

# Introduction to Valuation

**E**very asset, financial as well as real, has a value. The key to successfully investing in and managing these assets lies in understanding not only what the value is, but the sources of the value. Any asset can be valued, but some assets are easier to value than others, and the details of valuation will vary from case to case. Thus, the valuation of a real estate property will require different information and follow a different format than the valuation of a publicly traded stock. What is surprising, however, is not the differences in techniques across assets, but the degree of similarity in basic principles. There is uncertainty associated with valuation. Often that uncertainty comes from the asset being valued, though the valuation model may add to that uncertainty.

This chapter lays out a philosophical basis for valuation, together with a discussion of how valuation is or can be used in a variety of frameworks, from portfolio management to corporate finance.

## **A PHILOSOPHICAL BASIS FOR VALUATION**

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It was Oscar Wilde who described a cynic as one who “knows the price of everything, but the value of nothing.” He could very well have been describing some analysts and many investors, a surprising number of whom subscribe to the “bigger fool” theory of investing, which argues that the value of an asset is irrelevant as long as there is a “bigger fool” around willing to buy the asset from them. While this may provide a basis for some profits, it is a dangerous game to play, since there is no guarantee that such an investor will still be around when the time to sell comes.

A postulate of sound investing is that an investor does not pay more for an asset than it's worth. This statement may seem logical and obvious, but it is forgotten and rediscovered at some time in every generation and in every market. There are those who are disingenuous enough to argue that value is in the eye of the beholder, and that any price can be justified if there are other investors willing to pay that price. That is patently absurd. Perceptions may be all that matter when the asset is a painting or a sculpture, but investors do not (and should not) buy most assets for aesthetic or emotional reasons; financial assets are acquired for the cash flows expected on them. Consequently, perceptions of value have to be backed up by reality, which implies that the price that is paid for any asset should reflect the cashflows it is expected to generate. The models of valuation described in this book attempt to relate value to the level and expected growth of these cash flows.

There are many areas in valuation where there is room for disagreement, in-

cluding how to estimate true value and how long it will take for prices to adjust to true value. But there is one point on which there can be no disagreement: Asset prices cannot be justified by merely using the argument that there will be other investors around willing to pay a higher price in the future.

## GENERALITIES ABOUT VALUATION

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Like all analytical disciplines, valuation has developed its own set of myths over time. This section examines and debunks some of these myths.

### **Myth 1: Since valuation models are quantitative, valuation is objective.**

Valuation is neither the science that some of its proponents make it out to be nor the objective search for true value that idealists would like it to become. The models that we use in valuation may be quantitative, but the inputs leave plenty of room for subjective judgments. Thus, the final value that we obtain from these models is colored by the bias that we bring into the process. In fact, in many valuations, the price gets set first and the valuation follows.

The obvious solution is to eliminate all bias before starting on a valuation, but this is easier said than done. Given the exposure we have to external information, analyses, and opinions about a firm, it is unlikely that we embark on most valuations without some bias. There are two ways of reducing the bias in the process. The first is to avoid taking strong public positions on the value of a firm before the valuation is complete. In far too many cases, the decision on whether a firm is under- or overvalued precedes the actual valuation,<sup>1</sup> leading to seriously biased analyses. The second is to minimize, prior to the valuation, the stake we have in whether the firm is under- or overvalued.

Institutional concerns also play a role in determining the extent of bias in valuation. For instance, it is an acknowledged fact that equity research analysts are more likely to make buy rather than sell recommendations<sup>2</sup> (i.e., they are more likely to find firms to be undervalued than overvalued). This can be traced partly to the difficulties analysts face in obtaining access and collecting information on firms that they have issued sell recommendations on, and partly to pressure that they face from portfolio managers, some of whom might have large positions in the stock. In recent years, this trend has been exacerbated by the pressure on equity research analysts to deliver investment banking business.

When using a valuation done by a third party, the biases of the analyst(s) doing the valuation should be considered before decisions are made on its basis. For instance, a self-valuation done by a target firm in a takeover is likely to be positively biased. While this does not make the valuation worthless, it suggests that the analysis should be viewed with skepticism.

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<sup>1</sup>This is most visible in takeovers, where the decision to acquire a firm often seems to precede the valuation of the firm. It should come as no surprise, therefore, that the analysis almost invariably supports the decision.

<sup>2</sup>In most years buy recommendations outnumber sell recommendations by a margin of 10 to 1. In recent years this trend has become even stronger.

**BIAS IN EQUITY RESEARCH**

The lines between equity research and salesmanship blur most in periods that are characterized by “irrational exuberance.” In the late 1990s, the extraordinary surge of market values in the companies that comprised the new economy saw a large number of equity research analysts, especially on the sell side, step out of their roles as analysts and become cheerleaders for these stocks. While these analysts might have been well-meaning in their recommendations, the fact that the investment banks that they worked for were leading the charge on new initial public offerings from these firms exposed them to charges of bias and worse.

In 2001, the crash in the market values of new economy stocks and the anguished cries of investors who had lost wealth in the crash created a firestorm of controversy. There were congressional hearings where legislators demanded to know what analysts knew about the companies they recommended and when they knew it, statements from the SEC about the need for impartiality in equity research, and decisions taken by some investment banks to create at least the appearance of objectivity. At the time this book went to press, both Merrill Lynch and Credit Suisse First Boston (CSFB) had decided that their equity research analysts could no longer hold stock in companies that they covered. Unfortunately, the real source of bias—the intermingling of investment banking business and investment advice—was left untouched.

Should there be government regulation of equity research? It would not be wise, since regulation tends to be heavy-handed and creates side costs that seem quickly to exceed the benefits. A much more effective response can be delivered by portfolio managers and investors. The equity research of firms that create the potential for bias should be discounted or, in egregious cases, even ignored.

**Myth 2: A well-researched and well-done valuation is timeless.**

The value obtained from any valuation model is affected by firm-specific as well as marketwide information. As a consequence, the value will change as new information is revealed. Given the constant flow of information into financial markets, a valuation done on a firm ages quickly and has to be updated to reflect current information. This information may be specific to the firm, affect an entire sector, or alter expectations for all firms in the market.

The most common example of firm-specific information is an earnings report that not only contains news about a firm’s performance in the most recent time period but, more importantly, about the business model that the firm has adopted. The dramatic drop in value of many new economy stocks from 1999 to 2001 can be traced, at least partially, to the realization that these firms had business models that might deliver customers but not earnings, even in the long term.

In some cases, new information can affect the valuations of all firms in a sector. Thus, pharmaceutical companies that were valued highly in early 1992, on the as-

sumption that the high growth from the 1980s would continue into the future, were valued much less in early 1993, as the prospects of health reform and price controls dimmed future prospects. With the benefit of hindsight, the valuations of these companies (and the analyst recommendations) made in 1992 can be criticized, but they were reasonable given the information available at that time.

Finally, information about the state of the economy and the level of interest rates affects all valuations in an economy. A weakening in the economy can lead to a reassessment of growth rates across the board, though the effect on earnings is likely to be largest at cyclical firms. Similarly, an increase in interest rates will affect all investments, though to varying degrees.

When analysts change their valuations, they will undoubtedly be asked to justify them, and in some cases the fact that valuations change over time is viewed as a problem. The best response may be the one that John Maynard Keynes gave when he was criticized for changing his position on a major economic issue: “When the facts change, I change my mind. And what do you do, sir?”

### **Myth 3: A good valuation provides a precise estimate of value.**

Even at the end of the most careful and detailed valuation, there will be uncertainty about the final numbers, colored as they are by assumptions that we make about the future of the company and the economy. It is unrealistic to expect or demand absolute certainty in valuation, since cash flows and discount rates are estimated. This also means that analysts have to give themselves a reasonable margin for error in making recommendations on the basis of valuations.

The degree of precision in valuations is likely to vary widely across investments. The valuation of a large and mature company with a long financial history will usually be much more precise than the valuation of a young company in a sector in turmoil. If this latter company happens to operate in an emerging market, with additional disagreement about the future of the market thrown into the mix, the uncertainty is magnified. Later in this book, in Chapter 23, we will argue that the difficulties associated with valuation can be related to where a firm is in the life cycle. Mature firms tend to be easier to value than growth firms, and young start-up companies are more difficult to value than companies with established products and markets. The problems are not with the valuation models we use, though, but with the difficulties we run into in making estimates for the future. Many investors and analysts use the uncertainty about the future or the absence of information to justify not doing full-fledged valuations. In reality, though, the payoff to valuation is greatest in these firms.

### **Myth 4: The more quantitative a model, the better the valuation.**

It may seem obvious that making a model more complete and complex should yield better valuations; but it is not necessarily so. As models become more complex, the number of inputs needed to value a firm tends to increase, bringing with it the potential for input errors. These problems are compounded when models become so complex that they become “black boxes” where analysts feed in numbers at one

end and valuations emerge from the other. All too often when a valuation fails, the blame gets attached to the model rather than the analyst. The refrain becomes “It was not my fault. The model did it.”

There are three important points on all valuation. The first is the principle of parsimony, which essentially states that you do not use more inputs than you absolutely need to value an asset. The second is that there is a trade-off between the additional benefits of building in more detail and the estimation costs (and error) with providing the detail. The third is that the models don’t value companies—you do. In a world where the problem that we often face in valuations is not too little information but too much, separating the information that matters from the information that does not is almost as important as the valuation models and techniques that you use to value a firm.

### **Myth 5: To make money on valuation, you have to assume that markets are inefficient.**

Implicit in the act of valuation is the assumption that markets make mistakes and that we can find these mistakes, often using information that tens of thousands of other investors have access to. Thus, it seems reasonable to say that those who believe that markets are inefficient should spend their time and resources on valuation whereas those who believe that markets are efficient should take the market price as the best estimate of value.

This statement, though, does not reflect the internal contradictions in both positions. Those who believe that markets are efficient may still feel that valuation has something to contribute, especially when they are called on to value the effect of a change in the way a firm is run or to understand why market prices change over time. Furthermore, it is not clear how markets would become efficient in the first place if investors did not attempt to find under- and over-valued stocks and trade on these valuations. In other words, a precondition for market efficiency seems to be the existence of millions of investors who believe that markets are not efficient.

On the other hand, those who believe that markets make mistakes and buy or sell stocks on that basis must believe that ultimately markets will correct these mistakes (i.e., become efficient), because that is how they make their money. This is a fairly self-serving definition of inefficiency—markets are inefficient until you take a large position in the stock that you believe to be mispriced, but they become efficient after you take the position.

It is best to approach the issue of market efficiency as a wary skeptic. Recognize that on the one hand markets make mistakes but, on the other, finding these mistakes requires a combination of skill and luck. This view of markets leads to the following conclusions: First, if something looks too good to be true—a stock looks obviously undervalued or overvalued—it is probably *not* true. Second, when the value from an analysis is significantly different from the market price, start off with the presumption that the market is correct; then you have to convince yourself that this is not the case before you conclude that something is over- or undervalued. This higher standard may lead you to be more cautious in following through on valuations, but given the difficulty of beating the market, this is not an undesirable outcome.

**Myth 6: The product of valuation (i.e., the value) is what matters; the process of valuation is not important.**

As valuation models are introduced in this book, there is the risk of focusing exclusively on the outcome (i.e., the value of the company and whether it is under- or overvalued), and missing some valuable insights that can be obtained from the process of the valuation. The process can tell us a great deal about the determinants of value and help us answer some fundamental questions: What is the appropriate price to pay for high growth? What is a brand name worth? How important is it to improve returns on projects? What is the effect of profit margins on value? Since the process is so informative, even those who believe that markets are efficient (and that the market price is therefore the best estimate of value) should be able to find some use for valuation models.

**THE ROLE OF VALUATION**

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Valuation is useful in a wide range of tasks. The role it plays, however, is different in different arenas. The following section lays out the relevance of valuation in portfolio management, in acquisition analysis, and in corporate finance.

**Valuation in Portfolio Management**

The role that valuation plays in portfolio management is determined in large part by the investment philosophy of the investor. Valuation plays a minimal role in portfolio management for a passive investor, whereas it plays a larger role for an active investor. Even among active investors, the nature and the role of valuation are different for different types of active investment. Market timers use valuation much less than investors who pick stocks for the long term, and their focus is on market valuation rather than on firm-specific valuation. Among security selectors, valuation plays a central role in portfolio management for fundamental analysts and a peripheral role for technical analysts.

**Fundamental Analysts** The underlying theme in fundamental analysis is that the true value of the firm can be related to its financial characteristics—its growth prospects, risk profile, and cash flows. Any deviation from this true value is a sign that a stock is under- or overvalued. It is a long-term investment strategy, and the assumptions underlying it are:

- The relationship between value and the underlying financial factors can be measured.
- The relationship is stable over time.
- Deviations from the relationship are corrected in a reasonable time period.

Valuation is the central focus in fundamental analysis. Some analysts use discounted cash flow models to value firms, while others use multiples such as the price-earnings and price-book value ratios. Since investors using this approach hold a large number of undervalued stocks in their portfolios, their hope is that, on average, these portfolios will do better than the market.

**Franchise Buyer** The philosophy of a franchise buyer is best expressed by an investor who has been very successful at it—Warren Buffett. “We try to stick to businesses we believe we understand,” Mr. Buffett writes.<sup>3</sup> “That means they must be relatively simple and stable in character. If a business is complex and subject to constant change, we’re not smart enough to predict future cash flows.” Franchise buyers concentrate on a few businesses they understand well and attempt to acquire undervalued firms. Often, as in the case of Mr. Buffett, franchise buyers wield influence on the management of these firms and can change financial and investment policy. As a long-term strategy, the underlying assumptions are that:

- Investors who understand a business well are in a better position to value it correctly.
- These undervalued businesses can be acquired without driving the price above the true value.

Valuation plays a key role in this philosophy, since franchise buyers are attracted to a particular business because they believe it is undervalued. They are also interested in how much additional value they can create by restructuring the business and running it right.

**Chartists** Chartists believe that prices are driven as much by investor psychology as by any underlying financial variables. The information available from trading—price movements, trading volume, short sales and so forth—gives an indication of investor psychology and future price movements. The assumptions here are that prices move in predictable patterns, that there are not enough marginal investors taking advantage of these patterns to eliminate them, and that the average investor in the market is driven more by emotion than by rational analysis.

While valuation does not play much of a role in charting, there are ways in which an enterprising chartist can incorporate it into analysis. For instance, valuation can be used to determine support and resistance lines<sup>4</sup> on price charts.

**Information Traders** Prices move on information about the firm. Information traders attempt to trade in advance of new information or shortly after it is revealed to financial markets, buying on good news and selling on bad. The underlying assumption is that these traders can anticipate information announcements and gauge the market reaction to them better than the average investor in the market.

For an information trader, the focus is on the relationship between information

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<sup>3</sup>This is extracted from Mr. Buffett’s letter to stockholders in Berkshire Hathaway for 1993.

<sup>4</sup>On a chart, the support line usually refers to a lower bound below which prices are unlikely to move, and the resistance line refers to the upper bound above which prices are unlikely to venture. While these levels are usually estimated using past prices, the range of values obtained from a valuation model can be used to determine these levels (i.e., the maximum value will become the resistance line and the minimum value will become the support line).

and changes in value, rather than on value per se. Thus an information trader may buy stock in even an overvalued firm if he or she believes that the next information announcement is going to cause the price to go up because it contains better than expected news. If there is a relationship between how undervalued or overvalued a company is and how its stock price reacts to new information, then valuation could play a role in investing for an information trader.

**Market Timers** Market timers note, with some legitimacy, that the payoff to calling turns in markets is much greater than the returns from stock picking. They argue that it is easier to predict market movements than to select stocks and that these predictions can be based on factors that are observable.

