
UNDERSTANDING FINANCIAL STATEMENTS

In March 1999, Boeing reported earnings of \$1,120 million for 1998 on capital invested of \$19,288 million. At about the same time, the Home Depot announced that it earned \$1,614 million during 1998 on assets of \$13,465 million. But how did Boeing and the Home Depot measure earnings and what comprises invested capital and assets? The answers to these questions lie in a series of accounting principles that form the basis for financial statements.

In this chapter, we will examine these principles by looking at four basic questions:

- 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 still produce revenues for the firm such as patents and trademarks.
- How did the firm raise the funds to finance these assets? In acquiring these 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.
- How profitable are these assets? A good investment, we argued, is one that makes a return greater than the hurdle rate. To evaluate whether the investments that a firm has already made are good investments, we need to estimate what returns we are making on these investments.
- How much uncertainty (or risk) is embedded in these assets? While we have not directly confronted the issue of risk yet, estimating how much uncertainty there is in existing investments and the implications for a firm is clearly a first step.

We will look at the way accountants would answer these questions, and why the answers might be different when doing financial analysis. 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 financial analysis is much more forward looking.

The Basic Accounting Statements

There are three basic accounting statements that summarize information about a firm. The first is the **balance sheet**, shown in Figure 4.1, 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.

Figure 4.1: The Balance Sheet
The Balance Sheet

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

The next is the **income statement**, shown in Figure 4.2, 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).

Figure 4.2: The Income Statement

Income Statement	
Gross revenues from sale of products or services	Revenues
Expenses associates 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 & Preferred Equity for Current Period	= Net Income before extraordinary items
Profits and 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

Finally, there is the statement of cash flows, shown in figure 4.3, which specifies the sources of cash to the firm from both operations and new financing, and the uses of this cash, during a period.

Figure 4.3: Statement of Cash Flows

Statement of Cash Flows

Net cash flow from operations, after taxes and interest expenses	Cash Flows From Operations
Includes divestiture and acquisition of real assets (capital expenditures) and disposal and purchase of financial assets. Also includes acquisitions of other firms.	+ Cash Flows From Investing
Net cash flow from the issue and repurchase of equity, from the issue and repayment of debt and after dividend payments	+ Cash Flows from Financing
	= Net Change in Cash Balance

The statement of cash flows can be viewed as an attempt to both explain how much the cash flows during a period were, and why the cash balance changed during the period.

✍ CT 4.1: Financial statements are prepared once every three months at most firms in the United States. Which of the three statements - the income statement, the balance sheet or the statement of cash flows - is likely to show the least change from period to period? Why?

Informational Needs

When analyzing a firm, what are the questions to which we would like to know the answers? A firm, as we define it, includes both investments already made -- we will call these **assets-in-place** -- and investments yet to be made -- we will call these **growth assets**. In addition, a firm can either borrow the funds it needs to make these investments, in which case it is using debt, or raise it from its owners, in the form of equity. Figure 4.4 summarizes this description of a firm in the form of a financial balance sheet:

Figure 4.4: A Financial Balance Sheet

Assets		Liabilities	
Existing Investments Generate cashflows today Includes long lived (fixed) and short-lived (working capital) assets	Assets in Place	Debt	Fixed Claim on cash flows Little or No role in management <i>Fixed Maturity</i> <i>Tax Deductible</i>
Expected Value that will be created by future investments	Growth Assets	Equity	Residual Claim on cash flows Significant Role in management <i>Perpetual Lives</i>


Note that while this summary does have some similarities with the accounting balance sheet, there are key differences. The most important one is that here we explicitly consider growth assets when we look at what a firm owns.

When doing a financial analysis of a firm, we would like to be able to answer of questions relating to each of these items. Figure 4.5 lists the questions:

Figure 4.5: Key Financial Questions

Assets		Liabilities	
What are the assets in place? How valuable are these assets? How risky are these assets?	Assets in Place	Debt	What is the value of the debt? How risky is the debt?
What are the growth assets? How valuable are these assets?	Growth Assets	Equity	What is the value of the equity? How risky is the equity?

As we will see in this chapter, accounting statements allow us to acquire some information about each of these questions, but they fall short in terms of both the timeliness with which they provide it and the way in which they measure asset value, earnings and risk. In the sections that follow, we will examine some of the ways in which we can get beyond these limitations.

 **CT 4.2:** The distinction between assets in place and growth assets is a key component of financial analysis. Why is this distinction important?

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. In this section, we 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 to either generate future cash inflows or reduce future cash out flows. 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 upwards for improvements made to the asset since purchase and downwards 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 for valuing an asset vary across different kinds of assets, three principles underlie the way assets are valued in accounting statements.

- *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, they view the historical cost as the best estimate of the value of an asset.
- *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 values are estimated for an asset based upon expected future cash flows.

- *A Preference for under estimating value rather than over estimating 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 of both raw material 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 assets like patents and trademarks that presumably will create future earnings and cash flows, and also uniquely accounting assets such as goodwill that arise because of acquisitions made by the firm.

Fixed Assets

Generally accepted accounting principles 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 choice 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, 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 former¹, at least in the years right after the asset is acquired. In contrast, Japanese and German firms often use accelerated depreciation for both tax and financial reporting purposes, leading to reported income which is understated relative to that of their U.S. counterparts.

☞ *CC 4.1*: What factors might cause the market value of an asset to deviate dramatically from its book value?

Current Assets

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

¹ 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.

Accounts Receivable

Accounts receivable represent money owed by individuals 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 the payment, it is creating accounts receivable. The accounting convention is for accounts receivable to be recorded as the amount owed to the firm, based upon the billing at the time of the credit sale. The only major valuation issue relates to 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 when they do. 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 to be ever 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. We will examine the valuation of marketable securities later in this section.

Inventory

Three basis approaches to valuing inventory are allowed by GAAP: FIFO, LIFO and Weighted Average.

(a) *First-in, First-out (FIFO)*: Under FIFO, the cost of goods sold is based upon the cost of material bought earliest in the period, while the cost of inventory is based upon 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.

(b) *Last-in, First-out (LIFO)*: Under LIFO, the cost of goods sold is based upon the cost of material bought towards 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.

(c) *Weighted Average*: Under the weighted average approach, both inventory and the cost of goods sold are based upon the average cost of all units 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 upon prices paid towards 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 carry forwards 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 inventory values 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 upon 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, and other marketable securities including treasury bills or bonds. The way in which these assets are valued depends upon 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 upon the categorization.

Minority, Passive Investments

If the securities or assets owned in another firm represent less than 20% 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 sub-categorized 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 investments 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 investments that are 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 trading investments, 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 through this choice, 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% and 50% 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 upon 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% of the overall ownership of that firm, an investment is treated as a **majority active investment**². 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. The share of the firm that is owned by other investors is shown as a **minority**

² Firms have evaded the requirements of consolidation by keeping their share of ownership in other firms below 50%.

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.

Intangible Assets

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

1. 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, the expenditure 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 not allowed to amortize goodwill or other intangible assets with no specific lifetime.

2. Goodwill

Intangible assets are sometimes by-products of acquisitions. When a firm acquires another firm, the purchase price is first allocated over 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 does create an intangible asset (goodwill) which has to be amortized over 40 years. Firms which do not want to see this charge against their earnings often use 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 are aggregated to create the consolidated balance of the combined firm.³

How well do accountants categorize assets and measure value?

In figure 4.5, there were two questions relating to asset value that we listed as important to answer. The first relates to the value of assets in place, and the second relates to the value of growth assets. We will assess how well accounting statements help in answering these questions.

Value of Assets in Place

Accountants often argue that the book value of the assets is a good measure of the value of assets in place. We would contend otherwise, and our reasons lie in our basic disagreement with each of the three principles at the start of this section:

1. The book value of assets, which reflects historical cost, is not a good measure of the current market value of these assets, especially because assets age and the macro-economic environment changes. The current value even of non-traded assets can be

³ The Financial Accounting Standards Board (FASB) was considering eliminating the use of pooling and reducing the amortization period for goodwill in purchase accounting to 20 years at the time this book went to print.

much better estimated by looking at the expected future cash flows the assets will generate for the firm.

2. For assets that are publicly traded and have a market value that is observable, such as investments in the securities of other firms or real estate, the market value is a better estimate of the current value of the firm than the book value. No matter what one thinks of markets, they are much more likely to reflect current information and the value of an asset than the original historical costs, adjusted using an often arbitrarily defined depreciation schedule.
3. Finally, in cases where the market value of assets is available, forcing companies to use the lesser of book value or market value or giving them the flexibility to choose between book and market value leads to misestimated values. Being conservative and under estimating value may be a virtue in accounting, but we should be aiming to get the best possible estimate of value, not the most conservative.

