 - \left(\frac{1+w}{1+r} \right)^t \right] \quad (11B.9)$$

There are at least two things to note about this characterization of the Asset/Salary Ratio. First, the annuity value is based on a date certain rather than a life annuity. If a life annuity is used then the annuity cost AC depends on the annuity's interest rate, i , the probability of a person age b at retirement of living to age $b + h$ (hPb), and on the last age in a mortality table, m , as follows:

$$AC_b = \sum_{b=0}^{m-b} \frac{hPb}{(1+i)^b} \quad (11B.10)$$

Second, the preretirement investment return, annuity investment return, and salary growth terms may all be different. If any of them are similar, the Asset/Salary Ratio equation collapses further. For example, if the preretirement investment rate of return and the salary growth rate are equal, then

$$ASR_t = \frac{A_t}{S_t} = RR * AC - P * t \quad (11B.11)$$

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CHAPTER 3 Franchise Margins and the Sales-Driven Franchise Value

1. The franchise value concept was developed by the author in conjunction with Stanley Kogelman (Leibowitz and Kogelman 1994).
2. For a more comprehensive treatment of the general case, see Leibowitz (1997).

CHAPTER 4 Franchise Value and the Price/Earnings Ratio

1. See for example, Miller and Modigliani (1961), Gordon (1962), and Fruhan (1979). For an update on the DDM, see the *Financial Analysts Journal* (1985).
2. In addition to its role in DDM models, the smooth-growth concept has had a great impact on our intuitions regarding the value of equity. For an early discussion of the relationships among growth, above-market returns, and firm value, see Solomon (1963).
3. For fixed-income securities, the realized compound yield, or total return, incorporates all the components of return. This concept was discussed in Homer and Leibowitz (1972).
4. With fixed-income securities, reinvestment is generally assumed to be in riskless assets, which may offer a lower return than the original investment. In this example, dividends are reinvested in equity assets that offer the same expected return as the original investment.
5. For ease of exposition, we consider only the case in which the return is equal to initial ROE. In “The Franchise Portfolio,” we discuss the more realistic situation in which franchise opportunities offer a range of returns.
6. For a constant growth rate (g) and market rate (k), the growth equivalent is $[g/(k - g)]$. See Appendix A for a derivation of this formula.
7. Because $G = g/(k - g)$ and $g = 10$ percent for Firm D, $G = 0.10/(0.12 - 0.10) = 500$ percent.

8. The observations presented here are consistent with the usual capital budgeting considerations. See, for example, Rao (1987).
9. In the approximation formula, “duration” (D) is the modified duration of the investment computed at a discount rate equal to k .
10. For investments with payoffs in the form of 20-year, level-payment annuities, higher annual returns lead to higher IRRs.
11. Appendix 4B shows that the approximation formula holds for arbitrary payment patterns.
12. It is actually the Macaulay duration, rather than the modified duration, that precisely measures the weighted-average time of payments. The two are sufficiently close, however, that the intuitive interpretation of the modified duration as a weighted-average time is valid. The relationship between the two durations is $(1 + k)D_{MOD} = D_{MAC}$.
13. The present value of \$20 a year for 10 years at a 12 percent discount rate is \$113. The present value of the perpetual equivalent is the perpetual return (R_p) divided by 0.12. Thus, $R_p = 0.12 \times 113 = 13.56$.
14. The slope of the FF line is $1/rk$. Because $r = 15$ percent and $k = 12$ percent, $1/rk = 55.56$. If the change in R_p is 100 basis points, the change in FF will be $0.01 \times 55.56 = 0.56$.
15. If the borrowing rate is 7.58 percent and the bank’s marginal tax rate is 34.00 percent, the after-tax borrowing rate is 66.00 percent of 7.58 percent, or 5.00 percent.
16. If the bank earns 9.71 percent on borrowed funds and it estimates expenses at 100 basis points, earnings after expenses and taxes equal 66.00 percent of (9.71 percent – 1.00 percent), or 5.75 percent.
17. See Salomon Brothers Inc. (1990).
18. If current earnings are believed to be understated as reported, a corrected earnings estimate may be used in place of the current earnings. See Chapter 10 for further details.
19. Fruhan (1979) provides a similar structure for tracing out the relationship between firm value and future investment opportunities.
20. “Franchise Value and the Growth Process” shows that, if a firm is to maintain a P/E greater than the base P/E while “consuming” its previously known franchise opportunities, the firm must be able to replenish expectations by generating new future franchise opportunities that are of the same magnitude as those that have been consumed.
21. To compute FF when the net spread varies over time, find a perpetual-equivalent net spread by equating the present value of the vary-