While valuation of individual stocks may not be of any use to a market timer, market timing strategies can use valuation in at least two ways:

1. The overall market itself can be valued and compared to the current level.
2. A valuation model can be used to value all stocks, and the results from the cross section can be used to determine whether the market is over- or undervalued. For example, as the number of stocks that are overvalued, using the dividend discount model, increases relative to the number that are undervalued, there may be reason to believe that the market is overvalued.

**Efficient Marketers** Efficient marketers believe that the market price at any point in time represents the best estimate of the true value of the firm, and that any attempt to exploit perceived market efficiencies will cost more than it will make in excess profits. They assume that markets aggregate information quickly and accurately, that marginal investors promptly exploit any inefficiencies, and that any inefficiencies in the market are caused by friction, such as transactions costs, and cannot be arbitrated away.

For efficient marketers, valuation is a useful exercise to determine why a stock sells for the price that it does. Since the underlying assumption is that the market price is the best estimate of the true value of the company, the objective becomes determining what assumptions about growth and risk are implied in this market price, rather than on finding under- or overvalued firms.

### Valuation in Acquisition Analysis

Valuation should play a central part in acquisition analysis. The bidding firm or individual has to decide on a fair value for the target firm before making a bid, and the target firm has to determine a reasonable value for itself before deciding to accept or reject the offer.

There are also special factors to consider in takeover valuation. First, the effects of synergy on the combined value of the two firms (target plus bidding firm) have to be considered before a decision is made on the bid. Those who suggest that synergy is impossible to value and should not be considered in quantitative terms are wrong. Second, the effects on value of changing management and restructuring the target firm will have to be taken into account in deciding on a fair price. This is of particular concern in hostile takeovers.

Finally, there is a significant problem with bias in takeover valuations. Target



firms may be overly optimistic in estimating value, especially when the takeovers are hostile and they are trying to convince their stockholders that the offer prices are too low. Similarly, if the bidding firm has decided for strategic reasons to do an acquisition, there may be strong pressure on the analyst to come up with an estimate of value that backs up the acquisition.

### Valuation in Corporate Finance

If the objective in corporate finance is the maximization of firm value,<sup>5</sup> the relationship between financial decisions, corporate strategy, and firm value has to be delineated. In recent years, management consulting firms have started offering companies advice on how to increase value.<sup>6</sup> Their suggestions have often provided the basis for the restructuring of these firms.

The value of a firm can be directly related to decisions that it makes—on which projects it takes, on how it finances them, and on its dividend policy. Understanding this relationship is key to making value-increasing decisions and to sensible financial restructuring.

### CONCLUSION

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Valuation plays a key role in many areas of finance—in corporate finance, in mergers and acquisitions, and in portfolio management. The models presented in this book will provide a range of tools that analysts in each of these areas will find of use, but the cautionary note sounded in this chapter bears repeating. Valuation is not an objective exercise, and any preconceptions and biases that an analyst brings to the process will find their way into the value.

### QUESTIONS AND SHORT PROBLEMS

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1. The value of an investment is:
  - a. The present value of the cash flows on the investment.
  - b. Determined by investor perceptions about it.
  - c. Determined by demand and supply.
  - d. Often a subjective estimate, colored by the bias of the analyst.
  - e. All of the above.
2. There are many who claim that value is based on investor perceptions, and perceptions alone, and that cash flows and earnings do not matter. This argument is flawed because:
  - a. Value is determined by earnings and cash flows, and investor perceptions do not matter.
  - b. Perceptions do matter, but they can change. Value must be based on something more stable.

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<sup>5</sup>Most corporate financial theory is constructed on this premise.

<sup>6</sup>The motivation for this has been the fear of hostile takeovers. Companies have increasingly turned to “value consultants” to tell them how to restructure, increase value, and avoid being taken over.

- c. Investors are irrational. Therefore, their perceptions should not determine value.
  - d. Value is determined by investor perceptions, but it is also determined by the underlying earnings and cash flows. Perceptions must be based on reality.
3. You use a valuation model to arrive at a value of \$15 for a stock. The market price of the stock is \$25. The difference may be explained by:
- a. A market inefficiency; the market is overvaluing the stock.
  - b. The use of the wrong valuation model to value the stock.
  - c. Errors in the inputs to the valuation model.
  - d. All of the above.

## Approaches to Valuation

**A**nalysts use a wide range of models in practice, ranging from the simple to the sophisticated. These models often make very different assumptions, but they do share some common characteristics and can be classified in broader terms. There are several advantages to such a classification: It makes it easier to understand where individual models fit into the big picture, why they provide different results, and when they have fundamental errors in logic.

In general terms, there are three approaches to valuation. The first, discounted cash flow (DCF) valuation, relates the value of an asset to the present value (PV) of expected future cash flows on that asset. The second, relative valuation, estimates the value of an asset by looking at the pricing of comparable assets relative to a common variable such as earnings, cash flows, book value, or sales. The third, contingent claim valuation, uses option pricing models to measure the value of assets that share option characteristics. Some of these assets are traded financial assets like warrants, and some of these options are not traded and are based on real assets, (projects, patents, and oil reserves are examples). The latter are often called real options. There can be significant differences in outcomes, depending on which approach is used. One of the objectives in this book is to explain the reasons for such differences in value across different models, and to help in choosing the right model to use for a specific task.

### **DISCOUNTED CASH FLOW VALUATION**

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While discounted cash flow valuation is only one of the three ways of approaching valuation and most valuations done in the real world are relative valuations, it is the foundation on which all other valuation approaches are built. To do relative valuation correctly, we need to understand the fundamentals of discounted cash flow valuation. To apply option pricing models to value assets, we often have to begin with a discounted cash flow valuation. This is why so much of this book focuses on discounted cash flow valuation. Anyone who understands its fundamentals will be able to analyze and use the other approaches. This section will consider the basis of this approach, a philosophical rationale for discounted cash flow valuation, and an examination of the different subapproaches to discounted cash flow valuation.

#### **Basis for Discounted Cash Flow Valuation**

This approach has its foundation in the present value rule, where the value of any asset is the present value of expected future cash flows on it.

$$\text{Value} = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

where  $n$  = Life of the asset

$CF_t$  = Cash flow in period  $t$

$r$  = Discount rate reflecting the riskiness of the estimated cash flows

The cash flows will vary from asset to asset—dividends for stocks, coupons (interest) and the face value for bonds, and after-tax cash flows for a real project. The discount rate will be a function of the riskiness of the estimated cash flows, with higher rates for riskier assets and lower rates for safer projects.

You can in fact think of discounted cash flow valuation on a continuum. At one end of the spectrum you have the default-free zero coupon bond, with a guaranteed cash flow in the future. Discounting this cash flow at the riskless rate should yield the value of the bond. A little further up the risk spectrum are corporate bonds where the cash flows take the form of coupons and there is default risk. These bonds can be valued by discounting the cash flows at an interest rate that reflects the default risk. Moving up the risk ladder, we get to equities, where there are expected cash flows with substantial uncertainty around the expectation. The value here should be the present value of the expected cash flows at a discount rate that reflects the uncertainty.

### Underpinnings of Discounted Cash Flow Valuation

In discounted cash flow valuation, we try to estimate the intrinsic value of an asset based on its fundamentals. What is intrinsic value? For lack of a better definition, consider it the value that would be attached to the firm by an all-knowing analyst, who not only estimates the expected cash flows for the firm correctly but also attaches the right discount rate to these cash flows and values them with absolute precision. Hopeless though the task of estimating intrinsic value may seem to be, especially when valuing young companies with substantial uncertainty about the future, these estimates can be different from the market prices attached to these companies. In other words, markets make mistakes. Does that mean markets are inefficient? Not quite. While market prices can deviate from intrinsic value (estimated based on fundamentals), it is expected that the two will converge sooner rather than later.

### Categorizing Discounted Cash Flow Models

There are literally thousands of discounted cash flow models in existence. Investment banks or consulting firms often claim that their valuation models are better or more sophisticated than those used by their contemporaries. Ultimately, however, discounted cash flow models can vary only a couple of dimensions.

**Equity Valuation, Firm Valuation, and Adjusted Present Value (APV) Valuation** There are three paths to discounted cash flow valuation: The first is to value just the equity stake in the business; the second is to value the entire firm, which includes, besides equity, the other claimholders in the firm (bondholders, preferred stockholders, etc.); and the third is to value the firm in pieces, beginning with its

operations and adding the effects on value of debt and other nonequity claims. While all three approaches discount expected cash flows, the relevant cash flows and discount rates are different under each.

The value of equity is obtained by discounting expected cash flows to equity (i.e., the residual cash flows after meeting all expenses, reinvestment needs, tax obligations, and interest and principal payments) at the cost of equity (i.e., the rate of return required by equity investors in the firm).

$$\text{Value of equity} = \sum_{t=1}^{t=n} \frac{\text{CF to equity}_t}{(1 + k_e)^t}$$

where  $n$  = Life of the asset  
 CF to equity<sub>t</sub> = Expected cash flow to equity in period  $t$   
 $k_e$  = Cost of equity

The dividend discount model is a specialized case of equity valuation, where the value of equity is the present value of expected future dividends.

The value of the firm is obtained by discounting expected cash flows to the firm (i.e., the residual cash flows after meeting all operating expenses, reinvestment needs, and taxes, but prior to any payments to either debt or equity holders) at the weighted average cost of capital (WACC), which is the cost of the different components of financing used by the firm, weighted by their market value proportions.

$$\text{Value of firm} = \sum_{t=1}^{t=n} \frac{\text{CF to firm}_t}{(1 + \text{WACC})^t}$$

where  $n$  = Life of the asset  
 CF to firm<sub>t</sub> = Expected cash flow to firm in period  $t$   
 WACC = Weighted average cost of capital

The value of the firm can also be obtained by valuing each claim on the firm separately. In this approach, which is called adjusted present value (APV), we begin by valuing equity in the firm, assuming that it was financed only with equity. We then consider the value added (or taken away) by debt by considering the present value (PV) of the tax benefits that flow from debt and the expected bankruptcy costs.

$$\begin{aligned} \text{Value of firm} &= \text{Value of all-equity-financed firm} + \text{PV of tax benefits} \\ &\quad + \text{Expected bankruptcy costs} \end{aligned}$$

In fact, this approach can be generalized to allow different cash flows to the firm to be discounted at different rates, given their riskiness.

While the three approaches use different definitions of cash flow and discount rates, they will yield consistent estimates of value as long as you use the same set of assumptions in valuation. The key error to avoid is mismatching cash flows and discount rates, since discounting cash flows to equity at the cost of capital will lead to an upwardly biased estimate of the value of equity, while discounting cash flows

to the firm at the cost of equity will yield a downwardly biased estimate of the value of the firm. Illustration 2.1 shows the equivalence of equity and firm valuation. In Chapter 15, we will show that adjusted present value models and firm valuation models also yield the same values.

### ILLUSTRATION 2.1: Effects of Mismatching Cash Flows and Discount Rates

Assume that you are analyzing a company with the following cash flows for the next five years. Assume also that the cost of equity is 13.625% and the firm can borrow long term at 10%. (The tax rate for the firm is 50%.) The current market value of equity is \$1,073, and the value of debt outstanding is \$800.

<i>Year</i>	<i>Cash Flow to Equity</i>	<i>Interest (Long-Term)</i>	<i>Cash Flow to Firm</i>
1	\$50	\$40	\$90
2	\$60	\$40	\$100
3	\$68	\$40	\$108
4	\$76.2	\$40	\$116.2
5	\$83.49	\$40	\$123.49
Terminal value	\$1603.008		\$2363.008

The cost of equity is given as an input and is 13.625%, and the after-tax cost of debt is 5%.

$$\text{Cost of debt} = \text{Pretax rate}(1 - \text{Tax rate}) = 10\%(1 - .5) = 5\%$$

Given the market values of equity and debt, we can estimate the cost of capital.

$$\begin{aligned} \text{WACC} &= \text{Cost of equity}[\text{Equity}/(\text{Debt} + \text{Equity})] + \text{Cost of debt}[\text{Debt}/(\text{Debt} + \text{Equity})] \\ &= 13.625\%(1,073/1,873) + 5\%(800/1,873) = 9.94\% \end{aligned}$$

#### METHOD 1: DISCOUNT CASH FLOWS TO EQUITY AT COST OF EQUITY TO GET VALUE OF EQUITY

We discount cash flows to equity at the cost of equity:

$$\begin{aligned} \text{PV of equity} &= 50/1.13625 + 60/1.13625^2 + 68/1.13625^3 + 76.2/1.13625^4 \\ &\quad + (83.49 + \$1,603)/1.13625^5 = \$1,073 \end{aligned}$$

#### METHOD 2: DISCOUNT CASH FLOWS TO FIRM AT COST OF CAPITAL TO GET VALUE OF FIRM

$$\begin{aligned} \text{PV of firm} &= 90/1.0994 + 100/1.0994^2 + 108/1.0994^3 + 116.2/1.0994^4 \\ &\quad + (123.49 + \$2,363)/1.0994^5 = \$1,873 \end{aligned}$$

$$\begin{aligned} \text{PV of equity} &= \text{PV of firm} - \text{Market value of debt} \\ &= \$1,873 - \$800 = \$1,073 \end{aligned}$$

Note that the value of equity is \$1,073 under both approaches. It is easy to make the mistake of discounting cash flows to equity at the cost of capital or the cash flows to the firm at the cost of equity.

#### ERROR 1: DISCOUNT CASH FLOWS TO EQUITY AT COST OF CAPITAL TO GET TOO HIGH A VALUE FOR EQUITY

$$\begin{aligned} \text{PV of equity} &= 50/1.0994 + 60/1.0994^2 + 68/1.0994^3 + 76.2/1.0994^4 \\ &\quad + (83.49 + \$1,603)/1.0994^5 = \$1,248 \end{aligned}$$

**ERROR 2: DISCOUNT CASH FLOWS TO FIRM AT COST OF EQUITY TO GET TOO LOW A VALUE FOR THE FIRM**

$$\begin{aligned} \text{PV of firm} &= 90/1.13625 + 100/1.13625^2 + 108/1.13625^3 + 116.2/1.13625^4 \\ &\quad + (123.49 + \$2,363)/1.13625^5 = \$1,613 \end{aligned}$$

$$\begin{aligned} \text{PV of equity} &= \text{PV of firm} - \text{Market value of debt} \\ &= \$1,612.86 - \$800 = \$813 \end{aligned}$$

The effects of using the wrong discount rate are clearly visible in the last two calculations (Error 1 and Error 2). When the cost of capital is mistakenly used to discount the cash flows to equity, the value of equity increases by \$175 over its true value (\$1,073). When the cash flows to the firm are erroneously discounted at the cost of equity, the value of the firm is understated by \$260. It must be pointed out, though, that getting the values of equity to agree with the firm and equity valuation approaches can be much more difficult in practice than in this example. We will return to this subject in Chapters 14 and 15 and consider the assumptions that we need to make to arrive at this result.

**Total Cash Flow versus Excess Cash Flow Models** The conventional discounted cash flow model values an asset by estimating the present value of all cash flows generated by that asset at the appropriate discount rate. In excess return (and excess cash flow) models, only cash flows earned in excess of the required return are viewed as value creating, and the present value of these excess cash flows can be added to the amount invested in the asset to estimate its value. To illustrate, assume that you have an asset in which you invested \$100 million and that you expect to generate \$12 million in after-tax cash flows in perpetuity. Assume further that the cost of capital on this investment is 10 percent. With a total cash flow model, the value of this asset can be estimated as follows:

$$\text{Value of asset} = \$12 \text{ million} / .1 = \$120 \text{ million}$$

With an excess return model, we would first compute the excess return made on this asset:

$$\begin{aligned} \text{Excess return} &= \text{Cash flow earned} - \text{Cost of capital} \times \text{Capital invested in asset} \\ &= \$12 \text{ million} - .10 \times \$100 \text{ million} = \$2 \text{ million} \end{aligned}$$

**A SIMPLE TEST OF CASH FLOWS**

There is a simple test that can be employed to determine whether the cash flows being used in a valuation are cash flows to equity or cash flows to the firm. If the cash flows that are being discounted are after interest expenses (and principal payments), they are cash flows to equity and the discount rate used should be the cost of equity. If the cash flows that are discounted are before interest expenses and principal payments, they are usually cash flows to the firm. Needless to say, there are other items that need to be considered when estimating these cash flows, and they will be considered in extensive detail in the coming chapters.