Having leveled this criticism, let us add that it is entirely understandable that accountants are leery about giving firms the latitude to estimate the value of non-traded assets. Some firms that will clearly misuse this power to over estimate their value and mislead investors.

Value of Growth Assets

If accounting measures of assets-in-place are flawed because of their dependence on book value and the inherent conservativeness of accounting principles, accounting measures of growth assets are at best shoddy and at worst non-existent. Some might counter by arguing that intangible assets really measure growth assets, but this argument does not hold up for several reasons. While patents and trademarks may be useful in generating future growth, they are not the only ingredients. In fact, firms in a vast number of sectors where neither ideas nor products can be patented often are able to generate high growth and have growth assets. For these firms, accounting principles give us no guidance on the value of growth assets. Even for firms in sectors like pharmaceuticals and biotechnology, where patents are granted and are then used to generate future growth, it is

difficult to see how the accounting measure of value can be used to capture the value of these patents. First, the value of the patent does not show up if it is internally generated. Second, if the patent was acquired, but the acquisition took place several years ago, the book value of the patent does not provide any measure of the value of growth that can be generated by the patent.

There are two specific instances in which accounting rules attempt, and fail, to answer the question of how much growth assets are worth and how to value them. The first is the acquisition of firms by other firms, and the other is the case in which assets are generated by internal research.

Accounting for Acquisitions

The use of book value to estimate historical cost for assets in place and the neglect of growth assets come into conflict with market value most noticeably when one firm acquires another. Since acquisitions are made at market value, and the value of the acquired firm's assets are at book value, accountants are left with the unenviable task of reconciling the two at the time of the acquisition. Whether they do so, and how, depends in large part on the way the acquisition is accounted for. With purchase accounting, goodwill supposedly measures intangible assets that the firm has accumulated that could not be captured in the book value of the assets. In reality, goodwill captures the effects of three variables. The first is the difference between the book value of assets in place and their current market value, the second is the value of growth assets and the third is the premium over value that was paid by the acquirer for real or perceived synergy. Whatever the combination of variables that goodwill ends up measuring, it is also quite obvious that amortizing it over forty years, as required in the US for instance, is senseless. In fact, the negative effect of forced amortization on earnings seems to be sufficient to cause firms to try to qualify for pooling.

To qualify for pooling accounting, an acquisition has to be financed entirely with the stock of the bidding firm⁴. In a pooling transaction, the book values of assets of the two firms are aggregated to arrive at the book value of assets of the combined firm. The new equity is valued in book value terms, and thus the market price paid on the acquisition is not considered. While pooling does allow firms to maintain the illusion that book values actually measure asset value, it obscures valuable information on the acquisition.

There are conditions under which the choice between pooling and purchase can have real effects on the cash flows and value of the firm. The first occurs when all or some of the goodwill amortization is tax deductible. In any acquisition where market value exceeds book value, the use of purchase accounting should result in higher cash flows and value than the use of pooling accounting. The other instance occurs when there are constraints on dividend and debt policy, stated in terms of retained earnings, that might become tighter if there are amortization expenses that reduce earnings; if there are, the use of pooling accounting may provide the firm with more flexibility on both dividend and financing decisions.

Illustration 4.1: Measuring Asset Value

Table 4.1 summarizes asset values, as measured in the balance sheets of Boeing, The Home Depot and InfoSoft at the end of the 1998 financial year:

Table 4.1: Balance Sheets: Boeing, Home Depot and InfoSoft

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Fixed Assets	\$8,589	\$8,160	\$4,000
Goodwill	\$2,312	\$140	
Investments and Notes Receivable		\$41	
Deferred Income Taxes	\$411	\$0	
Prepaid Pension Expense	\$3,513	\$0	
Customer Financing	\$4,930	\$0	
Other Assets	\$542	\$191	
<i>Current Assets</i>			
Cash	\$2,183	\$62	\$100

⁴ This is only one of a number of conditions that have to be met for pooling to be allowed.

Short-term Marketable Investments	\$279	\$0	\$400
Accounts Receivables	\$3,288	\$469	\$500
Current Portion of Customer Financing	\$781	\$0	
Deferred Income Taxes	\$1,495	\$0	
Inventories	\$8,349	\$4,293	\$2,500
Other Current Assets	\$0	\$109	
Total Current Assets	\$16,375	\$4,933	\$3,500
Total Assets	\$36,672	\$13,465	\$7,500

There are a number of points worth noting about Boeing and the Home Depot, the two publicly traded companies.

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, both Boeing and InfoSoft fail to report the value of a very significant asset, which is the effect of past research and development expenses. Since accounting convention requires that these be expensed in the year that they occur and not capitalized, the research asset does not show up in the balance sheet.

Valuing the Research Asset

A significant shortcoming of accounting statements is the way in which they treat research and development expenses. Under the rationale that the products of research are too uncertain and difficult to quantify, accounting standards have evolved requiring all R&D expenses to be expensed in the period in which they occur. This has several consequences, but one of the most profound is that the value of the assets created by research does not show up on the balance sheet as part of the total assets of the firm. This, in turn, creates ripple effects for the measurement of capital and profitability ratios for the firm.

We would argue that research expenses, notwithstanding the uncertainty about future benefits, should be capitalized. To capitalize and value research assets, we first need to make an assumption about how long it takes for research and development to be converted, on average, into commercial products. This is called the **amortizable life** of these assets. This life will vary across firms and reflect the commercial life of the products that emerge from the research. To illustrate, research and development expenses at a pharmaceutical company should have fairly long amortizable lives, since the approval process for new drugs is long. In contrast, research and development expenses at a software firm, where products tend to emerge from research much more quickly and have shorter commercial lives, should be amortized over a shorter period.

Once the amortizable life of research and development expenses has been estimated, the next step is to collect data on R&D expenses over past years ranging back to the amortizable life of the research asset. Thus, if the research asset has an amortizable life of 5 years, the R&D expenses in each of the five years prior to the current one have to be

obtained. For simplicity, it can be assumed that the amortization is uniform over time, which leads us to the following estimate of the residual value of research asset today:

$$\text{Value of the Research Asset} = \sum_{t=-(n-1)}^{t=0} \text{R\&D}_t \frac{(n+t)}{n}$$

Thus, in the case of the research asset with a five-year life, we cumulate 1/5 of the R&D expenses from four years, 2/5 of the R & D expenses from three years, 3/5 of the R&D expenses from two years ago, 4/5 of the R&D expenses from last year and this year's entire R&D expense to arrive at the value of the research asset.

Illustration 4.2: Measuring the Value of the Research Asset

To value the research asset for both firms, we first need to make an assumption about the amortizable life of the asset. In the case of Boeing, the products are new and improved airplanes that have long commercial lives. Consequently, we use a ten-year life for Boeing's research asset and assume that any research expenses are amortized uniformly in the ten years after the expense is incurred. Table 4.2 values the research asset at Boeing, based upon the R&D expenses at Boeing over the last 10 years (including the current year):

Table 4.2: Valuing Boeing's Research Asset

Year	R&D	Unamortized Portion	Value
1989	\$754	0.10	\$75
1990	\$827	0.20	\$165
1991	\$1,417	0.30	\$425
1992	\$1,846	0.40	\$738
1993	\$1,661	0.50	\$831
1994	\$1,704	0.60	\$1,022
1995	\$1,300	0.70	\$910
1996	\$1,633	0.80	\$1,306
1997	\$1,924	0.90	\$1,732
1998	\$1,895	1.00	\$1,895
Capitalized Value of R&D Expenses =			\$9,100

The research and development expense in 1989 was \$ 754 million; since 10% of that value has been amortized each year since, only 10% of the expense remains unamortized, yielding the remaining value of \$ 75 million. The same process is repeated for each

expense, concluding with the current year's R&D expense of \$1,895 million that has not been amortized yet. Summing up the remaining values of all the research expenses over the last 10 years yields a value of \$9.1 billion for the research asset at Boeing.

To value InfoSoft's research asset, we assumed a much shorter amortizable life of 3 years. Table 4.3 summarizes the value of InfoSoft's research asset, based upon R&D expenses over the last 3 years.


Table 4.3: R & D Asset: InfoSoft

Year	R&D	Unamortized Portion	Unamortized amount
-3	\$1,500		
-2	\$2,400	0.33333	\$800
-1	\$3,200	0.66667	\$2,133
0	\$4,000	1	\$4,000
Value of Research Asset =			\$6,933

The value of the research asset in this case is \$6.933 million.



R&Dconv.xls: This spreadsheet allows you to convert research and development expenses from operating to capital expenses.

 CT 4.3: Given current accounting standards, what types of firms will see the values of their assets understated and why?