ing spread pattern to the present value of the perpetual-equivalent net spread. In the examples of this section, for which spreads are sustained for five years, equity capital is assumed to earn the 12 percent market rate beyond the initial five-year period. For details of the computation of perpetual-equivalent returns, see “The Franchise Portfolio.”

22. Although earnings will obviously fluctuate with changing market conditions and changes in the firm structure, remember that in the context of this model, E and r should be interpreted as long-term sustainable values.
23. See Appendix 4C for development of this FF formulation for the base P/E.
24. In the formula for the full P/E, the incremental P/E is added to $1/k$. Appendix 4C demonstrates that, when computing the base P/E, the incremental P/E must be added to the book equity capital-to-earnings ratio ($1/r$).
25. The new weighted-average return on book equity is computed as follows $(0.33 \times 31.6 \text{ percent}) + (0.33 \times 20.0 \text{ percent}) + (0.33 \times 12.0 \text{ percent}) = 21.2 \text{ percent}$. Note that the 6 percent earnings increase (and the 6 percent price increase) could also be computed by dividing the instantaneous 0.50-unit P/E change by the base P/E of 8.33.
26. The more general case of risky cash flows can be accommodated by replacing the constant return values with expected values. Note that in addition to ignoring risk, this chapter considers only firms in which *operating* earnings are unaffected by leverage.
27. Even in this equilibrium world in which the firm’s total value remains constant, different financial structures will lead to different P/Es.
28. The degree of leverage can be characterized in many different ways. In general, academic studies reflect the debt load as a percentage of the total market value of all the firm’s securities (both debt and equity). Among equity market participants and credit analysts, however, the common practice is to express the leverage percentage relative to the total capitalization, that is, as a percentage of the firm’s initial book value prior to any leveraging. We follow this latter convention because it is more intuitive. The general methodology of this study is not affected by this choice of leverage *numeraire*.
29. These same price/earnings ratios could have been obtained by examining the earnings per share resulting from leverage-induced declines in both total earnings and in the number of shares outstanding.
30. The incremental franchise P/E is $FF \times G$, and the corresponding