We then add the present value of these excess returns to the investment in the asset:

$$\begin{aligned}\text{Value of asset} &= \text{Present value of excess return} + \text{Investment in the asset} \\ &= \$2 \text{ million} / .1 + \$100 \text{ million} = \$120 \text{ million}\end{aligned}$$

Note that the answers in the two approaches are equivalent. Why, then, would we want to use an excess return model? By focusing on excess returns, this model brings home the point that it is not earnings per se that create value, but earnings in excess of a required return. Chapter 32 will consider special versions of these excess return models such as Economic Value Added (EVA). As in this simple example, with consistent assumptions, total cash flow and excess return models are equivalent.

### **Applicability and Limitations of Discounted Cash Flow Valuation**

Discounted cash flow valuation is based on expected future cash flows and discount rates. Given these informational requirements, this approach is easiest to use for assets (firms) whose cash flows are currently positive and can be estimated with some reliability for future periods, and where a proxy for risk that can be used to obtain discount rates is available. The further we get from this idealized setting, the more difficult discounted cash flow valuation becomes. Here are some scenarios where discounted cash flow valuation might run into trouble and need to be adapted.

**Firms in Trouble** A distressed firm generally has negative earnings and cash flows and expects to lose money for some time in the future. For these firms, estimating future cash flows is difficult to do, since there is a strong probability of bankruptcy. For firms that are expected to fail, discounted cash flow valuation does not work very well, since the method values the firm as a going concern providing positive cash flows to its investors. Even for firms that are expected to survive, cash flows will have to be estimated until they turn positive, since obtaining a present value of negative cash flows will yield a negative value for equity<sup>1</sup> or for the firm.

**Cyclical Firms** The earnings and cash flows of cyclical firms tend to follow the economy—rising during economic booms and falling during recessions. If discounted cash flow valuation is used on these firms, expected future cash flows are usually smoothed out, unless the analyst wants to undertake the onerous task of predicting the timing and duration of economic recessions and recoveries. In the depths of a recession many cyclical firms look like troubled firms, with negative earnings and cash flows. Estimating future cash flows then becomes entangled with analyst predictions about when the economy will turn and how strong the upturn will be, with more optimistic analysts arriving at higher estimates of value. This is

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<sup>1</sup>The protection of limited liability should ensure that no stock will sell for less than zero. The price of such a stock can never be negative.



unavoidable, but the economic biases of the analysts have to be taken into account before using these valuations.

**Firms with Unutilized Assets** Discounted cash flow valuation reflects the value of all assets that produce cash flows. If a firm has assets that are unutilized (and hence do not produce any cash flows), the value of these assets will not be reflected in the value obtained from discounting expected future cash flows. The same caveat applies, in lesser degree, to underutilized assets, since their value will be understated in discounted cash flow valuation. While this is a problem, it is not insurmountable. The value of these assets can always be obtained externally<sup>2</sup> and added to the value obtained from discounted cash flow valuation. Alternatively, the assets can be valued as though they are used optimally.

**Firms with Patents or Product Options** Firms often have unutilized patents or licenses that do not produce any current cash flows and are not expected to produce cash flows in the near future, but nevertheless are valuable. If this is the case, the value obtained from discounting expected cash flows to the firm will understate the true value of the firm. Again, the problem can be overcome, in this case by valuing these assets in the open market or by using option pricing models, and then adding the value obtained from discounted cash flow valuation.

**Firms in the Process of Restructuring** Firms in the process of restructuring often sell some of their assets, acquire other assets, and change their capital structure and dividend policy. Some of them also change their ownership structure (going from publicly traded to private status and vice versa) and management compensation schemes. Each of these changes makes estimating future cash flows more difficult and affects the riskiness of the firm. Using historical data for such firms can give a misleading picture of the firm's value. However, these firms can be valued, even in the light of the major changes in investment and financing policy, if future cash flows reflect the expected effects of these changes and the discount rate is adjusted to reflect the new business and financial risk in the firm.

**Firms Involved in Acquisitions** There are at least two specific issues relating to acquisitions that need to be taken into account when using discounted cash flow valuation models to value target firms. The first is the thorny one of whether there is synergy in the merger and if its value can be estimated. It can be done, though it does require assumptions about the form the synergy will take and its effect on cash flows. The second, especially in hostile takeovers, is the effect of changing management on cash flows and risk. Again, the effect of the change can and should be incorporated into the estimates of future cash flows and discount rates and hence into value.

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<sup>2</sup>If these assets are traded on external markets, the market prices of these assets can be used in the valuation. If not, the cash flows can be projected, assuming full utilization of assets, and the value can be estimated.

**Private Firms** The biggest problem in using discounted cash flow valuation models to value private firms is the measurement of risk (to use in estimating discount rates), since most risk/return models require that risk parameters be estimated from historical prices on the asset being analyzed. Since securities in private firms are not traded, this is not possible. One solution is to look at the riskiness of comparable firms that are publicly traded. The other is to relate the measure of risk to accounting variables, which are available for the private firm.

The point is not that discounted cash flow valuation cannot be done in these cases, but that we have to be flexible enough to deal with them. The fact is that valuation is simple for firms with well-defined assets that generate cash flows that can be easily forecasted. The real challenge in valuation is to extend the valuation framework to cover firms that vary to some extent or the other from this idealized framework. Much of this book is spent considering how to value such firms.

## RELATIVE VALUATION

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While we tend to focus most on discounted cash flow valuation when discussing valuation, the reality is that most valuations are relative valuations. The value of most assets, from the house you buy to the stocks you invest in, are based on how similar assets are priced in the marketplace. This section begins with a basis for relative valuation, moves on to consider the underpinnings of the model, and then considers common variants within relative valuation.

### Basis for Relative Valuation

In relative valuation, the value of an asset is derived from the pricing of comparable assets, standardized using a common variable such as earnings, cash flows, book value, or revenues. One illustration of this approach is the use of an industry-average price-earnings ratio to value a firm, the assumption being that the other firms in the industry are comparable to the firm being valued and that the market, on average, prices these firms correctly. Another multiple in wide use is the price-book value ratio, with firms selling at a discount on book value relative to comparable firms being considered undervalued. The multiple of price to sales is also used to value firms, with the average price-sales ratios of firms with similar characteristics being used for comparison. While these three multiples are among the most widely used, there are others that also play a role in analysis—price to cash flows, price to dividends, and market value to replacement value (Tobin's Q), to name a few.

### Underpinnings of Relative Valuation

Unlike discounted cash flow valuation, which is a search for intrinsic value, relative valuation relies much more on the market. In other words, we assume that the market is correct in the way it prices stocks on average, but that it makes errors on the pricing of individual stocks. We also assume that a comparison of multiples will allow us to identify these errors, and that these errors will be corrected over time.

The assumption that markets correct their mistakes over time is common to

both discounted cash flow and relative valuation, but those who use multiples and comparables to pick stocks argue, with some basis, that errors made in pricing individual stocks in a sector are more noticeable and more likely to be corrected quickly. For instance, they would argue that a software firm that trades at a price-earnings ratio of 10 when the rest of the sector trades at 25 times earnings is clearly undervalued and that the correction toward the sector average should occur sooner rather than later. Proponents of discounted cash flow valuation would counter that this is small consolation if the entire sector is overpriced by 50 percent.

### **Categorizing Relative Valuation Models**

Analysts and investors are endlessly inventive when it comes to using relative valuation. Some compare multiples across companies, while other compare the multiple of a company to the multiples it used to trade at in the past. While most relative valuations are based on comparables, there are some relative valuations that are based on fundamentals.

**Fundamentals versus Comparables** In discounted cash flow valuation, the value of a firm is determined by its expected cash flows. Other things remaining equal, higher cash flows, lower risk, and higher growth should yield higher value. Some analysts who use multiples go back to these discounted cash flow models to extract multiples. Other analysts compare multiples across firms or time and make explicit or implicit assumptions about how firms are similar or vary on fundamentals.

**Using Fundamentals** The first approach relates multiples to fundamentals about the firm being valued—growth rates in earnings and cash flows, payout ratios and risk. This approach to estimating multiples is equivalent to using discounted cash flow models, requiring the same information and yielding the same results. Its primary advantage is that it shows the relationship between multiples and firm characteristics, and allows us to explore how multiples change as these characteristics change. For instance, what will be the effect of changing profit margins on the price-sales ratio? What will happen to price-earnings ratios as growth rates decrease? What is the relationship between price-book value ratios and return on equity?

**Using Comparables** The more common approach to using multiples is to compare how a firm is valued with how similar firms are priced by the market or, in some cases, with how the firm was valued in prior periods. As we will see in the later chapters, finding similar and comparable firms is often a challenge, and frequently we have to accept firms that are different from the firm being valued on one dimension or the other. When this is the case, we have to either explicitly or implicitly control for differences across firms on growth, risk, and cash flow measures. In practice, controlling for these variables can range from the naive (using industry averages) to the sophisticated (multivariate regression models where the relevant variables are identified and controlled for).

**Cross-Sectional versus Time Series Comparisons** In most cases, analysts price stocks on a relative basis by comparing the multiples they are trading at to the multiples at which other firms in the same business are trading at. In some cases, however, especially for mature firms with long histories, the comparison is done across time.

**Cross-Sectional Comparisons** When we compare the price-earnings ratio of a software firm to the average price-earnings ratio of other software firms, we are doing relative valuation and we are making cross-sectional comparisons. The conclusions can vary depending on our assumptions about the firm being valued and the comparable firms. For instance, if we assume that the firm we are valuing is similar to the average firm in the industry, we would conclude that it is cheap if it trades at a multiple that is lower than the average multiple. If, however, we assume that the firm being valued is riskier than the average firm in the industry, we might conclude that the firm should trade at a lower multiple than other firms in the business. In short, you cannot compare firms without making assumptions about their fundamentals.

**Comparisons across Time** If you have a mature firm with a long history, you can compare the multiple it trades at today to the multiple it used to trade at in the past. Thus, Ford Motor Company may be viewed as cheap because it trades at six times earnings, if it has historically traded at 10 times earnings. To make this comparison, however, you have to assume that your firm's fundamentals have not changed over time. For instance, you would expect a high-growth firm's price-earnings ratio to drop over time and its expected growth rate to decrease as it becomes larger. Comparing multiples across time can also be complicated by changes in interest rates and the behavior of the overall market. For instance, as interest rates fall below historical norms and the overall market increases in value, you would expect most companies to trade at much higher multiples of earnings and book value than they have historically.

### **Applicability and Limitations of Multiples**

The allure of multiples is that they are simple and easy to relate to. They can be used to obtain estimates of value quickly for firms and assets, and are particularly useful when a large number of comparable firms are being traded on financial markets, and the market is, on average, pricing these firms correctly. They tend to be more difficult to use to value unique firms with no obvious comparables, with little or no revenues, and with negative earnings.

By the same token, multiples are also easy to misuse and manipulate, especially when comparable firms are used. Given that no two firms are exactly alike in terms of risk and growth, the definition of comparable firms is a subjective one. Consequently, a biased analyst can choose a group of comparable firms to confirm his or her biases about a firm's value. Illustration 2.2 shows an example. While this potential for bias exists with discounted cash flow valuation as well, the analyst in DCF valuation is forced to be much more explicit about the assumptions that determine the final value. With multiples, these assumptions are often left unstated.

### ASSET-BASED VALUATION MODELS

There are some analysts who add a fourth approach to valuation to the three described in this chapter. They argue that you can value the individual assets owned by a firm and aggregate them to arrive at a firm value—asset-based valuation models. In fact, there are several variants on asset-based valuation models. The first is liquidation value, which is obtained by aggregating the estimated sale proceeds of the assets owned by a firm. The second is replacement cost, where you estimate what it would cost you to replace all of the assets that a firm has today.

While analysts may use asset-based valuation approaches to estimate value, they are not alternatives to discounted cash flow, relative, or option pricing models since both replacement and liquidation values have to be obtained using one or another of these approaches. Ultimately, all valuation models attempt to value assets; the differences arise in how we identify the assets and how we attach value to each asset. In liquidation valuation, we look only at assets in place and estimate their value based on what similar assets are priced at in the market. In traditional discounted cash flow valuation, we consider all assets and include expected growth potential to arrive at value. The two approaches may, in fact, yield the same values if you have a firm that has no growth assets and the market assessments of value reflect expected cash flows.

### ILLUSTRATION 2.2: The Potential for Misuse with Comparable Firms

Assume that an analyst is valuing an initial public offering (IPO) of a firm that manufactures computer software. At the same time,<sup>3</sup> the price-earnings multiples of other publicly traded firms manufacturing software are:

<i>Firm</i>	<i>Multiple</i>
Adobe Systems	23.2
Autodesk	20.4
Broderbund	32.8
Computer Associates	18.0
Lotus Development	24.1
Microsoft	27.4
Novell	30.0
Oracle	37.8
Software Publishing	10.6
System Software	15.7
<i>Average PE ratio</i>	<i>24.0</i>

While the average PE ratio using the entire sample is 24, it can be changed markedly by removing a couple of firms in the group. For instance, if the two firms with the lowest PE ratios in the group (Software Publishing and System Software) are eliminated from the sample, the average PE ratio increases to 27. If the two firms with the highest PE ratios in the group (Broderbund and Oracle) are removed from the group, the average PE ratio drops to 21.

<sup>3</sup>These were the PE ratios for these firms at the end of 1992.

The other problem with using multiples based on comparable firms is that it builds in errors (overvaluation or undervaluation) that the market might be making in valuing these firms. In Illustration 2.2, for instance, if the market has overvalued all computer software firms, using the average PE ratio of these firms to value an initial public offering will lead to an overvaluation of the IPO stock. In contrast, discounted cash flow valuation is based on firm-specific growth rates and cash flows, so it is less likely to be influenced by market errors in valuation.

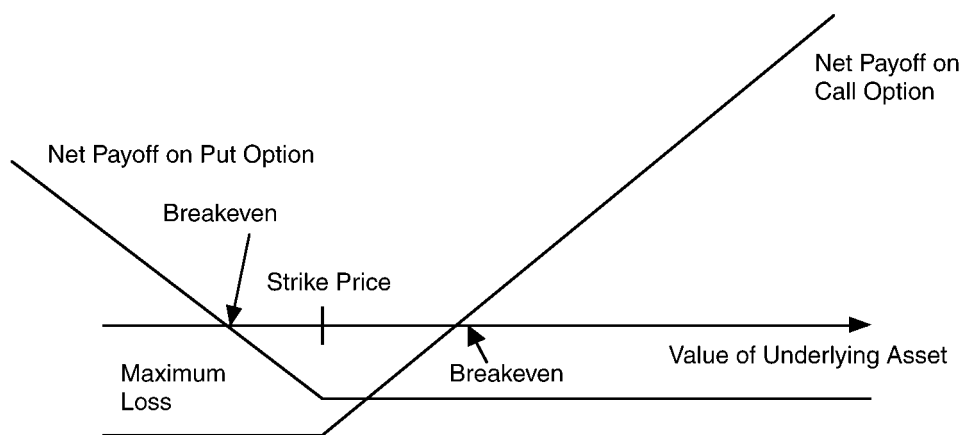
## CONTINGENT CLAIM VALUATION

Perhaps the most significant and revolutionary development in valuation is the acceptance, at least in some cases, that the value of an asset may be greater than the present value of expected cash flows if the cash flows are contingent on the occurrence or nonoccurrence of an event. This acceptance has largely come about because of the development of option pricing models. While these models were initially used to value traded options, there has been an attempt in recent years to extend the reach of these models into more traditional valuation. There are many who argue that assets such as patents or undeveloped reserves are really options and should be valued as such, rather than with traditional discounted cash flow models.