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 liability 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

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

1. It 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 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. In the section that follows, we 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 and 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

1. 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.

2. 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.
3. 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.
4. Other short term liabilities, which is a catch-all 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, in terms of 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 due at maturity. The difference between the issue price and the face value is amortized each period and is treated as a non-cash 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 (fall), the present value of the loan obligations should decrease (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 which have long term debt denominated in non-domestic 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 home currency.

☞ *CC 4.2*: Assume that all of the debt on your books was borrowed three years ago, when the treasury bond rate was 7% and you were borrowing at 7.5%. If the treasury bond rate today is 6%, and you are a riskier firm than you used to be, will the market value of your debt be greater than or less than your book value? Explain.

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 last two decades accountants have increasingly moved towards quantifying these liabilities and showing them as long term liabilities.

1. 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 -

- (a) the lease life exceeds 75% of the life of the asset
- (b) there is a transfer of ownership to the lessee at the end of the lease term
- (c) there is an option to purchase the asset at a "bargain price" at the end of the lease term.
- (d) the present value of the lease payments, discounted at an appropriate discount rate, exceeds 90% 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 revenue code uses slightly different criteria⁵ for determining whether the lease is an operating lease.

2. Employee Benefits

Employers 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.

a. 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 which 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 pre-specified 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 prior contributions made by the employer and the returns they have earned, and the rate of return that the employer expects

⁵ The requirements for an operating lease in the revenue code are as follows - (a) the property can be used by someone other than the lessee at the end of the lease term, (b) the lessee cannot buy the asset using a bargain purchase option, (c) the lessor has at least 20% of its capital at risk, (d) the lessor has a positive cash flow from the lease independent of tax benefits and (e) the lessee does not have an investment in the lease.

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 over-funded plan, whereas one whose assets are less than its liabilities is an under-funded plan, and disclosures to that effect have to be included in financial statements, generally in the footnotes.

When a pension fund is over-funded, 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 over-funding is a transitory phenomenon that could well disappear by the next period. When a fund is under-funded, the firm has a liability, though accounting standards require that firms reveal only the excess of accumulated⁶ pension fund liabilities over pension fund assets on the balance sheet.

b. Health Care Benefits

A firm can provide health care benefits in one 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. The key difference between the two is that firms do not have to report⁷ the excess of their health

⁶ 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.

⁷ While companies might not have to report the excess of their health care obligations over assets as a liability, some firms choose to do so anyway.

care obligations over the health care fund assets as a liability on the balance sheet, though a footnote to that effect has to be added to the financial statement.

3. 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 which pays \$55,000 on its taxable income based upon its tax accounting, and which would have paid \$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 as 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 the other hand, the firm will eventually have to pay its deferred taxes, and treating it 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 viewed in accounting as 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, a few other items also end up in 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 our 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 reduction in the 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 is an increase in the number of shares outstanding. 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 accountants, 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.

How well do accountants measure the financing mix of the firm?

The accounting measures of what comprises debt, and what the values of debt and equity are, represent the logical extension of the principles of historical cost and conservative estimation that underlie the way accountants approach asset valuation. From a

financial analysis standpoint, there are many points on which we can disagree with accounting assessments of the values of debt and equity.

Classification into Debt and Equity

On the definition of debt, we would agree with the accounting assessment that for an item to be treated as a liability it has to give rise to a fixed obligation or obligations in the future. We would add two additional conditions. The first is that the obligation has to be tax deductible; thus, preferred stock which gives rise to a fixed obligation (dividends) cannot be treated as debt. The second is that failure to meet the obligation should result in some or complete loss of control of the firm to the entity to whom the obligation is owed.

In the categorization of financing into debt and equity, the treatment of hybrid securities is the most troublesome component. Consider, for instance, the example of convertible bonds, which are part debt and part equity (i.e., the conversion option). The accounting convention is to treat these securities as debt until they get converted and then to treat them as equity. A far more rational approach is to try to break convertible bonds into their conversion option and straight bond components, and to treat the first as equity and the second as debt.

Valuation of Debt and Equity

On the issue of valuation, the use of historical cost for both debt and equity results in values for both which do not reflect the true value. This disparity is exaggerated as firms get older, and the book values become less and less meaningful as estimates of value, even for assets in place. The divergence between book and market values also gets larger as the value of growth assets increases, since the book value of equity cannot adequately reflect the value of expected growth. Finally, the emphasis on book value also results in a failure

to consider the effects on equity of option exercise, other than through the incomplete⁸ mechanism of reporting earnings and book value on a primary and fully diluted bases. On debt, the divergence between market and book value tends to be smaller and the growth effect does not play as significant a role as it does in the valuation of equity.

Illustration 4.3: Measuring Liabilities and Equity

Table 4.4 summarizes the accounting estimates of liabilities and equity at Boeing, The Home Depot and InfoSoft for the 1998 financial year:

Table 4.4: Liabilities – Boeing, Home Depot and InfoSoft

	<i>Boeing</i>	<i>The Home Depot</i>	<i>InfoSoft</i>
Accounts Payable & other liabilities	\$10,733	\$1,586	\$1,000
Accrued Salaries and Expenses		\$1,010	
Advances in excess of costs	\$1,251	\$0	
Taxes payable	\$569	\$247	
Short term debt and Current LT debt	\$869	\$14	\$500
Total Current Liabilities	\$13,422	\$2,857	
Accrued Health Care Benefits	\$4,831		
Other Long Term Liabilities		\$210	
Deferred Income Taxes		\$83	
Long-term Debt	\$6,103	\$1,566	\$4,000
Minority Interests		\$9	
Shareholder's Equity			
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	\$3,500
Total Liabilities	\$36,672	\$13,465	\$7,500

The most significant difference between the two publicly traded 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'

⁸ It is incomplete because the fully diluted number of shares lumps together valuable and useless options, in-the-money and out-of-the-money options and options with a few days left to expiration and options with years left to expiration together.

equity for both firms represents the book value of equity and is significantly different from the market value of equity. Table 4.5 summarizes the difference at the end of the 1998.

Table 4.5: Book and Market Value of Equity Comparison

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoftot</i>
Book Value of Equity	\$12,316	\$8,740	\$3,500
Market Value of Equity	\$32,595	\$85,668	NA

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.

Operating Leases, Capital Leases and Debt

When a lease is classified as an operating lease, the lease expenses are treated as operating expenses and the operating lease does not show up as part of the debt of the firm. When a lease is classified as a capital lease, the present value of the lease expenses is treated as debt, and interest is imputed on this amount and shown in the income statement. In practical terms, however, reclassifying operating leases as capital leases can substantially increase the debt shown on the balance sheet substantially especially for firms in sectors which have significant operating leases; airlines and retailing come to mind.

We would make the argument that in an operating lease, the lease payments are just as much a commitment as are lease expenses in a capital lease or interest payments on debt. The fact that the lessee may not take ownership of the asset at the end of the lease period, which seems to be the criterion on which the operating/capital lease choice is made, should not be a significant factor in whether the commitments are treated as the equivalent of debt.

Converting operating lease expenses into a debt equivalent is straightforward. The operating lease commitments in future years, which are revealed in the footnotes to the

financial statements for US firms, should be discounted back at a rate that reflects their status as unsecured and fairly risky debt. As an approximation, using the firm's current pre-tax cost of borrowing as the discount rate yields a good estimate of the value of operating leases. Note that capital leases are accounted for similarly in financial statements, but the significant difference is that the present value of capital lease payments is computed using the cost of debt at the time of the capital lease commitment and is not adjusted as market rates change.

Illustration 4.4: The Debt Value of Operating Leases

Both Boeing and the Home Depot have operating leases, though they comprise a much larger cost for the latter. In this illustration, we will estimate the “debt value” of these operating leases, by taking the present value of operating lease expenses over time. To compute the present value of operating leases in Table 4.6, we use the pre-tax cost of borrowing for each firm – 5.80% for the Home Depot and 5.50% for Boeing.

Table 4.6: Debt Value of Operating Leases

Boeing			Home Depot	
Year	Operating Lease Expense	Present Value at 5.5%	Operating Lease Expense	Present Value at 5.8%
1	\$ 205	\$ 194.31	\$ 294	\$ 277.88
2	\$ 167	\$ 150.04	\$ 291	\$ 259.97
3	\$ 120	\$ 102.19	\$ 264	\$ 222.92
4	\$ 86	\$ 69.42	\$ 245	\$ 195.53
5	\$ 61	\$ 46.67	\$ 236	\$ 178.03
Yr 6 -15	\$ -	\$ -	\$ 270	\$ 1,513.37
PV of Operating Lease Expenses		\$ 562.64		\$ 2,647.70

The operating lease expenses after year 5 for the Home Depot are treated as an annuity. The present value of operating leases is treated as the equivalent of debt. Thus, Boeing has \$562 million more in debt than is reported in the balance sheet, and the Home Depot has \$2,648 million more in debt than is reported in the balance sheet.