- franchise value is $E \times FF \times G$. With $G = 160$ percent, $FF = 3.33$, and $E = \$15$ million, the implied franchise value is \$80 million, as in the earlier example.
31. If $G = 125$ percent and FF and E are as before, the implied franchise value is \$62.5 million. This value leads to the threshold P/E of 12.5.
 32. The discussion here assumes a taxable corporation and tax-exempt investors; the effects of investor tax rates are thus not considered.
 33. Figure 4.45 presents a comparison between a taxable and a tax-exempt entity and assumes that, in the absence of leverage, both firms provide the same return on equity on an after-tax basis.
 34. The key assumption here, unlike in the dividend discount model, is that the totality of a firm's franchise investment opportunities will be fully consumed within a company's specific time frame. Thereafter, the growth rate is determined *solely* by the market rate and the firm's dividend payout policy.
 35. The decrease in franchise factor is explained by the fact that the return on book equity (which appears in the denominator of FF) changes over time whenever the return on new investment and the return on existing book are different. The return on equity actually is a weighted average of the old and new returns. Because in this example the new return (20 percent) is higher than the current return (15 percent), the blended rate rises slowly over time, which leads to a correspondingly modest decrease in franchise factor.
 36. When the franchise is fully consumed by a constant growth in earnings from the outset, the P/E will fall continually until it reaches the base P/E . This result does not hold, however, for arbitrary franchise structures.
 37. Because $\text{Market value} = TV + FV = (TV)(1 + FV/TV)$, $P/E = \text{Market value}/E = (TV/E)(1 + FV/TV) = (1/k)(1 + f\text{-ratio})$.
 38. For example, the standard infinite-horizon dividend discount model implies a stable P/E (and constant f -ratio) over time. In franchise model terms, the infinite DDM requires that franchise investments be available to accommodate precisely the retentions from a growing earnings stream. It is hard to believe that many franchises would come in such neat packages. An alternative interpretation might be an outsized franchise whose consumption is constrained by the availability of retained earnings. In today's financial markets, however, external financing sources could be applied to exploit such above-market opportunities expeditiously.
 39. Because $(1 + g_p) = \text{New price/Old price}$ and $P = E(P/E)$, it follows that $(1 + g_p) = (1 + g_E)(1 + g_{P/E})$. Thus, $g_p = g_E + g_{P/E} + (g_E)(g_{P/E})$. Dropping

the last term, which is fairly small, results in the given approximation formula.

40. If an unexpected event were to result in a loss of franchise value, the market value and the P/E would suddenly drop by an appropriate amount.
41. Based on “The Franchise Portfolio,” all earnings streams are assumed to be in the form of “normalized” perpetuities.
42. In the special case of a TV firm with $P/E = 1/k$, the formula for g_p reduces to bk . This result confirms the earlier observation that, for TV firms, $g_p = g_E = bk$. For a general discussion of the factors that influence share price, see Keane (1990).
43. This same value could, of course, be obtained from the expression $g_p = k - (d/P) = 12.00$ percent $- 2.33$ percent $= 9.67$ percent. The preceding analysis was designed, however, to provide insight into the respective roles of TV and FV in the firm’s overall price growth.
44. An exception to this P/E decline occurs in a franchise-value structure in which all measures continue to grow at a given uniform rate—that is, under the special conditions that are implicit in the standard dividend discount model (see Appendix 4E).
45. At the end of the first year, the realized g_E and $g_{P/E}$ at Point A bring the firm to a new P/E multiple of 15.3 (that is, 1.0173×15). With a different P/E at the start of the second year, that year will also have a new VPL.
46. Issuing new shares dilutes the growth in earnings per share relative to what it would have been if no new shares had been issued. If no external financing were needed, earnings would grow at 26 percent (that is, 0.20×130 percent). The 21.2 percent represents a 4.8 percent drop-off—compared with the hypothetical 26 percent—that is attributable to dilution in both earnings and franchise value. For more details, see Appendix 4E.
47. The single-period model used for this section can be extended dynamically by repeatedly applying the model to year-end values.
48. In these examples, only actions that retain the risk pattern of the firm are being considered. If the firm changes its risk class dramatically—for example, through disproportionate debt financing—the appropriate discount rate (k) will change and the firm will migrate to a new VPL. As long as all the firm’s initiatives for the year—funding, acquisitions, distributions, or investments—take place at the implicit 12 percent discount rate, the firm will remain on the same VPL during the one-year period.
49. See Ibbotson Associates (1991).