### Basis for Approach

A contingent claim or option is a claim that pays off only under certain contingencies—if the value of the underlying asset exceeds a prespecified value for a call option or is less than a prespecified value for a put option. Much work has been done in the past 20 years in developing models that value options, and these option pricing models can be used to value any assets that have optionlike features.

Figure 2.1 illustrates the payoffs on call and put options as a function of the value of the underlying asset. An option can be valued as a function of the following variables: the current value and the variance in value of the underlying asset, the strike price and the time to expiration of the option, and the riskless interest



**FIGURE 2.1** Payoff Diagram on Call and Put Options

rate. This was first established by Fischer Black and Myron Scholes in 1972 and has been extended and refined subsequently in numerous variants. While the Black-Scholes option pricing model ignored dividends and assumed that options would not be exercised early, it can be modified to allow for both. A discrete-time variant, the binomial option pricing model, has also been developed to price options.

An asset can be valued as an option if the payoffs are a function of the value of an underlying asset. It can be valued as a call option if when that value exceeds a prespecified level the asset is worth the difference. It can be valued as a put option if it gains value as the value of the underlying asset drops below a prespecified level, and if it is worth nothing when the underlying asset's value exceeds that specified level.

### **Underpinnings of Contingent Claim Valuation**

The fundamental premise behind the use of option pricing models is that discounted cash flow models tend to understate the value of assets that provide payoffs that are contingent on the occurrence of an event. As a simple example, consider an undeveloped oil reserve belonging to Exxon. You could value this reserve based on expectations of oil prices in the future, but this estimate would miss the fact that the oil company will develop this reserve only if oil prices go up and will not if oil prices decline. An option pricing model would yield a value that incorporates this right.

When we use option pricing models to value assets such as patents and undeveloped natural resource reserves, we are assuming that markets are sophisticated enough to recognize such options and incorporate them into the market price. If the markets do not do so, we assume that they will eventually; the payoff to using such models comes about when this correction occurs.

### **Categorizing Option Pricing Models**

The first categorization of options is based on whether the underlying asset is a financial asset or a real asset. Most listed options, whether they be options listed on the Chicago Board Options Exchange or callable fixed income securities, are on financial assets such as stocks and bonds. In contrast, options can be on real assets such as commodities, real estate, or even investment projects; such options are often called real options.

A second and overlapping categorization is based on whether the underlying asset is traded. The overlap occurs because most financial assets are traded, whereas relatively few real assets are traded. Options on traded assets are generally easier to value, and the inputs to the option pricing models can be obtained from financial markets. Options on nontraded assets are much more difficult to value since there are no market inputs available on the underlying assets.

### **Applicability and Limitations of Option Pricing Models**

There are several direct examples of securities that are options—LEAPS, which are long-term equity options on trades stocks; contingent value rights, which provide protection to stockholders in companies against stock price declines; and warrants, which are long-term call options issued by firms.

There are other assets that generally are not viewed as options but still share several option characteristics. Equity, for instance, can be viewed as a call option on the value of the underlying firm, with the face value of debt representing the strike price and the term of the debt measuring the life of the option. A patent can be analyzed as a call option on a product, with the investment outlay needed to get the project going considered the strike price and the patent life becoming the time to expiration of the option.

There are limitations in using option pricing models to value long-term options on nontraded assets. The assumptions made about constant variance and dividend yields, which are not seriously contested for short-term options, are much more difficult to defend when options have long lifetimes. When the underlying asset is not traded, the inputs for the value of the underlying asset and the variance in that value cannot be extracted from financial markets and have to be estimated. Thus the final values obtained from these applications of option pricing models have much more estimation error associated with them than the values obtained in their more standard applications (to value short-term traded options).

## CONCLUSION

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There are three basic, though not mutually exclusive, approaches to valuation. The first is discounted cash flow valuation, where cash flows are discounted at a risk-adjusted discount rate to arrive at an estimate of value. The analysis can be done purely from the perspective of equity investors by discounting expected cash flows to equity at the cost of equity, or it can be done from the viewpoint of all claimholders in the firm, by discounting expected cash flows to the firm at the weighted average cost of capital. The second is relative valuation, where the value of the equity in a firm is based on the pricing of comparable firms relative to earnings, cash flows, book value, or sales. The third is contingent claim valuation, where an asset with the characteristics of an option is valued using an option pricing model. There should be a place for each among the tools available to any analyst interested in valuation.

## QUESTIONS AND SHORT PROBLEMS

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1. Discounted cash flow valuation is based on the notion that the value of an asset is the present value of the expected cash flows on that asset, discounted at a rate that reflects the riskiness of those cash flows. Specify whether the following statements about discounted cash flow valuation are true or false, assuming that all variables are constant except for the one mentioned:
  - a. As the discount rate increases, the value of an asset increases.  
True \_\_\_\_ False \_\_\_\_
  - b. As the expected growth rate in cash flows increases, the value of an asset increases.  
True \_\_\_\_ False \_\_\_\_
  - c. As the life of an asset is lengthened, the value of that asset increases.  
True \_\_\_\_ False \_\_\_\_
  - d. As the uncertainty about the expected cash flow increases, the value of an asset increases.  
True \_\_\_\_ False \_\_\_\_



- e. An asset with an infinite life (i.e., it is expected to last forever) will have an infinite value.  
True \_\_\_\_ False \_\_\_\_
2. Why might discounted cash flow valuation be difficult to do for the following types of firms?
- A private firm, where the owner is planning to sell the firm.
  - A biotechnology firm with no current products or sales, but with several promising product patents in the pipeline.
  - A cyclical firm during a recession.
  - A troubled firm that has made significant losses and is not expected to get out of trouble for a few years.
  - A firm that is in the process of restructuring, where it is selling some of its assets and changing its financial mix.
  - A firm that owns a lot of valuable land that is currently unutilized.
3. The following are the projected cash flows to equity and to the firm over the next five years:

<i>Year</i>	<i>CF to Equity</i>	<i>Int (1 - t)</i>	<i>CF to Firm</i>
1	\$250.00	\$90.00	\$340.00
2	\$262.50	\$94.50	\$357.00
3	\$275.63	\$99.23	\$374.85
4	\$289.41	\$104.19	\$393.59
5	\$303.88	\$109.40	\$413.27
Terminal value	\$3,946.50		\$6,000.00

(The terminal value is the value of the equity or firm at the end of year 5.)

The firm has a cost of equity of 12% and a cost of capital of 9.94%. Answer the following questions:

- What is the value of the equity in this firm?
  - What is the value of the firm?
4. You are estimating the price-earnings multiple to use to value Paramount Corporation by looking at the average price-earnings multiple of comparable firms. The following are the price-earnings ratios of firms in the entertainment business.

<i>Firm</i>	<i>PE Ratio</i>
Disney (Walt)	22.09
Time Warner	36.00
King World Productions	14.10
New Line Cinema	26.70

- What is the average PE ratio?
- Would you use all the comparable firms in calculating the average? Why or why not?
- What assumptions are you making when you use the industry-average PE ratio to value Paramount Corporation?

# Understanding Financial Statements

**F**inancial statements provide the fundamental information that we use to analyze and answer valuation questions. It is important, therefore, that we understand the principles governing these statements by looking at four questions:

1. How valuable are the assets of a firm? The assets of a firm can come in several forms—assets with long lives such as land and buildings, assets with shorter lives such as inventory, and intangible assets that nevertheless produce revenues for the firm such as patents and trademarks.
2. How did the firm raise the funds to finance these assets? In acquiring assets, firms can use the funds of the owners (equity) or borrowed money (debt), and the mix is likely to change as the assets age.
3. How profitable are these assets? A good investment is one that makes a return greater than the cost of funding it. To evaluate whether the investments that a firm has already made are good investments, we need to estimate what returns these investments are producing.
4. How much uncertainty (or risk) is embedded in these assets? While we have not yet directly confronted the issue of risk, estimating how much uncertainty there is in existing investments, and the implications for a firm, is clearly a first step.

This chapter will look at the way accountants would answer these questions, and why the answers might be different when doing valuation. Some of these differences can be traced to the differences in objectives: Accountants try to measure the current standing and immediate past performance of a firm, whereas valuation is much more forward-looking.

## THE BASIC ACCOUNTING STATEMENTS

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There are three basic accounting statements that summarize information about a firm. The first is the balance sheet, shown in Figure 3.1, which summarizes the assets owned by a firm, the value of these assets, and the mix of financing (debt and equity) used to finance these assets at a point in time.

The next is the income statement, shown in Figure 3.2, which provides information on the revenues and expenses of the firm, and the resulting income made by the firm, during a period. The period can be a quarter (if it is a quarterly income statement) or a year (if it is an annual report).

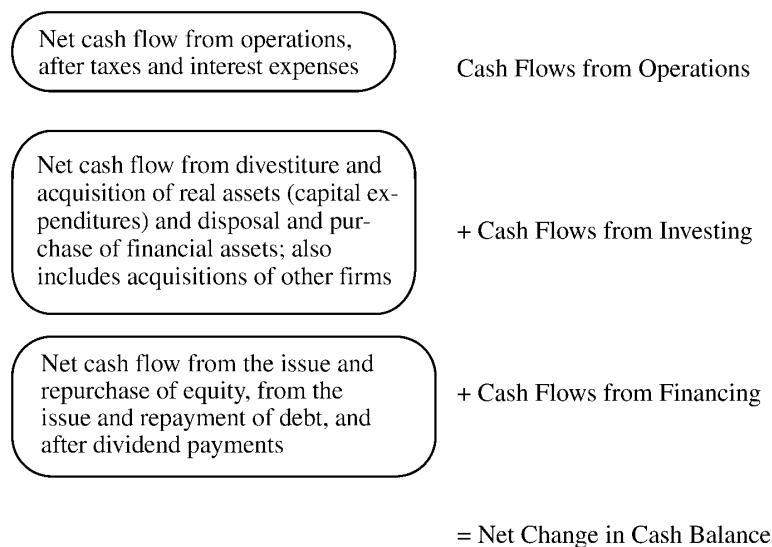
Finally, there is the statement of cash flows, shown in Figure 3.3, which speci-

Assets		Liabilities	
Long-lived real assets	Fixed Assets	Current Liabilities	Short-term liabilities of firm
Short-lived assets	Current Assets	Debt	Debt obligations of firm
Investments in securities and assets of other firms	Financial Investments	Other Liabilities	Other long-term obligations
Assets that are not physical, like patents and trademarks	Intangible Assets	Equity	Equity investment in firm

**FIGURE 3.1** The Balance Sheet

Gross revenues from sale of products or services	Revenues
Expenses associated with generating revenues	– Operating Expenses
Operating income for the period	= Operating Income
Expenses associated with borrowing and other financing	– Financial Expenses
Taxes due on taxable income	– Taxes
Earnings to common and preferred equity for current period	= Net Income before Extraordinary Items
Profits or losses not associated with operations	– (+) Extraordinary Losses (Profits)
Profits or losses associated with changes in accounting rules	– Income Changes Associated with Accounting Changes
Dividends paid to preferred stockholders	– Preferred Dividends
	= Net Income to Common Stockholders

**FIGURE 3.2** Income Statement



**FIGURE 3.3** Statement of Cash Flows

fies the sources and uses of cash to the firm from operating, investing, and financing activities during a period. The statement of cash flows can be viewed as an attempt to explain what the cash flows during a period were, and why the cash balance changed during the period.

## ASSET MEASUREMENT AND VALUATION

When analyzing any firm, we would like to know the types of assets that it owns, the value of these assets, and the degree of uncertainty about this value. Accounting statements do a reasonably good job of categorizing the assets owned by a firm, a partial job of assessing the value of these assets, and a poor job of reporting uncertainty about asset value. This section will begin by looking at the accounting principles underlying asset categorization and measurement, and the limitations of financial statements in providing relevant information about assets.

### Accounting Principles Underlying Asset Measurement

An asset is any resource that has the potential either to generate future cash inflows or to reduce future cash outflows. While that is a general definition broad enough to cover almost any kind of asset, accountants add a caveat that for a resource to be an asset a firm has to have acquired it in a prior transaction and be able to quantify future benefits with reasonable precision. The accounting view of asset value is to a great extent grounded in the notion of historical cost, which is the original cost of the asset, adjusted upward for improvements made to the asset since purchase and downward for the loss in value associated with the aging of the asset. This historical cost is called the book value. While the generally accepted accounting principles (GAAP) for valuing an asset vary across different kinds of assets, three principles underlie the way assets are valued in accounting statements:

1. *An abiding belief in book value as the best estimate of value.* Accounting estimates of asset value begin with the book value, and unless a substantial reason is given to do otherwise, accountants view the historical cost as the best estimate of the value of an asset.
2. *A distrust of market or estimated value.* When a current market value exists for an asset that is different from the book value, accounting convention seems to view this market value with suspicion. The market price of an asset is often viewed as both much too volatile and too easily manipulated to be used as an estimate of value for an asset. This suspicion runs even deeper when a value is estimated for an asset based on expected future cash flows.
3. *A preference for underestimating value rather than overestimating it.* When there is more than one approach to valuing an asset, accounting convention takes the view that the more conservative (lower) estimate of value should be used rather than the less conservative (higher) estimate of value. Thus, when both market and book value are available for an asset, accounting rules often require that you use the lesser of the two numbers.

## Measuring Asset Value

The financial statement in which accountants summarize and report asset value is the balance sheet. To examine how asset value is measured, let us begin with the way assets are categorized in the balance sheet. First there are the fixed assets, which include the long-term assets of the firm, such as plant, equipment, land, and buildings. Next, we have the short-term assets of the firm, including inventory (raw materials, work in progress, and finished goods, receivables (summarizing moneys owed to the firm), and cash; these are categorized as current assets. We then have investments in the assets and securities of other firms, which are generally categorized as **financial investments**. Finally, we have what is loosely categorized as intangible assets. These include not only assets such as patents and trademarks that presumably will create future earnings and cash flows, but also uniquely accounting assets such as goodwill that arise because of acquisitions made by the firm.

**Fixed Assets** Generally accepted accounting principles (GAAP) in the United States require the valuation of fixed assets at historical cost, adjusted for any estimated loss in value from the aging of these assets. While in theory the adjustments for aging should reflect the loss of earning power of the asset as it ages, in practice they are much more a product of accounting rules and convention, and these adjustments are called depreciation. Depreciation methods can very broadly be categorized into straight line (where the loss in asset value is assumed to be the same every year over its lifetime) and accelerated (where the asset loses more value in the earlier years and less in the later years). While tax rules, at least in the United States, have restricted the freedom that firms have on their choices of asset life and depreciation methods, firms continue to have a significant amount of flexibility on these decisions for reporting purposes. Thus, the depreciation that is reported in the annual reports may not be, and generally is not, the same depreciation that is used in the tax statements.

Since fixed assets are valued at book value and are adjusted for depreciation provisions, the value of a fixed asset is strongly influenced by both its depreciable life and the depreciation method used. Many firms in the United States use straight-

line depreciation for financial reporting while using accelerated depreciation for tax purposes, since firms can report better earnings with the former, at least in the years right after the asset is acquired.<sup>1</sup> In contrast, Japanese and German firms often use accelerated depreciation for both tax and financial reporting purposes, leading to reported income that is understated relative to that of their U.S. counterparts.

**Current Assets** Current assets include inventory, cash, and accounts receivable. It is in this category that accountants are most amenable to the use of market value, especially in valuing marketable securities.