Oplease.xls: This spreadsheet allows you to convert operating lease expenses into debt.

CT 4.4: Sports teams often enter into multi-year contracts with their star players. These contracts usually involve the commitment to make large payments over several years to the players, with no escape clauses. How would you treat these commitments in computing how much these sports teams owe?

Measuring Earnings and Profitability

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. In terms of our description of the firm, the income statement is designed to measure the earnings from assets in place. In this section, we 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 match⁹ expenses to revenues. This is in contrast to a cash based system

⁹ If a cost (such as an administrative cost) cannot be easily linked with a particular revenues, it is usually recognized as an expense in the period in which it is consumed.

of accounting, where revenues are recognized when payment is received, while 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 non-equity 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 life (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.

Revenue Recognition and the Matching Principle

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 for which it has received in return either cash or a receivable that is both observable and measurable. Expenses linked directly to the production of revenues (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, for instance, 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 a service, the firm providing the good or service may recognize the income only when it collects portions of the selling price under the installment method.

Operating Expenses

Reverting back to our 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 economical 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.

Adjusting Income to Reflect Research Expenses and Operating Leases

The accounting measures of operating and net income reflect the accounting treatment of both research expenses and operating leases as operating expenses. Earlier we

argued that neither expense is an operating expense. Research expenses, we noted, are really capital expenditures designed to generate future growth and give rise to a research asset. Operating expenses represent financing expenses, and the present value of these expenses should be considered as the equivalent of debt.

To make the appropriate adjustments to operating income, we first add back the research expenses and operating lease expenses. We then subtract out the amortization of the research asset and the depreciation on the asset created by converting operating lease expenses into debt. To estimate the amortization of the research asset, we make the simplifying assumption that R&D is written off linearly over its amortizable life. The R&D amortization can then be estimated as follows:

$$\text{Amortization of Research asset} = \frac{\sum_{t=-n}^{t=-1} R \& D_t}{n + t + 1}$$

The depreciation on the operating lease asset can be estimated using a straight line depreciation schedule, as well. The adjusted operating income then reflects a corrected measure of the operating earnings.

$$\begin{aligned} \text{Adjusted Operating Income} = & \text{Operating Income} + \text{R\& D Expenses} + \text{Operating lease} \\ & \text{expenses} - \text{Amortization of Research Asset} - \text{Depreciation of the asset created by the} \\ & \text{operating leases} \end{aligned}$$

We can simplify the operating lease adjustment if we assume that the interest expense on the debt created by converting operating leases will be equal to the difference between the operating lease expense and the depreciation of the asset created by the operating leases:

$$\begin{aligned} \text{PV of Operating lease expense} * \text{Interest rate on debt} = & \text{Operating lease expense} - \\ & \text{Depreciation of the asset created by the operating leases} \end{aligned}$$

Since taxes are still based upon the conventional treatment of R&D and operating lease expenses, the adjusted after-tax operating income can be estimated as follows:

$$\begin{aligned} \text{Adjusted After-tax Operating Income} = & \text{Operating Income} (1-t) + \text{R\& D Expenses} - \\ & \text{Amortization of Research Asset} + \text{Imputed interest expense on operating leases} \end{aligned}$$

Note that neither the amortization of the research asset nor the depreciation of the operating lease asset is depreciable, while R& D expenses and operating lease expenses are fully tax deductible.

The net income needs to be adjusted only for the R&D expense; the reclassification of operating leases from operating to financing expense should have no impact since net income is after both expenses. To adjust net income for R&D expenses, we add back R&D expenses and subtract the amortization of the research asset.

$$\text{Adjusted Net Income} = \text{Net Income} + \text{R\& D Expenses} - \text{Amortization of Research Asset}$$

The adjustments will generally increase both operating income and net income for firms where these expenses have been increasing over time.

Nonrecurring Items in Earnings Reports

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 the following:

- a. 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.
- b. 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.

- c. Losses associated with discontinued operations, which measure both the loss from the phase out period and any estimated loss on sale of the operations. To qualify, however, the operations have to be separable from the firm.
- d. Gains or losses associated with accounting changes, which measure earnings changes created by accounting changes made voluntarily by the firm (such as a change in inventory valuation) and accounting changes mandated by new accounting standards.

In practical terms, however, cleansing earnings of extraordinary items is made more difficult by the following factors:

- Firms are not consistent when it comes to separating ordinary from extraordinary gains and losses. Firms sometimes show write-offs and restructuring charges as part of their operating expenses, though they add footnotes to the effect that these are not normal expenses. Thus, it is up to the analyst to peruse the footnotes and make the necessary corrections to the earnings.
- In recent years, we have been witnesses to the strange phenomenon of recurring nonrecurring expenses, i.e., nonrecurring expenses that show up year after year in a firm's financial statement. This would suggest that some firms are taking advantage of the looseness in the distinction to classify operating expenses as nonrecurring expenses.
- Firms seem to vary in the way they estimate restructuring charges and write-offs. More conservative firms seem to assess larger charges than less conservative firms, and this affects reported earnings.
- A related and even more dangerous trend seems to be the use of restructuring charges as a device to improve future earnings and profitability. By taking large restructuring charges, firms reduce depreciation in future periods and thus increase earnings. This

effect is accentuated when profitability is measured on a return basis, since the book value of capital and equity is also reduced by large restructuring charges.

These trends suggest that we should look at nonrecurring charges with skepticism, and the adjustments should reflect what we see. If nonrecurring charges are really operating expenses, they should be treated as such and earnings estimated after these charges. If they are truly nonrecurring, earnings should be estimated prior to these charges. When it comes to computing return on equity and capital, however, more reliable estimates may be obtained if the book value of equity and capital are estimated prior to extraordinary charges, not just in the current period but cumulatively over time.

Illustration 4.5: Measures of Earnings

Table 4.7 summarizes the income statements of Boeing, the Home Depot and InfoSoft for the 1998 financial year:

Table 4.7: Income Statements: Boeing, Home Depot and InfoSoft

	Boeing (in millions)	Home Depot (in millions)	InfoSoft (in thousands)
Sales & Other Operating Revenues	\$56,154.00	\$30,219.00	\$20,000.00
- Operating Costs & Expenses	\$51,022.00	\$27,185.00	\$14,000.00
- Depreciation	\$1,517.00	\$373.00	
- Research and Development Expenses	\$1,895.00	\$0.00	\$4,000.00
Operating Income	\$1,720.00	\$2,661.00	\$2,000.00
+ Other Income (Includes Interest Income)	\$130.00	\$30.00	
- Interest Expenses	\$453.00	\$37.00	\$315.00
Earnings before Taxes	\$1,397.00	\$2,654.00	\$1,685.00
- Income Taxes	\$277.00	\$1,040.00	\$707.70
Net Earnings (Loss)	\$1,120.00	\$1,614.00	\$977.30

Boeing's operating income is reduced by the research and development expense, which as we noted earlier is more a capital than an operating expense. InfoSoft's operating income is also reduced by a substantial charge for research and development. The Home Depot's operating expenses include operating leases, which we argued earlier should be really classified as financing expenses.

The operating and net income for all three companies can be restated to reflect our earlier arguments that research expenses are really capital expenditures and that operating lease expenses should be treated as financing expenses.

Illustration 4.6: Adjusted Earnings

In table 4.8, we adjust the operating income, after-tax operating income and net income at the three companies for one-time charges, research expenses and operating lease expenses. We first computed the amortization of the research asset at Boeing and InfoSoft – Boeing, with a 10-year amortizable life, and InfoSoft, with a 3-year life.

Table 4.8: Adjusted Earnings for R&D Expenses

Boeing				
<i>Year</i>	<i>R&D expense</i>	<i>Unamortized</i>	<i>Remaining years</i>	<i>Amortization</i>
-10	\$751	\$75.1	1	\$75.1
-9	\$754	\$150.8	2	\$75.4
-8	\$827	\$248.1	3	\$82.7
-7	\$1,417	\$566.8	4	\$141.7
-6	\$1,846	\$923.0	5	\$184.6
-5	\$1,661	\$996.6	6	\$166.1
-4	\$1,704	\$1,192.8	7	\$170.4
-3	\$1,300	\$1,040.0	8	\$130.0
-2	\$1,633	\$1,469.7	9	\$163.3
-1	\$1,924	\$1,924.0	10	\$192.4
				\$1,381.7
InfoSoft				
-3	\$1,500	\$500.0	1	\$500.0
-2	\$2,400	\$1,600.0	2	\$800.0
-1	\$3,200	\$3,200.0	3	\$1,066.7
				\$2,366.7

We then computed the imputed interest expense on the debt value of operating leases for both Boeing and the Home Depot, computed in illustration 4.4, and adjusted operating earnings for operating lease expenses.