50. For a discussion of the effects of inflation on equity returns, see Buffet (1977). A theoretical analysis of the effects of inflation on corporate value is provided in Modigliani and Cohn (1979). A recent empirical study shows that high-flow-through industries tend to have higher share prices than low-flow-through ones (see Asikoglu and Ercan 1992).
51. At this point, “earnings” are *economic* earnings—the firm’s real cash flow that could be paid to shareholders (see Bodie, Kane, and Marcus 1989). In “Theoretical Price/Earnings Ratios and Accounting Variables,” a distinction is made between economic and accounting earnings.
52. For a discussion of the effects of flow-through on investment values, see Leibowitz, Sorenson, Arnott, and Hanson (1987) and Estep and Hanson (1980).
53. With a 4 percent inflation rate and a 12 percent nominal rate, the real rate (k_r) is computed from $(1 + k_r)(1.04) = 1.12$. Thus, $k_r = (1.12/1.04) - 1.00 = 7.69$ percent.
54. In the earlier example, for a firm with initial earnings that grow with inflation (E_D), the level-earnings equivalent is $E_D^* = k \times PV_D = kE_D(1 + I)/(k - I)$. Assuming that both the original firm and its inflation equivalent have book value B , the inflation-equivalent ROE (r_D^*) is defined to be E_D^*/B . That is, $r_D^*/E_D^*/B = [k(1 + I)/(k - I)](E_D/B)$. Because the second expression is r_D , γ is defined to be $[k(1 + I)/(k - I)]$.
55. In actuality, both of these “extremes” can be exceeded. If expenses rise more rapidly than revenues, net earnings will decrease with inflation, resulting in negative flow-through. Similarly, if costs can be contained, a flow-through of greater than 100 percent may be possible. In fact, one can argue that, in order for equity to act as a counterbalance against inflation, it *must* achieve a flow-through rate exceeding 100 percent.
56. If E^* is the level-earnings equivalent of an earnings stream that starts at the value E and grows with inflation, then $E^*/E = \gamma$ and $P/E^* = 1/k$, so $P/E = (P/E^*)(E^*/E) = (\gamma)(P/E^*) = \gamma(1/k)$.
57. When the earnings horizon is finite, $\gamma = [k(1 + \lambda I)/(k - \lambda I)] \times (1 - [(1 + \lambda I)/(1 + k)]^N)/(1 - [1/(1 + k)]^N)$. The first term in brackets is the adjustment factor when the earnings stream is a perpetuity. The second factor represents a finite time adjustment.
58. In the full-flow-through case, the ratio of the return spread to the nominal rate can also be expressed as the difference between a real return and a real discount rate, divided by the real rate. Applying the inflation adjustment factor to this “real spread ratio” results in the perpetual-equivalent nominal spread ratio $[(R^* - k)/k]$.

59. Recall that because G is measured relative to B_0 , a one-unit change in G is equal to 100 percent of the firm's current book value.
60. Although the analysis in this section assumes that the economic and accounting values of earnings, book value, and returns coincide, this assumption is rarely valid in practice. For example, manufacturing firms that use depreciated book-value accounting may understate their earnings under certain circumstances. The FF model given in "Theoretical Price/Earnings Ratios and Accounting Variables" adjusts for accounting differences. That theoretical model can be used to restate the inflation-flow-through model as follows: $P_T/E_A = q_E \gamma(1/k) + q_r \text{FF}_T^* G_A$, where $\text{FF}_T^* = (R_T^* - k)/r_0 k$, r_0 is the ratio of initial economic earnings to initial economic book value, q_E is the ratio of economic earnings to accounting earnings, and q_r is the ratio of the economic return to the accounting return.
61. For an early discussion of the relationship between inflation and changes in stock prices, see Williams (1938). For recent analyses, see Leibowitz (1986); Leibowitz, Bader, and Kogelman (1992); and Leibowitz, Sorensen, Arnott, and Hanson (1987). A detailed comparison of the total return on a stock and the total return on a bond is provided in Leibowitz (1978).
62. For comparative purposes, note that the modified duration of coupon bonds rarely exceeds 10 years and that the effective duration of the Salomon Brothers Broad Investment-Grade Bond Index is approximately 5 years.
63. For a review of the standard DDM, see Bodie, Kane, and Marcus (1989).
64. The separation of dividend payments from price appreciation becomes clearer when the DDM price equation is solved for k : $k = (d/P) + g$. The first term on the right side of the equation is the dividend yield.
65. The standard DDM duration can also be computed by taking the derivative of the price function. Specifically, DMM duration = $(-1/P)(dP/dk) = (1/P)[d/(k - g)^2] = 1/(k - g)$. When $k = 12$ percent and $g = 8$ percent, this formula leads to $1/(k - g) = 1/(0.12 - 0.08) = 1/0.04 = 25$.
66. For the DDM, the durations can be computed from the following formulas: $D_{TV} = (-1/TV)(dTV/dk) = 1/k$, and $D_{FV} = (-1/FV)(dFV/dk) = r/[k(r - k)] + 1/(k - g)$.
67. The trough pattern in the FV duration is derived from that value becoming very large as g or r approaches k (see formula in preceding note).
68. In addition, for a discussion of the effect of inflation flow-through on