**Accounts Receivable** Accounts receivable represent money owed by entities to the firm on the sale of products on credit. When the Home Depot sells products to building contractors and gives them a few weeks to make their payments, it is creating accounts receivable. The accounting convention is for accounts receivable to be recorded as the amount owed to the firm based on the billing at the time of the credit sale. The only major valuation and accounting issue is when the firm has to recognize accounts receivable that are not collectible. Firms can set aside a portion of their income to cover expected bad debts from credit sales, and accounts receivable will be reduced by this reserve. Alternatively, the bad debts can be recognized as they occur, and the firm can reduce the accounts receivable accordingly. There is the danger, however, that absent a decisive declaration of a bad debt, firms may continue to show as accounts receivable amounts that they know are unlikely ever to be collected.

**Cash** Cash is one of the few assets for which accountants and financial analysts should agree on value. The value of a cash balance should not be open to estimation error. Having said this, we should note that fewer and fewer companies actually hold cash in the conventional sense (as currency or as demand deposits in banks). Firms often invest the cash in interest-bearing accounts or in Treasuries so as to earn a return on their investments. In either case, market value can deviate from book value, especially if the investments are long-term. While there is no real default risk in either of these investments, interest rate movements can affect their value. The valuation of marketable securities will be examined later in this section.

**Inventory** Three basis approaches to valuing inventory are allowed by GAAP: first in, first out (FIFO), last in, first out (LIFO), and weighted average.

1. *First in, first out (FIFO)*. Under FIFO, the cost of goods sold is based on the cost of material bought earliest in the period, while the cost of inventory is based on the cost of material bought later in the year. This results in inventory being valued close to current replacement cost. During periods of inflation, the use of FIFO will result in the lowest estimate of cost of goods sold among the three valuation approaches, and the highest net income.

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<sup>1</sup>Depreciation is treated as an accounting expense. Hence, the use of straight-line depreciation (which is lower than accelerated depreciation in the first few years after an asset is acquired) will result in lower expenses and higher income.

2. *Last in, first out (LIFO)*. Under LIFO, the cost of goods sold is based on the cost of material bought toward the end of the period, resulting in costs that closely approximate current costs. The inventory, however, is valued on the basis of the cost of materials bought earlier in the year. During periods of inflation, the use of LIFO will result in the highest estimate of cost of goods sold among the three approaches, and the lowest net income.
3. *Weighted average*. Under the weighted average approach, both inventory and the cost of goods sold are based on the average cost of all material bought during the period. When inventory turns over rapidly, this approach will more closely resemble FIFO than LIFO.

Firms often adopt the LIFO approach for its tax benefits during periods of high inflation. The cost of goods sold is then higher because it is based on prices paid toward to the end of the accounting period. This, in turn, will reduce the reported taxable income and net income while increasing cash flows. Studies indicate that larger firms with rising prices for raw materials and labor, more variable inventory growth, and an absence of other tax loss carryforwards are much more likely to adopt the LIFO approach.

Given the income and cash flow effects of inventory valuation methods, it is often difficult to compare the profitability of firms that use different methods. There is, however, one way of adjusting for these differences. Firms that choose the LIFO approach to value inventories have to specify in a footnote the difference in inventory valuation between FIFO and LIFO, and this difference is termed the LIFO reserve. It can be used to adjust the beginning and ending inventories, and consequently the cost of goods sold, and to restate income based on FIFO valuation.

**Investments (Financial) and Marketable Securities** In the category of investments and marketable securities, accountants consider investments made by firms in the securities or assets of other firms, as well as other marketable securities including Treasury bills or bonds. The way in which these assets are valued depends on the way the investment is categorized and the motive behind the investment. In general, an investment in the securities of another firm can be categorized as a *minority passive investment*, a *minority active investment*, or a *majority active investment*, and the accounting rules vary depending on the categorization.

**Minority Passive Investments** If the securities or assets owned in another firm represent less than 20 percent of the overall ownership of that firm, an investment is treated as a minority passive investment. These investments have an acquisition value, which represents what the firm originally paid for the securities, and often a market value. Accounting principles require that these assets be subcategorized into one of three groups—investments that will be held to maturity, investments that are available for sale, and trading investments. The valuation principles vary for each.

- For an investment that will be held to maturity, the valuation is at historical cost or book value, and interest or dividends from this investment are shown in the income statement.

- For an investment that is available for sale, the valuation is at market value, but the unrealized gains or losses are shown as part of the equity in the balance sheet and not in the income statement. Thus, unrealized losses reduce the book value of the equity in the firm, and unrealized gains increase the book value of equity.
- For a trading investment, the valuation is at market value, and the unrealized gains and losses are shown in the income statement.

Firms are allowed an element of discretion in the way they classify investments and, subsequently, in the way they value these assets. This classification ensures that firms such as investment banks, whose assets are primarily securities held in other firms for purposes of trading, revalue the bulk of these assets at market levels each period. This is called marking to market, and provides one of the few instances in which market value trumps book value in accounting statements.

**Minority Active Investments** If the securities or assets owned in another firm represent between 20 percent and 50 percent of the overall ownership of that firm, an investment is treated as a minority active investment. While these investments have an initial acquisition value, a proportional share (based on ownership proportion) of the net income and losses made by the firm in which the investment was made is used to adjust the acquisition cost. In addition, the dividends received from the investment reduce the acquisition cost. This approach to valuing investments is called the equity approach.

The market value of these investments is not considered until the investment is liquidated, at which point the gain or loss from the sale relative to the adjusted acquisition cost is shown as part of the earnings in that period.

**Majority Active Investments** If the securities or assets owned in another firm represent more than 50 percent of the overall ownership of that firm, an investment is treated as a majority active investment. In this case, the investment is no longer shown as a financial investment but is instead replaced by the assets and liabilities of the firm in which the investment was made. This approach leads to a consolidation of the balance sheets of the two firms, where the assets and liabilities of the two firms are merged and presented as one balance sheet.<sup>2</sup> The share of the equity that is owned by other investors is shown as a minority interest on the liability side of the balance sheet. A similar consolidation occurs in the other financial statements of the firm as well, with the statement of cash flows reflecting the cumulated cash inflows and outflows of the combined firm. This is in contrast to the equity approach used for minority active investments, in which only the dividends received on the investment are shown as a cash inflow in the cash flow statement.

Here again, the market value of this investment is not considered until the ownership stake is liquidated. At that point, the difference between the market price and the net value of the equity stake in the firm is treated as a gain or loss for the period.

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<sup>2</sup>Firms have evaded the requirements of consolidation by keeping their share of ownership in other firms below 50 percent.



**Intangible Assets** Intangible assets include a wide array of assets ranging from patents and trademarks to goodwill. The accounting standards vary across intangible assets.

**Patents and Trademarks** Patents and trademarks are valued differently depending on whether they are generated internally or acquired. When patents and trademarks are generated from internal research, the costs incurred in developing the asset are expensed in that period, even though the asset might have a life of several accounting periods. Thus, the intangible asset is not valued in the balance sheet of the firm. In contrast, when an intangible asset is acquired from an external party, it is treated as an asset.

Intangible assets have to be amortized over their expected lives, with a maximum amortization period of 40 years. The standard practice is to use straight-line amortization. For tax purposes, however, firms are generally not allowed to amortize goodwill or other intangible assets with no specific lifetime, though recent changes in the tax law allow for some flexibility in this regard.

**Goodwill** Intangible assets are sometimes the by-products of acquisitions. When a firm acquires another firm, the purchase price is first allocated to tangible assets, and the excess price is then allocated to any intangible assets such as patents or trade names. Any residual becomes goodwill. While accounting principles suggest that goodwill captures the value of any intangibles that are not specifically identifiable, it is really a reflection of the difference between the book value of assets and the market value of the firm owning the assets. This approach is called purchase accounting, and it creates an intangible asset (goodwill) that is amortized over time. Until 2000, firms that did not want to see this charge against their earnings often used an alternative approach called pooling accounting, in which the purchase price never shows up in the balance sheet. Instead, the book values of the two companies involved in the merger were aggregated to create the consolidated balance of the combined firm.<sup>3</sup>

#### ILLUSTRATION 3.1: Asset Values for Boeing and the Home Depot

The following table summarizes asset values, as measured in the balance sheets of Boeing, the aerospace giant, and the Home Depot, a building supplies retailer, at the end of the 1998 financial year (in millions of dollars):

	<i>Boeing</i>	<i>Home Depot</i>
Net fixed assets	\$8,589	\$8,160
Goodwill	\$2,312	\$140
Investments and notes receivable	\$41	\$0
Deferred income taxes	\$411	\$0
Prepaid pension expense	\$3,513	\$0
Customer financing	\$4,930	\$0
Other assets	\$542	\$191

<sup>3</sup>The Financial Accounting Standards Board (FASB) eliminated the use of pooling and reduced the amortization period for goodwill in purchase accounting to 20 years in 2001.

<i>Current Assets</i>		
Cash	\$2,183	\$62
Short-term marketable investments	\$279	\$0
Accounts receivables	\$3,288	\$469
Current portion of customer financing	\$781	\$0
Deferred income taxes	\$1,495	\$0
Inventories	\$8,349	\$4,293
Other current assets	\$0	\$109
Total current assets	\$16,375	\$4,933
Total Assets	\$36,672	\$13,465

There are five points worth noting about these asset values:

1. *Goodwill.* Boeing, which acquired Rockwell in 1996 and McDonnell Douglas in 1997, used purchase accounting for the Rockwell acquisition and pooling for McDonnell Douglas. The goodwill on the balance sheet reflects the excess of acquisition value over book value for Rockwell and is being amortized over 30 years. With McDonnell Douglas, there is no recording of the premium paid on the acquisition among the assets.
2. *Customer financing and accounts receivable.* Boeing often either provides financing to its customers to acquire its planes or acts as the lessor on the planes. Since these contracts tend to run over several years, the present value of the payments due in future years on the financing and the lease payments is shown as customer financing. The current portion of these payments is shown as accounts receivable. The Home Depot provides credit to its customers as well, but all these payments due are shown as accounts receivable, since they are all short-term.
3. *Inventories.* Boeing values inventories using the weighted average cost method, while the Home Depot uses the FIFO approach for valuing inventories.
4. *Marketable securities.* Boeing classifies its short-term investments as trading investments and records them at market value. The Home Depot has a mix of trading, available-for-sale, and held-to-maturity investments and therefore uses a mix of book and market value to value these investments.
5. *Prepaid pension expense.* Boeing records the excess of its pension fund assets over its expected pension fund liabilities as an asset on the balance sheet.

Finally, the balance sheet for Boeing fails to report the value of a very significant asset, which is the effect of past research and development (R&D) expenses. Since accounting convention requires that these be expensed in the year that they occur and not be capitalized, the research asset does not show up in the balance sheet. Chapter 9 will consider how to capitalize research and development expenses and the effects on balance sheets.

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## MEASURING FINANCING MIX

The second set of questions that we would like to answer, and accounting statements to shed some light on, relate to the mix of debt and equity used by the firm, and the current values of each. The bulk of the information about these questions is provided on the liabilities side of the balance sheet and the footnotes to it.

### Accounting Principles Underlying Liability and Equity Measurement

Just as with the measurement of asset value, the accounting categorization of liabilities and equity is governed by a set of fairly rigid principles. The first is a *strict cat-*

egorization of financing into either a liability or an equity based on the nature of the obligation. For an obligation to be recognized as a liability, it must meet three requirements:

1. The obligation must be expected to lead to a future cash outflow or the loss of a future cash inflow at some specified or determinable date.
2. The firm cannot avoid the obligation.
3. The transaction giving rise to the obligation has to have already happened.

In keeping with the earlier principle of conservatism in estimating asset value, accountants recognize as liabilities only cash flow obligations that cannot be avoided.

The second principle is that the value of both liabilities and equity in a firm are *better estimated using historical costs* with accounting adjustments, rather than with expected future cash flows or market value. The process by which accountants measure the value of liabilities and equities is inextricably linked to the way they value assets. Since assets are primarily valued at historical cost or at book value, both debt and equity also get measured primarily at book value. The next section will examine the accounting measurement of both liabilities and equity.

## Measuring the Value of Liabilities and Equities

Accountants categorize liabilities into current liabilities, long-term debt, and long-term liabilities that are not debt or equity. Next, we will examine the way they measure each of these.

**Current Liabilities** Under current liabilities are categorized all obligations that the firm has coming due in the next year. These generally include:

- *Accounts payable*, representing credit received from suppliers and other vendors to the firm. The value of accounts payable represents the amounts due to these creditors. For this item, book and market value should be similar.
- *Short-term borrowing*, representing short-term loans (due in less than a year) taken to finance the operations or current asset needs of the business. Here again, the value shown represents the amounts due on such loans, and the book and market value should be similar, unless the default risk of the firm has changed dramatically since it borrowed the money.
- *Short-term portion of long-term borrowing*, representing the portion of the long-term debt or bonds that is coming due in the next year. Here again, the value shown is the actual amount due on these loans, and market and book value should converge as the due date approaches.
- *Other short-term liabilities*, which is a catchall component for any other short-term liabilities that the firm might have, including wages due to its employees and taxes due to the government.

Of all the items in the balance sheet, absent outright fraud, current liabilities should be the one for which the accounting estimates of book value and financial estimates of market value are closest.

**Long-Term Debt** Long-term debt for firms can take one of two forms. It can be a long-term loan from a bank or other financial institution, or it can be a long-term bond issued to financial markets, in which case the creditors are the investors in the bond. Accountants measure the value of long-term debt by looking at the present value of payments due on the loan or bond at the time of the borrowing. For bank loans, this will be equal to the nominal value of the loan. With bonds, however, there are three possibilities: When bonds are issued at par value, for instance, the value of the long-term debt is generally measured in terms of the nominal obligation created (i.e., principal due on the borrowing). When bonds are issued at a premium or a discount on par value, the bonds are recorded at the issue price, but the premium or discount is amortized over the life of the bond. As an extreme example, companies that issue zero coupon debt have to record the debt at the issue price, which will be significantly below the principal (face value) due at maturity. The difference between the issue price and the face value is amortized each period and is treated as a noncash interest expense that is tax deductible.

In all these cases, the value of debt is unaffected by changes in interest rates during the life of the loan or bond. Note that as market interest rates rise or fall, the present value of the loan obligations should decrease or increase. This updated market value for debt is not shown on the balance sheet. If debt is retired prior to maturity, the difference between book value and the amount paid at retirement is treated as an extraordinary gain or loss in the income statement.

Finally, companies that have long-term debt denominated in nondomestic currencies have to adjust the book value of debt for changes in exchange rates. Since exchange rate changes reflect underlying changes in interest rates, it does imply that this debt is likely to be valued much nearer to market value than is debt in the domestic currency.

**Other Long-Term Liabilities** Firms often have long-term obligations that are not captured in the long-term debt item. These include obligations to lessors on assets that firms have leased, to employees in the form of pension fund and health care benefits yet to be paid, and to the government in the form of taxes deferred. In the past two decades accountants have increasingly moved toward quantifying these liabilities and showing them as long-term liabilities.

**Leases** Firms often choose to lease long-term assets rather than buy them. Lease payments create the same kind of obligation that interest payments on debt create, and they must be viewed in a similar light. If a firm is allowed to lease a significant portion of its assets and keep it off its financial statements, a perusal of the statements will give a very misleading view of the company's financial strength. Consequently, accounting rules have been devised to force firms to reveal the extent of their lease obligations on their books.

There are two ways of accounting for leases. In an operating lease, the lessor (or owner) transfers only the right to use the property to the lessee. At the end of the lease period, the lessee returns the property to the lessor. Since the lessee does not assume the risk of ownership, the lease expense is treated as an operating expense in the income statement and the lease does not affect the balance sheet. In a capital lease, the lessee assumes some of the risks of ownership and enjoys some of

the benefits. Consequently, the lease, when signed, is recognized both as an asset and as a liability (for the lease payments) on the balance sheet. The firm gets to claim depreciation each year on the asset and also deducts the interest expense component of the lease payment each year. In general, capital leases recognize expenses sooner than equivalent operating leases.