	<i>Boeing</i>	<i>The Home Depot</i>
PV of Operating Leases	\$ 562.64	\$ 2647.70
Interest rate on Debt	5.50%	5.80%
Imputed interest expense on PV of operating leases	\$ 30.95	\$ 153.57

Finally, we adjusted the operating income at all three firms for R&D expenses and operating leases in Table 4.9:

Table 4.9: Adjusted Operating Income

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Operating Income	\$1,720	\$2,661	\$2,000
+ Research and Development Expenses	\$1,895	\$0	\$4,000
- Amortization of Research Asset	\$1,382	\$0	\$2,367
+ Imputed Interest Expense on Operating Leases	\$ 31	\$ 154	\$ -
= Adjusted Operating Income	\$2,264	\$2,815	\$3,633

Note that the adjusted operating income is substantially higher than the stated operating income for Boeing and InfoSoft. This is due to the fact that both firms have large R&D expenses that have increased over time. The Home Depot's operating income is increased because we add back the imputed interest expense on the debt, which we now treat as a financing expense.

The after-tax adjusted operating income is computed table 4.10 below for all three firms as well:

Table 4.10: Adjusted After-tax Operating Income

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Operating Income (1-t)	\$1,118	\$1,730	\$1,160
+ Special and One-time Charges (1-t)	\$0	\$0	\$0
+ Research and Development Expenses	\$1,895	\$0	\$4,000
- Amortization of Research Asset	\$1,382	\$0	\$2,367
+ Imputed Interest Expense (1- t)	\$20	\$100	\$0
= Adjusted After-tax Operating Income	\$1,651	\$1,829	\$2,793

You might wonder why we add back the after-tax portion of the special and one-time charges, while looking at the pre-tax portions of R&D expenses. We want to neutralize the effect of one-time charges and consider what the income would have been if these charges had not occurred. To the extent that these charges are tax deductible, the existing after-tax operating income has been reduced by only the after-tax portion of these charges.

For research expenses, we add back the entire expense since we want to preserve the tax advantage in the operating income. We do this because the revenue code still allows the firm to expense research expenses as they occur and thus bestows a significant tax benefit to the firm. The magnitude of this tax benefit can be estimated by taking the difference between the adjusted after-tax operating income estimated above and the after-tax

operating income we would have obtained by multiplying the pre-tax operating income in the previous table by $(1 - \text{tax rate})$.

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Adjusted After-tax Operating Income	\$1,651	\$1,829	\$2,793
Adjusted Operating Income $(1 - t)$	\$1,472	\$1,829	\$2,107
Tax Benefit of Expensing	\$180	\$0	\$686

Note that the tax benefit is much larger for Boeing and InfoSoft, which have large and increasing research expenses, than it is for the Home Depot whose operating lease expenses are increasing at a much slower rate.

Table 4.11 summarizes the adjusted net income at all three firms when one-time charges, research expenses and operating lease expenses are considered:

Table 4.11: Adjusted Net Income

	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Net Income	\$1,120	\$1,614	\$977
+ Special and One-time Charges $(1-t)$	\$0	\$0	\$0
+ R & D expenses	\$1,895	\$0	\$4,000
- Amortization of Research Asset	\$1,382	\$0	\$2,367
+ Operating Lease Expenses $(1-t)$	\$140	\$189	\$0
- Imputed Interest Expense $(1-t)$	\$20	\$100	\$0
- Depreciation $(1-t)$	\$120	\$89	\$0
= Adjusted Net Income	\$1,633	\$1,614	\$2,611

Note again the significant difference between the reported net income and the adjusted net income for Boeing and InfoSoft.

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 gauges 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.

I. Return on Assets (ROA) & Return on Capital (ROC)

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 is the accounting measure of operating income from the income statement, and total assets refers to the assets as measured using accounting rules, i.e., using book value 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 pre-tax basis with no loss of generality, by using the earnings before interest and taxes (EBIT), and not adjusting for taxes -

Pre-tax ROA = Earnings before interest and taxes / Total Assets

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

Finally, the ROA can be computed using the book value of debt and equity in the denominator instead of total assets. 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.

Return on Capital = EBIT (1-t) / (BV of Debt + BV of Equity)
--

Illustration 4.7: Estimating Return on Capital

Table 4.12 summarizes the after-tax return on asset and return on capital estimates for Boeing, the Home Depot and InfoSoft, using both average and beginning measures of capital in 1998:

Table 4.12: Return on Capital

	<i>Boeing</i>	<i>Boeing (Adjusted)</i>	<i>Home Depot</i>	<i>Home Depot (Adjusted)</i>	<i>InfoSoft</i>	<i>InfoSoft (Adjusted)</i>
After-tax Operating	\$1,118	\$1,651	\$1,730	\$1,829	\$1,160	\$2,793

Income						
BV of Capital - Beginning	\$19,807	\$28,394	\$8,525	\$11,173	\$6,500	\$11,800
BV of Capital - Ending	\$19,288	\$28,951	\$10,320	\$12,968	\$8,000	\$14,933
BV of Capital - Average	\$19,548	\$28,672	\$9,423	\$12,070	\$7,250	\$13,367
ROC (based on average)	5.72%	5.76%	18.36%	15.16%	16.00%	20.90%
ROC (based on beginning)	5.64%	5.82%	20.29%	16.37%	17.85%	23.67%

On an unadjusted basis, Boeing had a terrible year in terms of after-tax returns. The Home Depot and InfoSoft had much better years in terms of those same returns. We earlier argued that the reported operating income is depressed because of one-time charges, especially at Boeing, and by the accounting treatment of R&D expenses (at Boeing and InfoSoft) and operating lease expenses (at the Home Depot). The adjusted after-tax operating incomes estimated in illustration 4.6 are therefore used to compute adjusted returns on capital. The capital estimates also have to be adjusted, for consistency, to reflect the capitalization of operating lease expenses and R&D expenses. To illustrate the adjustment, the ending book values of capital at each of the firms are presented below with the adjustments.

<i>Capital Adjustment</i>	<i>Boeing</i>	<i>Home Depot</i>	<i>InfoSoft</i>
Book Value of Capital	\$19,288	\$10,320	\$8,000
+ Present Value of Operating Leases	\$ 563	\$ 2,648	\$ -
+ Capitalized value of research asset	\$9,100	\$0	\$6,933
= Adjusted Book Value of Capital	\$28,951	\$12,968	\$14,933

The adjusted return on capital increases for Boeing and InfoSoft, but declines for the Home Depot. In our view, this adjusted measure is a much better estimate of the true profitability of these firms.

☞ *CC 4.3:* A number of different definitions of return on assets exist. One measure divides the net income by the total assets. What are the problems with this measure, and what types of firms are likely to have low returns on assets, using this measure?

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.

$$\begin{aligned}
 \text{ROC} &= \text{EBIT} (1 - t) / \text{BV of Capital} \\
 &= \text{EBIT}(1-t)/\text{Sales} \quad * \quad \text{Sales /BV of Capital} \\
 &= \text{After-tax Operating Margin} \quad * \quad \text{Capital Turnover Ratio}
 \end{aligned}$$

$$\text{Pre-tax Operating Margin} = \text{EBIT} / \text{Sales}$$

Thus, a firm can arrive at a high ROC by either increasing its profit margin or more efficiently utilizing its capital to increase sales. There are likely to be competitive constraints and technological constraints on increasing sales, but firms still have some freedom within these constraints to choose the mix of profit margin and capital turnover that maximizes their 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.



There 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.

ROC of a firm versus Divisional ROC

The return on capital of a firm can be further disaggregated by division, and each division's ROC can be estimated separately.

$$\text{Divisional ROC} = \text{EBIT of division} (1-t) / \text{Book value of Capital of Division}$$

If the earnings and the capital of each division are clearly delineated, this statistic is easy to estimate. If assets are used by more than one division (headquarters expenses), and earnings are generated by multiple divisions, the analyst has to allocate the capital and earnings to the divisions before computing the ROC.

Illustration 4.8: ROC by division - Boeing in 1998

Boeing's business can be broadly divided into two segments - commercial aircraft and information, space, and defense systems. The following table summarizes the return on capital for each segment, based upon Boeing's adjusted earnings and capital in 1998.