- the value of real estate, see Leibowitz, Hartzell, Shulman, and Langetieg (1987).
69. In this and all other examples, the given flow-through rate is assumed to hold for all time periods.
 70. To obtain the correct PV, more decimal places are necessary than are displayed in the text.
 71. The reasoning behind discounting at the real return on equity is contained in the observation that, at time n , earnings will be $\$16,000,000 \times (1 + I)^n$ and the denominator (that is, the discount factor) will be $(1 + k)^n = (1 + k_r)^n(1 + I)^n$. In the ratio of these two quantities, the inflation factor “cancels out,” leaving only the initial earnings and the real discount factor.
 72. In certain cases, truly extraordinary near-term earnings might be sufficient to compensate for the lack of inflation flow-through in later years.
 73. If λ is 100 percent, then $\gamma = [k(1 + I)]/(k - I)$. Because $k = (1 + k_r)(1 + I) - 1$, it follows that $k - I = (1 + k_r)(1 + I) - 1 - I = (1 + I)k_r$. Consequently, $(1 + I)/(k - I) = 1/k_r$, γ is simply k/k_r , and $FF^* = \gamma(R - k_r)/rk = (k/k_r)(R - k_r)/rk = (R - k_r)/rk_r$.
 74. Because the example assumes 100 percent flow-through, $\gamma = k/k_r = 12 \text{ percent}/7.69 \text{ percent} = 1.56$, and $R^* = 1.56 \times 10.256 \text{ percent} = 16 \text{ percent}$. Thus, the inflation-adjusted NIS is 4 percent (16 percent - 12 percent). This spread is the same as that in the DDM example.
 75. For additional perspectives on the rate sensitivity of firms, see Bernstein (1992), Sorensen and Bienstock (1992), and Modigliani and Cohn (1979).
 76. For example, Stewart (1991) measures economic earnings by NOPAT, “the profits derived from the company’s operations after taxes but before financing costs and noncash bookkeeping entries.”
 77. This aspect is part of Modigliani and Cohn’s (1979) arguments with regard to the effects of inflation on corporate value. Because of this asymmetry in the effect of movements in interest rates, however, the debt-value overstatement actually tends to be chronic, even without the direct effects of inflation.
 78. See, for example, Williams (1938), Gordon (1962), and Miller and Modigliani (1961).
 79. The assumptions here specify a firm with equity financing only, but as discussed in “The Franchise Factor for Leveraged Firms,” the analysis can be readily generalized to firms with a mixture of debt and equity.
 80. For a thoughtful discussion of the gap between economic and accounting earnings, see Treynor (1972).