Since firms prefer to keep leases off the books and sometimes to defer expenses, they have a strong incentive to report all leases as operating leases. Consequently the Financial Accounting Standards Board has ruled that a lease should be treated as a capital lease if it meets any one of the following four conditions:

1. The lease life exceeds 75 percent of the life of the asset.
2. There is a transfer of ownership to the lessee at the end of the lease term.
3. There is an option to purchase the asset at a bargain price at the end of the lease term.
4. The present value of the lease payments, discounted at an appropriate discount rate, exceeds 90 percent of the fair market value of the asset.

The lessor uses the same criteria for determining whether the lease is a capital or operating lease and accounts for it accordingly. If it is a capital lease, the lessor records the present value of future cash flows as revenue and recognizes expenses. The lease receivable is also shown as an asset on the balance sheet, and the interest revenue is recognized over the term of the lease as paid.

From a tax standpoint, the lessor can claim the tax benefits of the leased asset only if it is an operating lease, though the tax code uses slightly different criteria for determining whether the lease is an operating lease.<sup>4</sup>

**Employee Benefits** Employers can provide pension and health care benefits to their employees. In many cases, the obligations created by these benefits are extensive, and a failure by the firm to adequately fund these obligations needs to be revealed in financial statements.

**Pension Plans** In a pension plan, the firm agrees to provide certain benefits to its employees, either by specifying a defined contribution (wherein a fixed contribution is made to the plan each year by the employer, without any promises as to the benefits that will be delivered in the plan) or a defined benefit (wherein the employer promises to pay a certain benefit to the employee). In the latter case, the employer has to put sufficient money into the plan each period to meet the defined benefits.

Under a defined contribution plan, the firm meets its obligation once it has made the prespecified contribution to the plan. Under a defined benefit plan, the firm's obligations are much more difficult to estimate, since they will be determined by a number of variables, including the benefits that employees are entitled to, the

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<sup>4</sup>The requirements for an operating lease in the tax code are: (1) The property can be used by someone other than the lessee at the end of the lease term, (2) the lessee cannot buy the asset using a bargain purchase option, (3) the lessor has at least 20 percent of its capital at risk, (4) the lessor has a positive cash flow from the lease independent of tax benefits, and (5) the lessee does not have an investment in the lease.

prior contributions made by the employer and the returns they have earned, and the rate of return that the employer expects to make on current contributions. As these variables change, the value of the pension fund assets can be greater than, less than, or equal to pension fund liabilities (which include the present value of promised benefits). A pension fund whose assets exceed its liabilities is an overfunded plan, whereas one whose assets are less than its liabilities is an underfunded plan, and disclosures to that effect have to be included in financial statements, generally in the footnotes.

When a pension fund is overfunded, the firm has several options. It can withdraw the excess assets from the fund, it can discontinue contributions to the plan, or it can continue to make contributions on the assumption that the overfunding is a transitory phenomenon that could well disappear by the next period. When a fund is underfunded, the firm has a liability, though accounting standards require that firms reveal only the excess of accumulated pension fund liability<sup>5</sup> over pension fund assets on the balance sheet.

**Health Care Benefits** A firm can provide health care benefits in either of two ways—by making a fixed contribution to a health care plan without promising specific benefits (analogous to a defined contribution plan) or by promising specific health benefits and setting aside the funds to provide these benefits (analogous to a defined benefit plan). The accounting for health care benefits is very similar to the accounting for pension obligations.

**Deferred Taxes** Firms often use different methods of accounting for tax and financial reporting purposes, leading to a question of how tax liabilities should be reported. Since accelerated depreciation and favorable inventory valuation methods for tax accounting purposes lead to a deferral of taxes, the taxes on the income reported in the financial statements will generally be much greater than the actual tax paid. The same principles of matching expenses to income that underlie accrual accounting suggest that the deferred income tax be recognized in the financial statements. Thus a company that pays taxes of \$55,000 on its taxable income based on its tax accounting, and which would have paid taxes of \$75,000 on the income reported in its financial statements, will be forced to recognize the difference (\$20,000) as deferred taxes. Since the deferred taxes will be paid in later years, they will be recognized when paid.

It is worth noting that companies that actually pay more in taxes than the taxes they report in the financial statements create an asset called a deferred tax asset. This reflects the fact that the firm's earnings in future periods will be greater as the firm is given credit for the deferred taxes.

The question of whether the deferred tax liability is really a liability is an interesting one. Firms do not owe the amount categorized as deferred taxes to any entity, and treating it as a liability makes the firm look more risky than it really is. On

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<sup>5</sup>The accumulated pension fund liability does not take into account the projected benefit obligation, where actuarial estimates of future benefits are made. Consequently, it is much smaller than the total pension liabilities.

the other hand, the firm will eventually have to pay its deferred taxes, and treating the amount as a liability seems to be the conservative thing to do.

**Preferred Stock** When a company issues preferred stock, it generally creates an obligation to pay a fixed dividend on the stock. Accounting rules have conventionally not viewed preferred stock as debt because the failure to meet preferred dividends does not result in bankruptcy. At the same time, the fact the preferred dividends are cumulative makes them more onerous than common equity. Thus, preferred stock is a hybrid security, sharing some characteristics with equity and some with debt.

Preferred stock is valued on the balance sheet at its original issue price, with any cumulated unpaid dividends added on. Convertible preferred stock is treated similarly, but it is treated as equity on conversion.

**Equity** The accounting measure of equity is a historical cost measure. The value of equity shown on the balance sheet reflects the original proceeds received by the firm when it issued the equity, augmented by any earnings made since (or reduced by losses, if any) and reduced by any dividends paid out during the period. While these three items go into what we can call the book value of equity, three other points need to be made about this estimate:

1. When companies buy back stock for short periods, with the intent of reissuing the stock or using it to cover option exercises, they are allowed to show the repurchased stock as treasury stock, which reduces the book value of equity. Firms are not allowed to keep treasury stock on the books for extended periods, and have to reduce their book value of equity by the value of repurchased stock in the case of actions such as stock buybacks. Since these buybacks occur at the current market price, they can result in significant reductions in the book value of equity.
2. Firms that have significant losses over extended periods or carry out massive stock buybacks can end up with negative book values of equity.
3. Relating back to the discussion of marketable securities, any unrealized gain or loss in marketable securities that are classified as available for sale is shown as an increase or decrease in the book value of equity in the balance sheet.

As part of their financial statements, firms provide a summary of changes in shareholders' equity during the period, where all the changes that occurred to the accounting measure of equity value are summarized.

Accounting rules still do not seem to have come to grips with the effect of warrants and equity options (such as those granted by many firms to management) on the book value of equity. If warrants are issued to financial markets, the proceeds from this issue will show up as part of the book value of equity. In the far more prevalent case where options are given or granted to management, there is no effect on the book value of equity. When the options are exercised, the cash inflows from the exercise do ultimately show up in the book value of equity, and there may be an increase in the number of shares outstanding (if the firm issues new shares). The same point can be made about convertible bonds, which are treated as debt until conversion, at which point they become part of equity. In partial defense of accoun-

tants, we must note that the effect of options outstanding is often revealed when earnings and book value are computed on a per share basis. Here, the computation is made on two bases, the first on the current number of shares outstanding (primary shares outstanding) and the second on the number of shares outstanding after all options have been exercised (fully diluted shares outstanding).

As a final point on equity, accounting rules still seem to consider preferred stock, with its fixed dividend, as equity or near-equity, largely because of the fact that preferred dividends can be deferred or cumulated without the risk of default. To the extent that there can still be a loss of control in the firm (as opposed to bankruptcy), we would argue that preferred stock shares almost as many characteristics with unsecured debt as it does with equity.

### ILLUSTRATION 3.2: Measuring Liabilities and Equity

The following table summarizes the accounting estimates of liabilities and equity at Boeing and the Home Depot for the 1998 financial year in millions of dollars:

	<i>Boeing</i>	<i>Home Depot</i>
Accounts payable and other liabilities	\$10,733	\$1,586
Accrued salaries and expenses	0	\$1,010
Advances in excess of costs	\$1,251	\$0
Taxes payable	\$569	\$247
Short-term debt and current long-term debt	\$869	\$14
Total current liabilities	\$13,422	\$2,857
Accrued health care benefits	\$4,831	0
Other long-term liabilities	0	\$210
Deferred income taxes	0	\$83
Long-term debt	\$6,103	\$1,566
Minority interests	\$9	\$0
<i>Shareholder's Equity</i>		
Par value	\$5,059	\$37
Additional paid-in capital	\$0	\$2,891
Retained earnings	\$7,257	\$5,812
Total shareholder's equity	\$12,316	\$8,740
Total liabilities	\$36,672	\$13,465

The most significant difference between the companies is the accrued health care liability shown by Boeing, representing the present value of expected health care obligations promised to employees in excess of health care assets. The shareholders' equity for both firms represents the book value of equity and is significantly different from the market value of equity. The following table summarizes the difference at the end of the 1998 (in millions of dollars):

	<i>Boeing</i>	<i>Home Depot</i>
Book value of equity	\$12,316	\$8,740
Market value of equity	\$32,595	\$85,668

One final point needs to be made about the Home Depot's liabilities. The Home Depot has substantial operating leases. Because these leases are treated as operating expenses, they do not show up in the balance sheet. Since they represent commitments to make payments in the future, we would argue that operating leases should be capitalized and treated as part of the liabilities of the firm. How best to do this will be considered later in this book, in Chapter 9.



## MEASURING EARNINGS AND PROFITABILITY

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How profitable is a firm? What did it earn on the assets that it invested in? These are fundamental questions we would like financial statements to answer. Accountants use the income statement to provide information about a firm's operating activities over a specific time period. The income statement is designed to measure the earnings from assets in place. This section will examine the principles underlying earnings and return measurement in accounting, and the way they are put into practice.

### Accounting Principles Underlying Measurement of Earnings and Profitability

Two primary principles underlie the measurement of accounting earnings and profitability. The first is the principle of accrual accounting. In accrual accounting, the revenue from selling a good or service is recognized in the period in which the good is sold or the service is performed (in whole or substantially). A corresponding effort is made on the expense side to match expenses to revenues.<sup>6</sup> This is in contrast to a cash-based system of accounting, where revenues are recognized when payment is received and expenses are recorded when paid.

The second principle is the categorization of expenses into operating, financing, and capital expenses. Operating expenses are expenses that, at least in theory, provide benefits only for the current period; the cost of labor and materials expended to create products that are sold in the current period is a good example. Financing expenses are expenses arising from the nonequity financing used to raise capital for the business; the most common example is interest expenses. Capital expenses are expenses that are expected to generate benefits over multiple periods; for instance, the cost of buying land and buildings is treated as a capital expense.

Operating expenses are subtracted from revenues in the current period to arrive at a measure of operating earnings from the firm. Financing expenses are subtracted from operating earnings to estimate earnings to equity investors or net income. Capital expenses are written off over their useful lives (in terms of generating benefits) as depreciation or amortization.

### Measuring Accounting Earnings and Profitability

Since income can be generated from a number of different sources, generally accepted accounting principles (GAAP) require that income statements be classified into four sections—income from continuing operations, income from discontinued operations, extraordinary gains or losses, and adjustments for changes in accounting principles.

Generally accepted accounting principles require the recognition of revenues when the service for which the firm is getting paid has been performed in full or substantially, and the firm has received in return either cash or a receivable that is both observable and measurable. Expenses linked directly to the production of revenues

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<sup>6</sup>If a cost (such as an administrative cost) cannot easily be linked with particular revenues, it is usually recognized as an expense in the period in which it is consumed.

(like labor and materials) are recognized in the same period in which revenues are recognized. Any expenses that are not directly linked to the production of revenues are recognized in the period in which the firm consumes the services.

While accrual accounting is straightforward in firms that produce goods and sell them, there are special cases where accrual accounting can be complicated by the nature of the product or service being offered. For instance, firms that enter into long-term contracts with their customers are allowed to recognize revenue on the basis of the percentage of the contract that is completed. As the revenue is recognized on a percentage-of-completion basis, a corresponding proportion of the expense is also recognized. When there is considerable uncertainty about the capacity of the buyer of a good or service to pay for it, the firm providing the good or service may recognize the income only when it collects portions of the selling price under the installment method.

Reverting back to the discussion of the difference between capital and operating expenses, operating expenses should reflect only those expenses that create revenues in the current period. In practice, however, a number of expenses are classified as operating expenses that do not seem to meet this test. The first is depreciation and amortization. While the notion that capital expenditures should be written off over multiple periods is reasonable, the accounting depreciation that is computed on the original historical cost often bears little resemblance to the actual economic depreciation. The second expense is research and development expenses, which accounting standards in the United States classify as operating expenses, but which clearly provide benefits over multiple periods. The rationale used for this classification is that the benefits cannot be counted on or easily quantified.

Much of financial analysis is built around the expected future earnings of a firm, and many of these forecasts start with the current earnings. It is therefore important that we know how much of these earnings come from the ongoing operations of the firm and how much can be attributed to unusual or extraordinary events that are unlikely to recur on a regular basis. From that standpoint, it is useful that firms categorize expenses into operating and nonrecurring expenses, since it is the earnings prior to extraordinary items that should be used in forecasting. Nonrecurring items include:

- *Unusual or infrequent items*, such as gains or losses from the divestiture of an asset or division, and write-offs or restructuring costs. Companies sometimes include such items as part of operating expenses. As an example, Boeing in 1997 took a write-off of \$1,400 million to adjust the value of assets it acquired in its acquisition of McDonnell Douglas, and it showed this as part of operating expenses.
- *Extraordinary items*, which are defined as events that are unusual in nature, infrequent in occurrence, and material in impact. Examples include the accounting gain associated with refinancing high-coupon debt with lower-coupon debt, and gains or losses from marketable securities that are held by the firm.
- *Losses associated with discontinued operations*, which measure both the loss from the phaseout period and any estimated loss on sale of the operations. To qualify, however, the operations have to be separable from the firm.
- *Gains or losses associated with accounting changes*, which measure earnings changes created by both accounting changes made voluntarily by the firm (such

as a change in inventory valuation) and accounting changes mandated by new accounting standards.

### ILLUSTRATION 3.3: Measures of Earnings

The following table summarizes the income statements of Boeing and the Home Depot for the 1998 financial year:

	<i>Boeing</i> (in \$ millions)	<i>Home Depot</i> (in \$ millions)
Sales and other operating revenues	\$56,154	\$30,219
– Operating costs and expenses	\$51,022	\$27,185
– Depreciation	\$ 1,517	\$ 373
– Research and development expenses	\$ 1,895	\$ 0
Operating income	\$ 1,720	\$ 2,661
+ Other income (includes interest income)	\$ 130	\$ 30
– Interest expenses	\$ 453	\$ 37
Earnings before taxes	\$ 1,397	\$ 2,654
– Income taxes	\$ 277	\$ 1,040
Net earnings (Loss)	\$ 1,120	\$ 1,614

Boeing's operating income is reduced by the research and development expense, which is treated as an operating expense by accountants. The Home Depot's operating expenses include operating leases. As noted earlier, the treatment of both these items skews earnings, and how best to adjust earnings when such expenses exist will be considered in Chapter 9.

**Measures of Profitability** While the income statement allows us to estimate how profitable a firm is in absolute terms, it is just as important that we gauge the profitability of the firm in terms of percentage returns. Two basic ratios measure profitability. One examines the profitability relative to the capital employed to get a rate of return on investment. This can be done either from the viewpoint of just the equity investors or by looking at the entire firm. Another examines profitability relative to sales, by estimating a profit margin.

**Return on Assets and Return on Capital** The *return on assets* (ROA) of a firm measures its operating efficiency in generating profits from its assets, prior to the effects of financing.

$$\text{Return on assets} = \text{Earnings before interest and taxes}(1 - \text{Tax rate}) / \text{Total assets}$$

Earnings before interest and taxes (EBIT) is the accounting measure of operating income from the income statement, and total assets refers to the assets as measured using accounting rules—that is, using book value (BV) for most assets. Alternatively, return on assets can be written as:

$$\text{Return on assets} = [\text{Net income} + \text{Interest expenses}(1 - \text{Tax rate})] / \text{Total assets}$$

By separating the financing effects from the operating effects, the return on assets provides a cleaner measure of the true return on these assets.