	<i>Commercial Aircraft</i>	<i>Information, Space & Defense</i>	<i>Firm</i>
Operating Income	\$ 75	\$ 1,576	\$ 1,651
Capital Invested	\$ 18,673	\$ 9,721	\$ 28,394

After-tax ROC	0.40%	16.21%	5.82%
---------------	-------	--------	-------

In estimating operating income by division, we adjusted for research and operating leasing expenses. The capital is allocated based upon the book value of assets reported by Boeing for each segment. Note that the return on capital is much lower for the commercial aircraft division, but that might reflect the sharp drop in operating income reported for this segment in 1998 by the firm.

II. 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 profits to the equity investor (net profit after taxes and interest expenses) to the book value of the equity investment.

$$\text{Return on Equity} = \text{Net Income} / \text{Book Value of Common Equity}$$

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 upon 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 which 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 follows¹⁰–

¹⁰ $\text{ROC} + D/E (\text{ROC} - i (1-t)) = (\text{NI} + \text{Int} (1-t))/(\text{D}+\text{E}) + D/E \{ (\text{NI} + \text{Int} (1-t))/(\text{D}+\text{E}) - \text{Int} (1-t)/\text{D} \}$

$$ROE = ROC + D/E (ROC - i (1-t))$$

where,

$$ROC = EBIT (1 - t) / (BV \text{ of Debt} + BV \text{ of Equity})$$

$$D/E = BV \text{ of Debt} / BV \text{ of Equity}$$

$$i = \text{Interest Expense on Debt} / BV \text{ of Debt}$$

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

The second term captures the benefit of financial leverage.

☞ *CC 4.4*: Two firms in the same business can arrive at similar returns on equity, one by taking great projects (high ROC) and the other by taking high leverage on average projects. Is there a qualitative difference between the two firms? Which ROE is of higher quality? Why?

Illustration 4.9: ROE Computations

Table 4.13 summarizes the return on equity for Boeing, the Home Depot and InfoSoft in 1998:

Table 4.13: Return on Equity

<i>Return Ratios</i>	<i>Boeing</i>	<i>Boeing (Adjusted)</i>	<i>Home Depot</i>	<i>Home Depot (Adjusted)</i>	<i>InfoSoft</i>	<i>InfoSoft (Adjusted)</i>
Net Income	\$1,120	\$1,633	\$1,614	\$1,614	\$977	\$2,611
BV of Equity- Beginning	\$12,953	\$21,540	\$7,214	\$7,214	\$2,500	\$7,800
BV of Equity- Ending	\$12,316	\$21,416	\$8,740	\$8,740	\$3,500	\$10,433
BV of Equity - Average	\$12,635	\$21,478	\$7,977	\$7,977	\$3,000	\$9,117
ROE (based on average)	8.86%	7.60%	20.23%	20.23%	32.58%	28.64%
ROE (based on beginning)	8.65%	7.58%	22.37%	22.37%	39.09%	33.47%

$$= \{ (NI + \text{Int} (1-t)) / (D+E) \} (1 + D/E) - \text{Int} (1-t) / E$$

$$= NI / E + \text{Int} (1-t) / E - \text{Int} (1-t) / E = NI / E = ROE$$

The results again indicate that Boeing had a poor year in 1998, while the Home Depot and InfoSoft reported healthier returns on equity. On an adjusted basis, Boeing's return on equity does not look any better. Note that the adjusted net income is from illustration 4.6, and the adjustments to book value of equity parallel those to book value of capital. The capitalized value of the research asset is added to equity, but the present value of operating lease expenses is not, since it is treated as debt.

The returns on equity can also be estimated by decomposing into the components specified above (using the adjusted beginning of the year numbers):

	<i>Boeing</i>	<i>Home Depot</i>
After-tax ROC	5.82%	16.37%
Debt/Equity Ratio	35.18%	48.37%
Book Interest Rate (1-tax rate)	4.22%	4.06%
ROE	6.38%	22.33%

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



There 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.

How well do accountants measure profitability?

Does the income statement provide us with a good measure of the earnings from a firm's assets or investments in place? Are the accounting measures of return - return on equity and return on capital - reasonable estimates of the returns made on investments? While the information provided in an income statement is clearly invaluable from a financial analysis perspective, components of it are misleading and incomplete. In particular, the key problems with accounting earnings measures are as follows:

- *Use of accrual accounting:* While the conceptual rationale for matching revenues to costs in each period has a strong basis, the use of accrual accounting does result in an

estimate of accounting earnings that might be very different from the cash earnings of the firm during the same period. In the process of going from cash earnings to accrual earnings, accountants also tend to create assets such as inventory, accounts receivable and accounts payable, which then have to be adjusted for to arrive at the cash flows. What about the statement of cash flows? While a cash flow statement does provide us very valuable information about the capital expenditure, acquisition cost and other financing actions of a firm during a period, its objective is not to estimate the cash earnings of the firm.

- *Operating, Financing and Capital Expenditures:* Let us begin by conceding the rationale for the separation of costs into operating, financing and capital expenditures, which is to provide an estimate of both operating and equity earnings from assets in place, prior to investments being made that generate growth in future periods.

There are two basic problems with the practical application of this categorization. The first is the rigidity with which capital expenses are written off over time through depreciation and amortization schedules. Not only is accounting depreciation almost never equal to economic depreciation, i.e., the loss in value associated with aging, but there is almost no attempt to estimate economic depreciation.


The other problem with the cost categorization is the inconsistency in its application, as evidenced in the treatment of operating leases and research expenses as operating expenses.

- *Measuring Returns:* Both the return on equity and capital are estimated based upon the accounting measures of equity and capital invested. To the extent that these book value estimates are outdated and do not reflect the market value of the assets in place at the firm, the return estimates are likely to be misleading. Furthermore, the inconsistencies in classifying expenses into operating, financing and capital expenses can have profound consequences for return estimation. Thus, the treatment of research and development expenses as operating expenses reduces earnings at firms with high levels

of these expenses (such as pharmaceutical and high technology firm).. Capitalizing research and development expenses would allow firms to show the value as an asset on the balance sheet, while pushing up the capital invested. Similarly, the reclassification of a lease expense from an operating lease expense to a capital lease expense can have a large effect on return on capital computations, with an increase in operating income (since capital lease expenses are not operating expenses) and in book value of capital (since the present value of capital leases are treated as the equivalent of debt). Finally, taking major restructuring charges or stock buybacks can cause book values to plummet and returns to escalate, leaving us with a skewed view of the overall profitability of a firm's assets in place.



This spreadsheet allows you to compute the profitability ratios for a firm, based upon financial statement data.

 CT 4.5: A high-technology firm announces a large increase in profits, largely as a consequence of cutting back on R&D expenses. Is the firm more profitable? Why or why not?

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 answer 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. In this section, we 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.

- a. The first is that the risk being measured is the risk of default, i.e. 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.
- b. 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 upon 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 number of disclosures that firms have to make about future obligations has 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 which hedge against risk, since the obligations on the contingent claim will be offset¹¹ by benefits elsewhere. In recent periods, however,

¹¹ This assumes that the hedge is set up competently. It is entirely possible that a hedge, if sloppily set up,

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. In the section on earnings, we looked at two of the profitability ratios – return on equity and return on capital. In this section, we will look at some of the financial ratios that are often used to measure the financial risk in a firm.

1. 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.

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

$\text{Current Ratio} = \text{Current Assets} / \text{Current Liabilities}$

can end up costing the firm money.

A current ratio below one, 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, which 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 upon its level¹² before the change.

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 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.

$$\text{Accounts Receivable Turnover} = \text{Sales} / \text{Average Accounts Receivable}$$

¹² If the current assets and current liabilities increase by an equal amount, the current ratio will go down if it was greater than one before the increase, and go up if it was less than one.

$$\text{Inventory Turnover} = \text{Cost of Goods Sold} / \text{Average Inventory}$$

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.

$$\text{Days Receivable Outstanding} = 365 / \text{Receivable Turnover}$$

$$\text{Days Inventory Held} = 365 / \text{Inventory Turnover}$$

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

$$\text{Accounts Payable Turnover} = \text{Purchases} / \text{Average Accounts Payable}$$

$$\text{Days Accounts Payable Outstanding} = 365 / \text{Accounts Payable Turnover}$$

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.

$$\text{Required Financing Period} = \text{Days Receivable Outstanding} + \text{Days Inventory Held} - \text{Days Accounts Payable Outstanding}$$

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



This is a dataset on the web that summarizes working capital ratios for firms in the United States, classified by industry.