81. The formula for the blended P/E is derived by multiplying P_T/E_T by q_E and observing that $q_E \text{FF}_T G_T = q_E \text{FF}_T G_A / q_B = q_r \text{FF}_T G_A$.
82. Recall that the value of FF is proportional to the economic spread on new investment. If the spread is cut in half, the dollar investment must be doubled to maintain the same level of the new investment factor ($\text{FF}_T \times G_A$).
83. The formula for P_T/B_A can be shown to be equivalent to the formula for P_T/E_A multiplied by r_A .
84. It can be shown that franchise-based P/E = $q_r \text{FF}_{TOT} G_{TOT}$, where $G_{TOT} = q_B + G_A$, $\text{FF}_{TOT} = (R_{TOT} - k)/r_T k$, and R_{TOT} is the weighted-average economic ROE; that is, $R_{TOT} = (q_B/G_{TOT})r_T + (G_A/G_{TOT})R_T$.
85. $\text{FF}_{CUR} = (r_T - k)/r_T k = (0.13 - 0.12)/(0.13 \times 0.12) = 0.64$; $q_r \text{F}_{CUR} = (0.13/0.15) \times 0.64 = 0.87 \times 0.64 = 0.56$.
86. $q_r \text{FF}_{NEW} = q_r (R_T - k)/r_T k = 0.87 \times (0.14 - 0.12)/(0.13 \times 0.12) = 1.11$.
87. This approach to valuation is based on Miller and Modigliani (1961).
88. This result is precisely the formula derived by Miller and Modigliani.

CHAPTER 5 Franchise Valuation under Q-Type Competition

1. See Bodie and Merton (1998); Damodaran (1994); Danielson (1998); Elton and Gruber (1991); Fruhan (1979); Gordon and Gordon (1997); Gordon (1962); Miller and Modigliani (1961); Peterson and Peterson (1996); Rappaport (1998); Sorensen, and Williamson (1985); Treynor (1972); and Williams (1938).
2. Although valuation models can be cast in terms of various flow variables—dividends, earnings, cash flow, etc.—I adhere in this article to more standard “earnings and dividends” terminology. The basic thrust of my argument can be readily extended to models based on other measures.
3. The choice of the capital Q reflects an intentional deference to Tobin’s q measure, even though his concept was much broader in scope. Moreover, because of the narrow focus on the competitive challenge, I have found it helpful to have the replacement costs serve as the *numerator* in our Q ratio rather than the denominator as in Tobin’s classic q measure.
4. In the more general case, strong franchise barriers could also lead to situations in which the would-be competitor’s capital expenditure would have to go far *beyond* simply replicating the original company’s goods-producing capacity. Such high-replacement-cost situations could lead to Q values that greatly exceed 1.

5. Q may also incorporate any general pricing divergences in the market for old versus new capital assets.
6. Even these harsh conditions would not necessarily doom the company to operational failure: The sales margin can still be positive even when the franchise margin is negative.
7. The P/E in this case can obviously be reduced to simply $P/E = Q/r$, but I use the longer expression for P/E, $(1/k)(r_Q/r)$, because it will prove useful later in the article. For the positive case with a sufficiently higher Q , $Q > 1$, a better mental model might be to view the company as being able to expand its margin up to the point where competition might just consider entering the field. Apart from this somewhat different view of the company's motivation, the mathematical development remains the same.
8. This simple example ignores any probable interaction between d and Q (i.e., the possibility that a more dramatic "voltage gap" between a high initial ROE and a low Q value might be accompanied by a more accelerated decay process).
9. This same postgrowth P/E of $1/k$ is obtained even under a growth scenario as long as the retained earnings can be invested at an ROE that only matches the cost of capital.
10. Moreover, it is comforting to see that this formulation agrees with the general expression when the horizon H is set equal to 1.
11. For example, Q -type competition would have a less dramatic impact on multiproduct companies, especially those with asynchronous product cycles, than on single-product companies.

CHAPTER 6 P/E Forwards and Their Orbits

1. Even though the text has numerical examples based on the preceding approximation, the precise formulations were used in preparing all the graphical results. Appendix 6A also contains a brief discussion of how this formulation could be extended under conditions of nonzero statistical correlation between g and $g_{P/E}$.
2. The exact expression developed in Appendix 6A would produce $g_{P/E} = -5.24$ percent or a forward P/E of 23.69.
3. This result can also be obtained by using the exact form of the expectational model, as shown in Appendix 6A.
4. Ironically, this short-term interpretation of the Gordon formula holds under more-general conditions than the more common long-term

form. For example, as shown in Leibowitz and Kogelman, certain long-term discounting models that distinguish between the return on equity for future investment and the ROE for current investment do *not* lead to the Gordon formulation.