ROA can also be computed on a pretax basis with no loss of generality, by using the earnings before interest and taxes and not adjusting for taxes:

$$\text{Pretax ROA} = \text{Earnings before interest and taxes} / \text{Total assets}$$

This measure is useful if the firm or division is being evaluated for purchase by an acquirer with a different tax rate.

A more useful measure of return relates the operating income to the capital invested in the firm, where capital is defined as the sum of the book value of debt and equity. This is the return on capital (ROC), and when a substantial portion of the liabilities is either current (such as accounts payable) or non-interest-bearing, this approach provides a better measure of the true return earned on capital employed in the business.

$$\text{Return on capital} = \frac{\text{EBIT}(1 - t)}{\text{BV of debt} + \text{BV of equity}}$$

For both measures, the book value can be measured at the beginning of the period or as an average of beginning and ending values.

#### ILLUSTRATION 3.4: Estimating Return on Capital

The following table summarizes the after-tax return on asset and return on capital estimates for Boeing and the Home Depot, using both average and beginning measures of capital in 1998:

	<i>Boeing</i> (in \$millions)	<i>Home Depot</i> (in \$millions)
After-tax operating income	\$ 1,118	\$ 1,730
Book value of capital—beginning	\$19,807	\$ 8,525
Book value of capital—ending	\$19,288	\$10,320
Book value of capital—average	\$19,548	\$ 9,423
Return on capital (based on average)	5.72%	18.36%
Return on capital (based on beginning)	5.64%	20.29%

Boeing had a terrible year in terms of after-tax returns. The Home Depot had a much better year in terms of those same returns.

**Decomposing Return on Capital** The return on capital of a firm can be written as a function of the operating profit margin it has on its sales, and its capital turnover ratio.

$$\begin{aligned} \text{ROC} &= \frac{\text{EBIT}(1 - t)}{\text{BV of capital}} \\ &= \frac{\text{EBIT}(1 - t)}{\text{Sales}} \times \frac{\text{Sales}}{\text{BV of capital}} \\ &= \text{After-tax operating margin} \times \text{Capital turnover ratio} \end{aligned}$$

Thus, a firm can arrive at a high ROC by either increasing its profit margin or utilizing its capital more efficiently to increase sales. There are likely to be competitive constraints and technological constraints on increasing sales, but a firm still has some freedom within these constraints to choose the mix of profit margin and capital turnover that maximizes its ROC. The return on capital varies widely across firms in different businesses, largely as a consequence of differences in profit margins and capital turnover ratios.



***mgnroc.xls***: This is a dataset on the Web that summarizes the operating margins, turnover ratios, and returns on capital of firms in the United States, classified by industry.

**Return on Equity** While the return on capital measures the profitability of the overall firm, the return on equity (ROE) examines profitability from the perspective of the equity investor, by relating the equity investor's profits (net profit after taxes and interest expenses) to the book value of the equity investment.

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Book value of common equity}}$$

Since preferred stockholders have a different type of claim on the firm than do common stockholders, the net income should be estimated after preferred dividends, and the common equity should not include the book value of preferred stock. This can be accomplished by using net income after preferred dividends in the numerator and the book value of common equity in the denominator.

**Determinants of ROE** Since the ROE is based on earnings after interest payments, it is affected by the financing mix the firm uses to fund its projects. In general, a firm that borrows money to finance projects and that earns a ROC on those projects that exceeds the after-tax interest rate it pays on its debt will be able to increase its ROE by borrowing. The ROE can be written as follows:<sup>7</sup>

$$\text{ROE} = \text{ROC} + \frac{D}{E} [\text{ROC} - i(1 - t)]$$

where  $\text{ROC} = \text{EBIT}(1 - t)/(\text{BV of debt} + \text{BV of equity})$

$D/E = \text{BV of debt}/\text{BV of equity}$

$i = \text{Interest expense on debt}/\text{BV of debt}$

$t = \text{Tax rate on ordinary income}$

The second term captures the benefit of financial leverage.

<sup>7</sup> $\text{ROC} + D/E[\text{ROC} - i(1 - t)] = [\text{NI} + \text{Int}(1 - t)]/(D + E) + D/E\{[\text{NI} + \text{Int}(1 - t)]/(D + E) - \text{Int}(1 - t)/D\}$   
 $= \{[\text{NI} + \text{Int}(1 - t)]/(D + E)\}(1 + D/E) - \text{Int}(1 - t)/E$   
 $= \text{NI}/E + \text{Int}(1 - t)/E - \text{Int}(1 - t)/E = \text{NI}/E = \text{ROE}$

**ILLUSTRATION 3.5: Return on Equity Computations**

The following table summarizes the return on equity for Boeing and the Home Depot in 1998:

<i>Return Ratios</i>	<i>Boeing (in \$millions)</i>	<i>Home Depot (in \$millions)</i>
Net income	\$ 1,120	\$1,614
Book value of equity—beginning	\$12,953	\$7,214
Book value of equity—ending	\$12,316	\$8,740
Book value of equity—average	\$12,635	\$7,977
Return on equity (based on average)	8.86%	20.23%
Return on equity (based on beginning)	8.65%	22.37%

The results again indicate that Boeing had a poor year in 1998, while the Home Depot reported healthier returns on equity. The returns on equity can also be estimated by decomposing into the components just specified (using the adjusted beginning-of-the-year numbers):

	<i>Boeing (in \$millions)</i>	<i>Home Depot (in \$millions)</i>
After-tax return on capital	5.82%	16.37%
Debt-equity ratio	35.18%	48.37%
Book interest rate (1 – Tax rate)	4.22%	4.06%
Return on equity	6.38%	22.33%

Note that a tax rate of 35% is used on both the return on capital and the book interest rate. This approach results in a return on equity that is different from the one estimated using the net income and the book value of equity.



**rocroe.xls:** This is a dataset on the Web that summarizes the return on capital, debt equity ratios, book interest rates, and returns on equity of firms in the United States, classified by industry.

**MEASURING RISK**

How risky are the investments the firm has made over time? How much risk do equity investors in a firm face? These are two more questions that we would like to find the answers to in the course of an investment analysis. Accounting statements do not really claim to measure or quantify risk in a systematic way, other than to provide footnotes and disclosures where there might be risk embedded in the firm. This section will examine some of the ways in which accountants try to assess risk.

**Accounting Principles Underlying Risk Measurement**

To the extent that accounting statements and ratios do attempt to measure risk, there seem to be two common themes.

The first is that the risk being measured is the risk of default—that is, the risk that a fixed obligation, such as interest or principal due on outstanding debt, will not be met. The broader equity notion of risk, which measures the variance of actual returns around expected returns, does not seem to receive much attention.

Thus, an all-equity-financed firm with positive earnings and few or no fixed obligations will generally emerge as a low-risk firm from an accounting standpoint, in spite of the fact that its earnings are unpredictable.

The second theme is that accounting risk measures generally take a static view of risk, by looking at the capacity of a firm at a point in time to meet its obligations. For instance, when ratios are used to assess a firm's risk, the ratios are almost always based on one period's income statement and balance sheet.

### Accounting Measures of Risk

Accounting measures of risk can be broadly categorized into two groups. The first is disclosures about potential obligations or losses in values that show up as footnotes on balance sheets, which are designed to alert potential or current investors to the possibility of significant losses. The second is ratios that are designed to measure both liquidity and default risk.

**Disclosures in Financial Statements** In recent years, the disclosures that firms have to make about future obligations have proliferated. Consider, for instance, the case of contingent liabilities. These refer to potential liabilities that will be incurred under certain contingencies, as is the case, for instance, when a firm is the defendant in a lawsuit. The general rule that has been followed is to ignore contingent liabilities that hedge against risk, since the obligations on the contingent claim will be offset by benefits elsewhere.<sup>8</sup> In recent periods, however, significant losses borne by firms from supposedly hedged derivatives positions (such as options and futures) have led to FASB requirements that these derivatives be disclosed as part of a financial statement. In fact, pension fund and health care obligations have moved from mere footnotes to actual liabilities for firms.

**Financial Ratios** Financial statements have long been used as the basis for estimating financial ratios that measure profitability, risk, and leverage. Earlier, the section on earnings looked at two of the profitability ratios—return on equity and return on capital. This section will look at some of the financial ratios that are often used to measure the financial risk in a firm.

**Short-Term Liquidity Risk** Short-term liquidity risk arises primarily from the need to finance current operations. To the extent that the firm has to make payments to its suppliers before it gets paid for the goods and services it provides, there is a cash shortfall that has to be met, usually through short-term borrowing. Though this financing of working capital needs is done routinely in most firms, financial ratios have been devised to keep track of the extent of the firm's exposure to the risk that it will not be able to meet its short-term obligations. The two most frequently used to measure short-term liquidity risk are the current ratio and the quick ratio.

**Current Ratios** The current ratio is the ratio of current assets (cash, inventory, accounts receivable) to its current liabilities (obligations coming due within the next period).

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<sup>8</sup>This assumes that the hedge is set up competently. It is entirely possible that a hedge, if sloppily set up, can end up costing the firm money.

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

A current ratio below 1, for instance, would indicate that the firm has more obligations coming due in the next year than assets it can expect to turn to cash. That would be an indication of liquidity risk.

While traditional analysis suggests that firms maintain a current ratio of 2 or greater, there is a trade-off here between minimizing liquidity risk and tying up more and more cash in net working capital (Net working capital = Current assets – Current liabilities). In fact, it can be reasonably argued that a very high current ratio is indicative of an unhealthy firm that is having problems reducing its inventory. In recent years firms have worked at reducing their current ratios and managing their net working capital better.

Reliance on current ratios has to be tempered by a few concerns. First, the ratio can be easily manipulated by firms around the time of financial reporting dates to give the illusion of safety; second, current assets and current liabilities can change by an equal amount, but the effect on the current ratio will depend on its level before the change.<sup>9</sup>

**Quick or Acid Test Ratios** The quick or acid test ratio is a variant of the current ratio. It distinguishes current assets that can be converted quickly into cash (cash, marketable securities) from those that cannot (inventory, accounts receivable).

$$\text{Quick ratio} = (\text{Cash} + \text{Marketable securities}) / \text{Current liabilities}$$

The exclusion of accounts receivable and inventory is not a hard-and-fast rule. If there is evidence that either can be converted into cash quickly, it can, in fact, be included as part of the quick ratio.

**Turnover Ratios** Turnover ratios measure the efficiency of working capital management by looking at the relationship of accounts receivable and inventory to sales and to the cost of goods sold:

$$\text{Accounts receivable turnover} = \text{Sales} / \text{Average accounts receivable}$$

$$\text{Inventory turnover} = \text{Cost of goods sold} / \text{Average inventory}$$

These statistics can be interpreted as measuring the speed with which the firm turns accounts receivable into cash or inventory into sales. These ratios are often expressed in terms of the number of days outstanding:

$$\text{Days accounts receivable outstanding} = 365 / \text{Accounts receivable turnover}$$

$$\text{Days inventory held} = 365 / \text{Inventory turnover}$$

A similar pair of statistics can be computed for accounts payable, relative to purchases:

$$\text{Accounts payable turnover} = \text{Purchases} / \text{Average accounts payable}$$

$$\text{Days accounts payable outstanding} = 365 / \text{Accounts payable turnover}$$

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<sup>9</sup>If the current assets and current liabilities increase by an equal amount, the current ratio will go down if it was greater than 1 before the increase, and go up if it was less than 1.



Since accounts receivable and inventory are assets, and accounts payable is a liability, these three statistics (standardized in terms of days outstanding) can be combined to get an estimate of how much financing the firm needs to raise to fund working capital needs.

$$\begin{aligned} \text{Required financing period} = & \text{Days accounts receivable outstanding} \\ & + \text{Days inventory held} \\ & - \text{Days accounts payable outstanding} \end{aligned}$$

The greater the financing period for a firm, the greater is its short-term liquidity risk.



**wcdata.xls:** This is a dataset on the Web that summarizes working capital ratios for firms in the United States, classified by industry.



**finratio.xls:** This spreadsheet allows you to compute the working capital ratios for a firm, based upon financial statement data.

**Long-Term Solvency and Default Risk** Measures of long-term solvency attempt to examine a firm's capacity to meet interest and principal payments in the long term. Clearly, the profitability ratios discussed earlier in the section are a critical component of this analysis. The ratios specifically designed to measure long-term solvency try to relate profitability to the level of debt payments in order to identify the degree of comfort with which the firm can meet these payments.

**Interest Coverage Ratios** The interest coverage ratio measures the capacity of the firm to meet interest payments from predebt, pretax earnings.

$$\text{Interest coverage ratio} = \frac{\text{EBIT}}{\text{Interest expenses}}$$

The higher the interest coverage ratio, the more secure is the firm's capacity to make interest payments from earnings. This argument, however, has to be tempered by the recognition that the amount of earnings before interest and taxes is volatile and can drop significantly if the economy enters a recession. Consequently, two firms can have the same interest coverage ratio but be viewed very differently in terms of risk.

The denominator in the interest coverage ratio can be easily extended to cover other fixed obligations such as lease payments. If this is done, the ratio is called a fixed charges coverage ratio:

$$\text{Fixed charges coverage ratio} = \frac{\text{EBIT (before fixed charges)}}{\text{Fixed charges}}$$

Finally, this ratio, while stated in terms of earnings, can be restated in terms of cash flows by using earnings before interest, taxes, depreciation, and amortization (EBITDA) in the numerator and cash fixed charges in the denominator.

$$\text{Cash fixed charges coverage ratio} = \frac{\text{EBITDA}}{\text{Cash fixed charges}}$$

Both interest coverage and fixed charges coverage ratios are open to the criticism that they do not consider capital expenditures, a cash flow that may be discretionary in the very short term, but not in the long term if the firm wants to maintain growth. One way of capturing the extent of this cash flow, relative to operating cash flows, is to compute a ratio of the two:

$$\text{Operating cash flow to capital expenditures} = \frac{\text{Cash flows from operations}}{\text{Capital expenditures}}$$

While there are a number of different definitions of cash flows from operations, the most reasonable way of defining it is to measure the cash flows from continuing operations, before interest but after taxes and after meeting working capital needs.

$$\text{Cash flow from operations} = \text{EBIT}(1 - \text{Tax rate}) - \Delta \text{Working capital}$$



**covratio.xls:** This is a dataset on the Web that summarizes the interest coverage and fixed charges coverage ratios for firms in the United States, classified by industry.

### ILLUSTRATION 3.6: Interest and Fixed Charges Coverage Ratios

The following table summarizes interest and fixed charges coverage ratios for Boeing and the Home Depot in 1998:

	<i>Boeing</i>	<i>Home Depot</i>
EBIT	\$1,720	\$2,661
Interest expense	\$ 453	\$ 37
Interest coverage ratio	3.80	71.92
EBIT	\$1,720	\$2,661
Operating lease expenses	\$ 215	\$ 290
Interest expenses	\$ 453	\$ 37
Fixed charges coverage ratio	2.90	9.02
EBITDA	\$3,341	\$3,034
Cash fixed charges	\$ 668	\$ 327
Cash fixed charges coverage ratio	5.00	9.28
Cash flows from operations	\$2,161	\$1,662
Capital expenditures	\$1,584	\$2,059
Cash flows/Capital expenditures	1.36	0.81

Boeing, based on its operating income in 1998, looks riskier than the Home Depot on both the interest coverage ratio basis and fixed charges coverage ratio basis. On a cash flow basis, however, Boeing does look much better. In fact, when capital expenditures are considered, the Home Depot has a lower ratio. For Boeing, the other consideration is the fact that operating income in 1998 was depressed relative to income in earlier years, and this does have an impact on the ratios across the board. It might make more sense when computing these ratios to look at the average operating income over time.