Illustration 4.10: Working Capital Turnover Ratios - Boeing and Home Depot

Table 4.14 provides a computation of working capital ratios for Boeing and the Home Depot at the end of 1998:

Table 4.14: Working Capital Ratios

	<i>Boeing</i>	<i>Home Depot</i>
Current Assets	\$ 16,375	\$ 4,933
Current Liabilities	\$ 13,422	\$ 2,857
Current Ratio	1.22	1.73
Cash & Marketable Securities	\$ 2,462	\$ 62
Current Liabilities	\$ 13,422	\$ 2,857
Quick Ratio	0.18	0.02

Sales	\$ 56,154	\$ 30,219
Accounts Receivable	\$ 3,288	\$ 469
Accounts Receivable Turnover	17.08	64.43
Days Receivable	21.37	5.66
Cost of Goods Sold	\$ 51,022	\$ 27,185
Inventory	\$ 8,349	\$ 4,293
Inventory Turnover	6.11	6.33
Days Inventory Held	59.73	57.64
Purchases	\$ 51,022	\$ 27,185
Accounts Payable	\$ 10,733	\$ 1,586
Accounts Payable Turnover	4.75	17.14
Days Accounts Payable	76.78	21.29
Required Financing Period	4.32	42.01

^a Neither Boeing nor the Home Depot explicitly broke out purchases. We have used the cost of goods instead.

Boeing with its lower current and quick ratios and shorter financing period, seems to be less risky than the Home Depot, though the differences in their underlying businesses makes this a tenuous comparison. A more relevant comparison for each firm would be to the industry averages for all these ratios.



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

2. 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, 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 pre-debt, pre-tax earnings.

$$\text{Interest Coverage Ratio} = \text{Earnings before interest and taxes} / \text{Interest Expenses}$$

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 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** -

$$\text{Fixed Charges Coverage Ratio} = \{ \text{Earnings before interest and taxes} + \text{Fixed Charges} \} / \text{Fixed Charges}$$

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

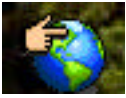
$$\text{Cash Fixed Charges Coverage Ratio} = \text{EBITDA} / \text{Cash Fixed Charges}$$

Both interest coverage and fixed charge 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 -

$$\text{Operating Cash flow to Capital Expenditures} = \text{Cash flows from Operations} / \text{Capital Expenditures}$$

While there 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.

$$\text{Cash flow from operations} = \text{EBIT} (1 - \text{tax rate}) - \text{Working Capital}$$



There is a dataset on the web that summarizes the interest coverage and fixed charge coverage ratios for firms in the United States, classified by industry.

Illustration 4.11: Interest and Fixed Charge Coverage Ratios

Table 4.15 summarizes interest and fixed charge coverage ratios for Boeing and Home Depot in 1998:

Table 4.15: Interest and Fixed Charge Coverage Ratios

	<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 Charge Coverage Ratio	2.90	9.02
EBITDA	\$ 3,341	\$ 3,034
Cash Fixed Charges	\$ 640	\$ 327
Cash Fixed Charge Coverage	5.22	9.28
Cash Flows from Operations	\$ 2,161	\$ 1,662
Capital Expenditures	\$ 1,584	\$ 2,059
CF/Cap Ex	1.36	0.81

Boeing, based upon its operating income in 1998, looks riskier than the Home Depot on both the interest coverage ratio and fixed charge 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.



This spreadsheet allows you to compute the interest coverage and fixed charge coverage ratios for a firm, based upon 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%. 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 -

$$\text{Debt/Equity Ratio} = (\text{Debt/Capital Ratio}) / (1 - \text{Debt/Capital Ratio})$$

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).

a. Variants on Debt Ratios

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.

$$\text{Long-term Debt to Capital Ratio} = \text{Debt} / (\text{Debt} + \text{Equity})$$

$$\text{Long-term Debt to Equity Ratio} = \text{Debt} / \text{Equity}$$

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 which do not have publicly traded bonds, but the market value of equity is not only easy to obtain, it is constantly updated to reflect market-wide 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 shift¹³ most market-value based debt ratios.

☞ CC 4.5: A standard approach to analyzing the debt ratio of a firm is to compare it to the debt ratios of firms in its peer group, using book value debt ratios. Which firms are likely to underutilize their debt capacities, using this approach, and why? Which are likely to overutilize debt and why?

Illustration 4.12: Book Value Debt Ratios and Variants- Boeing and Home Depot

Table 4.16 summarizes different estimates of the debt ratio for Boeing, the Home Depot and InfoSoft, using book values of debt and equity for all three firms:

Table 4.16: Book Value Debt Ratios

	<i>Boeing</i>	<i>Boeing</i>	<i>Home Depot</i>	<i>Home Depo</i>	<i>InfoSoft</i>	<i>InfoSoft</i>
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¹³ Deviations in the market value of equity from book value are likely to be much larger than deviation for debt, and are likely to dominate in most debt ratio calculations.

		(adjusted)		(adjusted)		(Adjusted)
Long Term Debt	\$6,103	\$6,666	\$1,566	\$4,214	\$4,000	\$4,000
Short Term Debt	\$869	\$869	\$14	\$14	\$500	\$500
BV of Equity	\$12,316	\$21,416	\$8,740	\$8,740	\$3,500	\$10,433
LT Debt/Equity	49.55%	31.12%	17.92%	48.21%	114.29%	38.34%
LT Debt / (LT Debt + Equity)	33.13%	23.74%	15.20%	32.53%	53.33%	27.71%
Debt/Equity	56.61%	35.18%	18.08%	48.37%	128.57%	43.13%
Debt/ (Debt + Equity)	36.15%	26.03%	15.31%	32.60%	56.25%	30.13%

Note that the debt is adjusted to reflect the present value of operating leases, which increases the debt outstanding at the Home Depot significantly. The equity is augmented by the capitalized value of research. The adjusted debt ratios are lower than the reported debt ratios for Boeing and InfoSoft, as capitalized research increases the value of the equity. The Home Depot, on the other hand, shows a much higher debt ratio when operating lease expenses are capitalized.




There 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.

How well do accountants measure the risk in a business?

How risky are the investments in a firm? We would argue that this is an area where accounting measures fall woefully short. Consider first the use of disclosures to reveal potential risk in a firm. The purpose of these disclosures may be to alert investors to potential problems in these firms. In reality, however, the sheer number of these disclosures and their focus on trivial detail leaves most non-accountants overwhelmed while giving them very little sense of the underlying risk in a firm.

If we define risk purely as default risk, accounting ratios do a reasonably good job of measuring a firm's capacity to meet its fixed obligations at any point in time, at least relative to other firms at the same point in time. Even here, financial ratios work much better when we look at them over time, taking into account the volatility in the earnings and

cash flows of the firm. If we define risk more broadly as the risk that actual returns will be lower than or different from expected returns, accounting measures provide us with very little information about this type of risk.

 CT 4.6: What accounting ratios would you use, and how would you use them, to measure a firm's exposure to equity risk (as opposed to default risk)?

Other issues in analyzing financial statements

Two more issues bear consideration before we conclude this section on financial statements. The first relates to differences in accounting standards and practices and how these differences may color comparisons across companies, and the second relates to accounting for acquisitions and how this can affect both the acquisition method and price.


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, and they cannot explain away radical departures from fundamental principles of valuation¹⁴. Choi and Levich, in a 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 4.17 summarizes accounting standards in eight major financial markets, and reveals that the common elements vastly outnumber those areas where there are differences.

¹⁴ At the peak of the Japanese market, there were many investors who explained away the price-earnings multiples of sixty 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 fifty for many firms, suggesting either extraordinary expected growth in the future or overvaluation.

The two countries that offer the strongest contrast to the United States are Germany and Japan. The key differences and their implications are as follows. 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 leases 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 and 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 U.S. 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.

 CT 4.7: As an investor in stocks, why might you want uniform accounting standards in different markets? What are some of the features you would like to have these uniform accounting standards to have?

Summary

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. We examine these differences in this chapter.

The first question that we examined related to the nature and the value of the assets owned by a firm. Categorizing assets into investments already made (assets in place) and investments yet to be made (growth assets), we argued that 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 that we looked at was the measurement of profitability. The two principles that seem to govern how profits are measured are accrual accounting – 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).

In the last part of the chapter, we examine how financial statements 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.

Live Case Study

Accounting Information and Financial Analysis

Objective:

To analyze financial statements and get a sense of how much a firm's assets are worth, how they are financed and how profitable they are, at least from an accounting standpoint.

Key Questions:

- a. What are the assets-in-place at the firm worth now? What is the composition of these assets? Are there any growth assets and what is their value?
- b. How are these assets financed? In particular, how much of the financing comes from equity and how much from debt?
- c. How profitable are the current investments of the firm?
- d. How much risk is there, at least from an accounting standpoint, in these assets?