5. The basis for this orbit bifurcation is described more fully in Appendix 6A.
6. To counter the tendency to see these results as paradoxical, recall that the equilibrium framework assumes that all these stocks fall into the same risk class, one that requires a 12 percent expected return. When $g = g_s$, a stable P/E generates the 12 percent return. With expected earnings growth higher than g_s , a declining P/E is needed to maintain the 12 percent return expectation, and vice versa for $g < g_s$.
7. It is tempting to draw an analogy between this result and the precision required in the launch phase for a satellite to be injected into a specified permanent orbit.
8. I leave it to the analyst to assess whether 14.25 percent growth for a full 15 years represents a more heroic forecast than 23.50 percent for 5 years.
9. Multiyear models can be even more treacherous; their greater complexity can obscure the fact that a casual assumption of P/E stability may be driving the outsized return projections.
10. For a more comprehensive discussion of this somewhat surprising effect, see Leibowitz (1998).
11. In fact, even if the beyond-horizon prospects remained exactly the same, high near-term growth, $g^* > g$, would actually lead to a declining $(P/E)_H^*$, so $g_{P/E}^*$ would be less than $\bar{g}_{P/E}$. This result would follow from the present value in the numerator of $(P/E)_H$ remaining unchanged at the same time that the denominator E_H increased.

CHAPTER 7 Franchise Labor

1. This chapter reports a purely analytical study and uses hypothetical examples for illustrative purposes only. It is not intended to be descriptive of any individual company or any specific class of equities.
2. The terms “gross” and “net” are used here in the special sense of returns *before* and *after* payment for the annual cost of new capital. No taxes or other expenses are considered in the example; that is, all returns are assumed to be effectively after tax.

CHAPTER 8 Spread-Driven Dividend Discount Models

1. In this chapter, the cost of capital, the discount rate, the required return, and the market rate are essentially used interchangeably.
2. The context of no debt leverage and no taxes also applies to this chapter.
3. Throughout this chapter, except where specifically noted, the retention ratio b is fixed at 0.5 and the financing of all new investments is assumed to be through this level of earnings retention.
4. This discussion focuses on ROEs and the earnings they generate, but the FV can also be articulated in terms of sales, sales growth, and net margins (Leibowitz 1997a, b; Rappaport and Moubassin, 2000). The franchise spread then depends on the extent to which the net margin exceeds the capital cost required to produce an incremental dollar of sales. The sales-based approach can be particularly helpful for companies at an early stage when earnings have yet to make an appearance.
5. Moreover, note that the ratio $P/E = 1/k$, which serves as a common “residual P/E” for multiphase DDMs, can also be interpreted as a special case of a spread-driven DDM.
6. The specific numerical values in this example were chosen so as to obtain a spread function that would provide a relatively low spread at $k = 6$ percent but that would still pass through $s = 2$ percent at $k = 10$ percent to allow a comparison with the earlier examples.
7. For simplicity, the retention factor was fixed at $b = 0.5$ throughout the study, but readers should note that the retention might well be higher during a high-growth phase.
8. To a certain extent, the concept of “Q-type” competition in Leibowitz (1998) foreshadowed the idea of growth-driven initial returns followed by a period of more competitive returns ultimately related to the cost of capital.

CHAPTER 9 The Levered P/E Ratio

1. A paper by Adserà and Viñolas attempts to integrate these factors into a single formulation.
2. Of course, myriad additional considerations surround the presence of debt—tax effects, credit spreads, potential bankruptcy costs, the various intervention options available to debtholders, and so on. For clarity, however, these complications are avoided here and the focus is on

how the observed characteristics of a levered company affect its return parameters within a totally tax-free environment.