**finratio.xls:** This spreadsheet allows you to compute the interest coverage and fixed charges coverage ratios for a firm based on financial statement data.

**Debt Ratios** Interest coverage ratios measure the capacity of the firm to meet interest payments, but do not examine whether it can pay back the principal on outstanding debt. Debt ratios attempt to do this, by relating debt to total capital or to equity. The two most widely used debt ratios are:

$$\text{Debt to capital ratio} = \text{Debt} / (\text{Debt} + \text{Equity})$$

$$\text{Debt to equity ratio} = \text{Debt} / \text{Equity}$$

The first ratio measures debt as a proportion of the total capital of the firm and cannot exceed 100 percent. The second measures debt as a proportion of the book value of equity in the firm and can be easily derived from the first, since:

$$\text{Debt to equity ratio} = (\text{Debt} / \text{Capital ratio}) / (1 - \text{Debt} / \text{Capital ratio})$$

While these ratios presume that capital is raised from only debt and equity, they can be easily adapted to include other sources of financing, such as preferred stock. While preferred stock is sometimes combined with common stock under the equity label, it is better to keep the two sources of financing separate and to compute the ratio of preferred stock to capital (which will include debt, equity, and preferred stock).

There are two close variants of debt ratios. In the first, only long-term debt is used rather than total debt, with the rationale that short-term debt is transitory and will not affect the long-term solvency of the firm.

$$\text{Long-term debt to capital ratio} = \text{Long-term debt} / (\text{Long-term debt} + \text{Equity})$$

$$\text{Long-term debt to equity ratio} = \text{Long-term debt} / \text{Equity}$$

Given the ease with which firms can roll over short-term debt and the willingness of many firms to use short-term financing to fund long-term projects, these variants can provide a misleading picture of the firm's financial leverage risk.

The second variant of debt ratios uses market value (MV) instead of book value, primarily to reflect the fact that some firms have a significantly greater capacity to borrow than their book values indicate.

$$\text{Market value debt to capital ratio} = \text{MV of debt} / (\text{MV of debt} + \text{MV of equity})$$

$$\text{Market value debt to equity ratio} = \text{MV of debt} / \text{MV of equity}$$

Many analysts disavow the use of market value in their calculations, contending that market values, in addition to being difficult to get for debt, are volatile and hence unreliable. These contentions are open to debate. It is true that the market value of debt is difficult to get for firms that do not have publicly traded bonds, but the market value of equity is not only easy to obtain, it is constantly updated to reflect marketwide and firm-specific changes. Furthermore, using the book value of debt as a proxy for market value in those cases where bonds are not traded does not significantly shift most market value-based debt ratios.<sup>10</sup>

<sup>10</sup>Deviations in the market value of equity from book value are likely to be much larger than deviations for debt, and are likely to dominate in most debt ratio calculations.

**ILLUSTRATION 3.7: Book Value Debt Ratios and Variants—Boeing and the Home Depot**

The following table summarizes different estimates of the debt ratio for Boeing and the Home Depot, using book values of debt and equity for both firms:

	<i>Boeing</i> (in \$millions)	<i>Home Depot</i> (in \$millions)
Long-term debt	\$ 6,103	\$1,566
Short-term debt	\$ 869	\$ 14
Book value of equity	\$12,316	\$8,740
Long-term debt/Equity	49.55%	17.92%
Long-term debt/(Long-term debt + Equity)	33.13%	15.20%
Debt/Equity	56.61%	18.08%
Debt/(Debt + Equity)	36.15%	15.31%

Boeing has a much higher book value debt ratio, considering either long-term or total debt, than the Home Depot.



***dbtfund.xls***: This is a dataset on the Web that summarizes the book value debt ratios and market value debt ratios for firms in the United States, classified by industry.

**OTHER ISSUES IN ANALYZING FINANCIAL STATEMENTS**

There are significant differences in accounting standards and practices across countries and these differences may color comparisons across companies.

**Differences in Accounting Standards and Practices**

Differences in accounting standards across countries affect the measurement of earnings. These differences, however, are not so great as they are made out to be by some analysts, and they cannot explain away radical departures from fundamental principles of valuation.<sup>11</sup> Choi and Levich, in a 1990 survey of accounting standards across developed markets, note that most countries subscribe to basic accounting notions of consistency, realization, and historical cost principles in preparing accounting statements. Table 3.1 summarizes accounting standards in

<sup>11</sup>At the peak of the Japanese market, there were many investors who explained away the price-earnings multiples of 60 and greater in the market by noting that Japanese firms were conservative in measuring earnings. Even after taking into account the general provisions and excess depreciation used by many of these firms to depress current earnings, the price-earnings multiples were greater than 50 for many firms, suggesting either extraordinary expected growth in the future or overvaluation.

**TABLE 3.1** International Comparison of Accounting Principles

Accounting Principle	United Kingdom	United States	France	Germany	Netherlands	Sweden	Switzerland	Japan
1. Consistency—Accounting principles and methods are applied on the same basis from period to period.	Yes	Yes	Yes	Yes	Yes	PP	PP	Yes
2. Realization—Revenue is recognized when realization is reasonably assured.	Yes	Yes	Yes	Yes	Yes	Yes	PP	Yes
3. Fair presentation of the financial statement is required.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Historical cost convention—Departures from the historical cost convention are disclosed.	Yes	Yes	Yes	Yes	Yes	Yes	RF	Yes
5. Accounting policies—A change in accounting principles and methods without a change in circumstances is accounted for by a prior year adjustment.	Yes	No	Yes	MP	RF	MP	MP	No
6. Fixed assets—revaluation—In historical cost statements, fixed assets are stated at an amount in excess of cost, which is determined at irregular intervals.	MP	No	Yes	No	RF	PP	No	No
7. Fixed assets—revaluation—When fixed assets are stated in historical cost statements at an amount in excess of cost, depreciation based on the revaluation amount is charged to income.	Yes	No	Yes	No	Yes	Yes	No	No
8. Goodwill is amortized.	MP	Yes	Yes	Yes	M	Yes	MP	Yes
9. Finance leases are capitalized.	Yes	Yes	No	No	No	Yes	RF	No
10. Short-term marketable securities are stated at the lower of cost or market value.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*(Continued)*

**TABLE 3.1** (Continued)

Accounting Principle	United Kingdom	United States	France	Germany	Netherlands	Sweden	Switzerland	Japan
11. Inventory values are stated at the lower of cost or market value.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12. Manufacturing overhead is allocated to year-end inventory.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13. Inventory is costed using FIFO.	PP	M	M	M	M	PP	PP	M
14. Long-term debt includes maturities longer than one year.	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
15. Deferred tax is recognized where accounting income and taxable income arise at different times.	Yes	Yes	Yes	No	Yes	No	No	Yes
16. Total pension fund assets and liabilities are excluded from a company's financial statements.	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
17. Research and development are expensed.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18. General purpose (purely discretionary) reserves are allowed.	No	No	Yes	Yes	Yes	Yes	Yes	Yes
19. Offsetting—Assets and liabilities are offset against each other in the balance sheet only when a legal right of offset exists.	Yes	Yes	Yes	Yes	Yes	Yes	PP	Yes
20. Unusual and extraordinary gains and losses are taken in the income statement.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21. Closing rate method of foreign currency translation is employed.	Yes	Yes	Yes	Yes	Yes	No	Yes	No

22. Currency translation gains or losses arising from trading are reflected in current income.	Yes	Yes	MP	MP	MP	MP	MP	No
23. Excess depreciation is permitted.	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
24. Basic statements reflect a historical cost valuation (no price level adjustment).	Yes	Yes	Yes	M	Yes	Yes	Yes	Yes
25. Supplementary inflation—adjusted financial statements are adjusted.	MP	MP	No	MP	Yes	No	No	No
26. Accounting for long-term investments:								
a. Less than 20% ownership—cost method.	Yes	Yes	Yes	No	Yes	Yes	Yes	
b. 20–50% ownership—equity method.	Yes	Yes	Yes	No	MP	M		
c. More than 50% ownership—full consolidation.	Yes	Yes	Yes	Yes	Yes	Yes		
27. Both domestic and foreign subsidiaries are consolidated.	Yes	Yes	Yes	M	Yes	MP	Yes	
28. Acquisitions are accounted for under the purchase cost method.	PP	PP	Yes	Yes	PP	Yes	Yes	
29. Minority interest is excluded from consolidation income.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
30. Minority interest is excluded from consolidated owners' equity.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	

Key: PP—Predominant practice

MP—Minority practice

M—Mixed practice

RF—Rarely or not found

eight major financial markets, and reveals that the common elements vastly outnumber those areas where there are differences.

The two countries that offer the strongest contrast to the United States are Germany and Japan. The key differences and their implications are: First, companies in the United States generally maintain separate tax and financial reporting books, which in turn generates items like deferred taxes to cover differences between the two books. Companies in Germany and Japan do not maintain separate books. Consequently, depreciation methods in financial reports are much more likely to be accelerated and hence to reduce stated income. Second, the requirement that a lease be capitalized and shown as a liability is much more tightly enforced in the United States. In Japan, leases are generally treated as operating leases and do not show up as liabilities in the balance sheet. In Germany, firms can capitalize leases, but they have more leeway in classifying leases as operating or capital leases than U.S. companies. Third, goodwill, once created, can be amortized over 40 years in the United States and over much shorter time periods in Germany and Japan, again depressing stated income. Fourth, reserves in the United States can be created only for specific purposes, whereas German and Japanese companies can use general reserves to equalize income across periods, leading to income being understated during the good years and overstated during bad years.

Most of these differences can be accounted and adjusted for when comparisons are made between companies in the United States and companies in other financial markets. Statistics such as price-earnings ratios, which use stated and unadjusted earnings, can be misleading when accounting standards vary widely across the companies being compared.

## CONCLUSION

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Financial statements remain the primary source of information for most investors and analysts. There are differences, however, in how accounting and financial analysis approach answering a number of key questions about the firm.

The first question relates to the nature and the value of the assets owned by a firm. Assets can be categorized into investments already made (assets in place) and investments yet to be made (growth assets); accounting statements provide a substantial amount of historical information about the former and very little about the latter. The focus on the original price of assets in place (book value) in accounting statements can lead to significant differences between the stated value of these assets and their market value. With growth assets, accounting rules result in low or no values for assets generated by internal research.

The second issue is the measurement of profitability. The two principles that seem to govern how profits are measured are accrual accounting—in which revenues and expenses are shown in the period where transactions occur rather than when the cash is received or paid—and the categorization of expenses into operating, financing, and capital expenses. While operating and financing expenses are shown in income statements, capital expenditures are spread over several time periods and take the form of depreciation and amortization. Accounting standards mis-categorize operating leases and research and development expenses as operating



expenses (when the former should be categorized as financing expenses and the latter as capital expenses).

Financial statements also deal with short-term liquidity risk and long-term default risk. While the emphasis in accounting statements is on examining the risk that firms may be unable to make payments that they have committed to make, there is very little focus on risk to equity investors.

## QUESTIONS AND SHORT PROBLEMS

Coca-Cola's balance sheet for December 1998 is summarized (in millions of dollars) for problems 1 through 9:

Cash and near-cash	\$1,648	Accounts payable	\$3,141
Marketable securities	1049	Short-term borrowings	4,462
Accounts receivable	1,666	Other short-term liabilities	1,037
Other current assets	2,017	<i>Current Liabilities</i>	8,640
<i>Current Assets</i>	6,380	Long-term borrowings	687
<i>Long-term investments</i>	1,863	Other long-term liabilities	1,415
Depreciable fixed assets	5,486	<i>Noncurrent liabilities</i>	2,102
Nondepreciable fixed assets	199		
Accumulated depreciation	2,016	Share capital (paid-in)	3,060
<i>Net fixed assets</i>	3,669	Retained earnings	5,343
<i>Other assets</i>	7,233	<i>Shareholder's equity</i>	8,403
<b>Total Assets</b>	<b>19,145</b>	<b>Total Liabilities and Equity</b>	<b>19,145</b>

- Consider the assets on Coca-Cola's balance sheet and answer the following questions:
  - Which assets are likely to be assessed closest to market value? Explain.
  - Coca-Cola has net fixed assets of \$3,669 million. Can you estimate how much Coca-Cola paid for these assets? Is there any way to know the age of these assets?
  - Coca-Cola seems to have far more invested in current assets than in fixed assets. Is this significant? Explain.
  - In the early 1980s, Coca-Cola sold off its bottling operations, and the bottlers became independent companies. How would this action have impacted the assets on Coca-Cola's balance sheet? (The manufacturing plants are most likely to be part of the bottling operations.)
- Examine the liabilities on Coca-Cola's balance sheet.
  - How much interest-bearing debt does Coca-Cola have outstanding? (You can assume that other short-term liabilities represent sundry payables, and other long-term liabilities represent health care and pension obligations.)
  - How much did Coca-Cola obtain in equity capital when it issued stock originally to the financial markets?
  - Is there any significance to the fact that the retained earnings amount is much larger than the original paid-in capital?
  - The market value of Coca-Cola's equity is \$140 billion. What is the book value of equity in Coca-Cola? Why is there such a large difference between the market value of equity and the book value of equity?

3. Coca-Cola's most valuable asset is its brand name. Where in the balance sheet do you see its value? Is there any way to adjust the balance sheet to reflect the value of this asset?
4. Assume that you have been asked to analyze Coca-Cola's working capital management.
  - a. Estimate the net working capital and noncash working capital for Coca-Cola.
  - b. Estimate the firm's current ratio.
  - c. Estimate the firm's quick ratio.
  - d. Would you draw any conclusions about the riskiness of Coca-Cola as a firm by looking at these numbers? Why or why not?

Coca-Cola's income statements for 1997 and 1998 are summarized (in millions of dollars) for problems 5 through 9:

	1997	1998
Net revenues	\$18,868	\$18,813
Cost of goods sold	6,015	5,562
Selling, general, and administrative expenses	7,852	8,284
Earnings before interest and taxes	5,001	4,967
Interest expenses	258	277
Nonoperating gains	1,312	508
Income tax expenses	1,926	1,665
Net income	4,129	3,533
Dividends	1,387	1,480

The following questions relate to Coca-Cola's income statement.

5. How much operating income did Coca-Cola earn, before taxes, in 1998? How does this compare to how much Coca-Cola earned in 1997? What are the reasons for the difference?
6. The biggest expense for Coca-Cola is advertising, which is part of the selling, general and administrative (G&A) expenses. A large portion of these expenses is designed to build up Coca-Cola's brand name. Should advertising expenses be treated as operating expenses or are they really capital expenses? If they are to be treated as capital expenses, how would you capitalize them? (Use the capitalization of R&D as a guide.)
7. What effective tax rate did Coca-Cola have in 1998? How does it compare with what the company paid in 1997 as an effective tax rate? What might account for the difference?
8. You have been asked to assess the profitability of Coca-Cola as a firm. To that end, estimate the pretax operating and net margins in 1997 and 1998 for the firm. Are there any conclusions you would draw from the comparisons across the two years?
9. The book value of equity at Coca-Cola in 1997 was \$7,274 million. The book value of interest-bearing debt was \$3,875 million. Estimate:
  - a. The return on equity (beginning of the year) in 1998.
  - b. The pretax return on capital (beginning of the year) in 1998.
  - c. The after-tax return on capital (beginning of the year) in 1998, using the effective tax rate in 1998.

10. SeeSaw Toys reported that it had a book value of equity of \$1.5 billion at the end of 1998 and 100 million shares outstanding. During 1999, it bought back 10 million shares at a market price of \$40 per share. The firm also reported a net income of \$150 million for 1999, and paid dividends of \$50 million. Estimate:
- The book value of equity at the end of 1999.
  - The return on equity, using beginning book value of equity.
  - The return on equity, using the average book value of equity.