Framework for Analysis:

I. Asset Valuation

- What is the book value of assets? (Consider net working capital, i.e., the difference between current assets and current liabilities, as an asset)
- Are there any significant assets that do not show up on the books (example: internally generated patents and assets under operating leases) and is there a way in which their value can be assessed?
- How old are the assets and how much of an inflation adjustment should there be to book value?
- Can you estimate the market value of any of the assets, and if so, how different is the book value from the market value for these assets? (Consider, for instance, minority holdings in other firms and how they are valued relative to market value)

II. Financing Mix

- How much does the firm owe? When was the debt borrowed and at what rate?

- Is there any financing or borrowing used by the firm that is not shown on the balance sheet? If so, what is the estimated value of this financing? (Example: Operating Leases)
- What is the book value of equity? How different is it from the market value of equity?
- Has the book value of equity been significantly affected by actions such as stock buybacks, and if so, how much?
- Collectively, what is the book value of capital in this firm? With the adjustments made for items such as R&D, operating leases and accounting changes, what is the adjusted book value of capital?

III. Profitability

- What is the operating income made by the firm?
 - Are there any operating expenses that are designed to create future growth and therefore should be reclassified as capital expenses? (Example: R&D expenses)
 - Are there any financing expenses that are being treated as operating expenses? (Example: Operating Lease expenses)
 - What is the adjusted operating income after these changes have been made?
 - What is the return on capital made by the firm, using both the conventional accounting measures of operating income and book capital, and the adjusted measures of operating income and book capital?
- What is the net income made by the firm?
 - Are there any extraordinary or one-time charges (income) affecting this estimate?
 - Are any of the expenses used to compute net income really capital expenses?
 - Is the income from holdings in other firms being adequately captured in the net income?
 - What portion of the net income can be attributed to movements in exchange rates?
 - What is the return on equity made by the firm, using both the conventional accounting measures of net income and book equity, and the adjusted measures of net income and book equity?

IV. Risk Analysis

- Are there any disclosures in the financial statements relating to risk that the firm may be exposed to in the future?
- How solvent is the firm in the short term in terms of being able to meet its obligations? (Compute the working capital ratios)
- How solvent is the firm in the long term in being able to meet its obligations? (Compute the coverage ratios)
- How volatile have the firm's earnings been over time?

Questions

1. Identify are the three basic accounting statements, and the objective of each statement.
2. An investment in buildings or equipment is treated as a capital expenditure in financial statements. Assume that you are looking at two firms that have invested equivalent amounts in capital equipment at the same point in time. Furthermore, assume that one firm used straight line depreciation to depreciate the assets, while the other used accelerated depreciation. If the assets are half way through their useful lives, which firm will have a higher book value for these assets?
3. You are examining the income statement for a firm and notice, in a footnote, that the firm switched from FIFO to LIFO for valuing inventory, during the period. If the inflation rate during the year was 10%, what effect will this change have on the net income reported for the year and why?
4. Seven Stores Inc. announces that it will be acquiring Stevens Stores, another retail firm, for \$ 1 billion. The book value of the Stevens Stores is \$ 250 million. Assuming that Seven Stores qualifies uses purchase accounting, estimate the goodwill created on this transaction. How would your answer be different if Seven Stores used pooling accounting?
5. A bio-technology firm reports that its earnings this year will be \$ 150 million, an increase of \$ 50 million over the prior year. However, you note that R&D expenses at the firm declined from \$ 200 million last year to \$ 80 million this year. Has this firm become more profitable this year? Why or why not?
6. You are comparing the profitability of two retail firms. One leases its stores using operating leases, and the other owns its stores. Which firm will show the higher operating income? Why is likely to have a higher return on capital?

7. A firm has a current ratio of 2. It decides to loosen credit to its customers and pay for this by using supplier credit (accounts payable) more liberally. Assuming that both accounts receivable and accounts payable increase by an equal dollar amount, what will happen to the current ratio?
8. Can book value of equity be negative? Why or why not? Can market value of equity ever be negative? Why or why not?
9. Zylon Enterprises has 100 million shares outstanding, trading at \$ 25 per share. It has a book value of equity of \$ 1 billion. Assuming that it buys back 20% of its outstanding stock, estimate the new book value of equity.
10. Amazon.com has a book value of equity of \$ 138 million and debt outstanding of \$ 349 million. The firm has a market value of equity of \$ 20 billion. Estimate the book value debt to capital ratio, and contrast it with the market value debt to capital ratio.

Problems

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

Cash & Near Cash	1648	Accounts Payable	3141
Marketable Securities	159	Short term Borrowings	4462
Accounts Receivable	1666	Other Short term liabilities	1037
Other Current Assets	2017	<i>Current Liabilities</i>	<i>8640</i>
<i>Current Assets</i>	<i>6380</i>	Long term Borrowings	687
Long term investments	1863	Other long term Liabilities	1415
Depreciable Fixed Assets	5486	Non-current liabilities	2102
Non-depreciable Fixed Assets	199		
Accumulated Depreciation	2016	Share Capital (Paid-in)	3060
<i>Net Fixed Assets</i>	<i>3669</i>	Retained Earnings	5343
Other Assets	7233	Shareholder Equity	8403
Total Assets	19145	Total Liabilities & Equity	19145

1. Consider the assets on Coca Cola's balance sheet and answer the following questions:
 - a. Looking at the assets that Coca Cola has on its balance sheet, which assets are likely to be assessed closest to market value? Explain.
 - b. 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?
 - c. Coca Cola seems to have far more invested in current assets, rather than fixed assets. Is this significant? Explain.
 - d. In the early 1980s, Coca Cola sold off its bottling operations, with 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)

2. Examine the liabilities on Coca Cola's balance sheet.
 - a. Based upon the 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)
 - b. Based upon the balance sheet, how much did Coca Cola obtain in equity capital when it issued stock originally to the financial markets?
 - c. Is there any significance to the fact that retained earnings is much larger than the original paid-in capital?
 - d. 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 non-cash 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 below (in millions of dollars):

	1997	1998
Net Revenues	\$ 18,868	\$ 18,813
Cost of Goods Sold	6,105	5,562
Selling, G & A Expenses	7,852	8,284
Earnings before interest and taxes	5,001	4,967

Interest Expenses	258	277
Non-operating 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 differences?

6. The biggest expense for Coca Cola is advertising, which is part of the selling, general and administrative expenses. A large portion of these expenses are 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 they 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 pre-tax 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

- the return on equity (beginning of the year) in 1998
- the pre-tax return on capital (beginning of the year) in 1998
- 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.

- a. Estimate the book value of equity at the end of 1999
- b. Estimate the return on equity, using beginning book value of equity.
- c. Estimate the return on equity, using the average book value of equity.

11. Derra Foods is a specialty food retailer. In its balance sheet, the firm reports \$ 1 billion in book value of equity and no debt, but it has operating leases on all its stores. In the most recent year, the firm made \$ 85 million in operating lease payments, and its commitments to make lease payments for the next 5 years and beyond are summarized below:

Year	Operating Lease Expense
1	\$ 90 million
2	\$ 90 million
3	\$ 85 million
4	\$ 80 million
5	\$ 80 million
6-10	\$ 75 million annually

If the firm's current cost of borrowing is 7%, estimate the debt value of operating leases. Estimate the book value debt to equity ratio.

12. Assume that Derra Foods, in problem 11, reported earnings before interest and taxes (with operating leases expensed) of \$ 200 million. Estimate the adjusted operating income, assuming that operating leases are capitalized.

13. FoodMarkets Inc. is a grocery chain. It reported a debt to capital ratio of 10%, and a return on capital of 25%, on a book value of capital invested of \$ 1 billion. Assume that the firm has significant operating leases. If the operating lease expense in the current year is \$

100 million and the present value of lease commitments if \$ 750 million, estimate the FoodMarket's debt to capital and return on capital.

14. Zif Software is a firm with significant research and development expenses. In the most recent year, the firm had \$ 100 million in research and development expenses. R&D expenses are amortizable over 5 years, and the R& D expenses over the last 5 years are as follows:

Year	R&D expenses
-5	\$ 50 million
-4	\$ 60 million
-3	\$ 70 million
-2	\$ 80 million
-1	\$ 90 million
Current year	\$ 100 million

Assuming a linear amortization schedule (over 5 years), estimate

- the value of the research asset
- the amount of R&D amortization this year
- the adjustment to operating income

15. Stellar Computers has a well-earned reputation for earning a high return on capital. The firm had a return on capital of 100%, on capital invested of \$ 1.5 billion, in 1999. Assume that you have estimated the value of the research asset to be \$ 1 billion. In addition, the R&D expense this year is \$ 250 million and that the amortization of the research asset is \$ 150 million. Re-estimate Stellar Computer's return on capital.