3. A more generalized model is deferred to a later study.
4. For the development, see Leibowitz (2002).
5. Note that the term “risk premium” is used here only as the convenient way to characterize the difference between the discount rate on (unlevered) equity and the corporate debt rate: There is neither a presumption nor an implication of any specific “risk model.”
6. Note, however, that this approach works only within the simplistic framework of the basic Gordon model. Unlike the development earlier in this chapter, it cannot be readily applied to more general cash flow patterns without encountering problems of circularity.
7. The derivation of the P/E computation for this tax case is available from the author upon request.
8. See the “Levered Valuation with Differential Returns” section in Leibowitz (2002).

CHAPTER 10 The Franchise Value Approach to the Leveraged Company

1. Leibowitz (1998, 2000); Leibowitz and Kogelman (1991, 1994).
2. Under Modigliani–Miller (1958a), one can argue that future capital costs should depend only on the overall magnitude of the needed capital, not at all on the choice of the equity/debt mix. In a tax-free environment, this result implies that the company’s going-forward debt policy will have no impact on either its future return on investment or its capital costs. Consequently, the debt policy should have no impact on the growth component of the company’s value. (This assertion ceases to be totally true when taxes and the impact of the tax shield are considered). By shunting aside the question of future debt policy, the argument based on Modigliani–Miller implies that equity valuation is affected only through the level of debt currently in place to support the existing book of business.
3. For the basic Gordon growth model, see Gordon (1962, 1974).
4. Again, recall that a given company with a fixed franchise spread s' (hence, a fixed unlevered return on investment, R') will have an unchanging FV even when it uses debt to fund new investments. For a *levered* company, however, higher levels of debt with a given R imply that its unlevered version will carry a lower franchise spread, a lower return on investment, and thus a lower franchise value.

5. Indeed, note that all of the preceding cash flow manipulations were carried out independently of any risk model (including the capital asset pricing model) assumptions.

CHAPTER 11 Retirement Planning and the Asset/Salary Ratio

We are grateful to Gary Selnow, John Ameriks, Mark Warshawsky, Harry Klaristenfeld, Deanne Shallcross, Yuewu Xu, and anonymous readers for helpful comments and suggestions.

1. FASB 87 requires private pension plan sponsors to report their surplus, or the excess of assets over present-value liabilities, on a market-to-market basis. GASB 5, on the other hand, does not require public pension plans to measure liabilities with a discount rate that reflects current market conditions.
2. At that time, social security benefits at age 65 replaced about 20 percent of income in the upper income categories (\$90,000 in 1990 dollars), about 50 percent of income for the middle income range (\$35,000), and about 70 percent of income for those with lower incomes (\$15,000).
3. To be precise, S_t is the individual's salary or income over the last year.
4. DC plan contribution rates vary considerably among employers. In higher education, many college and university plans are designed so that the employer and employee together contribute 10 percent or more of annual salary.
5. This assumes that salary equals \$1 or that the right-hand side of the equation is divided by S_t .
6. These examples assume 4 percent nominal (2 percent real) annual salary growth.
7. One of the limits of the Asset/Salary Ratio should be noted in connection with this first point. Other things being equal, a future salary *decrease* would in fact lead to an *increase* in the actual Asset/Salary Ratio. But in most cases individuals would not prefer to increase their own Asset/Salary Ratio in this manner.
8. Using the @Risk commercial software program, the Latin Hypercube sampling method was used along with expected value recalculation. In repeated simulations, the results converged consistently after about 1,500 iterations.

9. Note that the mean replacement ratio result was 83 percent, consistent with the non-stochastic expected value. However the $p = .50$ replacement ratio is 72 percent. Repeated simulations produced distributions of replacement ratios that exhibited skewness (1.8) and considerable kurtosis (9.8). Not surprisingly, these distributions resembled a log normal rather than a normal distribution.
10. The following formula follows the Heller and King convention, but it has been reduced to a simplified form that assumes contributions to the plan are made only once each year at year's end.

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