Financial Statements Analysis and Financial Models 3

OPENING CASE

The price of a share of common stock in expensive groceries retailer Whole Foods closed at about $29 on February 5, 2015. At that price, Whole Foods had a price–earnings (PE) ratio of 20. That is, investors were willing to pay $20 for every dollar in income earned by Whole Foods. At the same time, investors were willing to pay $10, $12, and $402 for each dollar earned by Ford, Cisco Systems, and Amazon.com, respectively. At the other extreme were General Electric (GE) and Anadarko Petroleum. Each had negative earnings for the previous year, yet GE was priced at about $29 per share and Anadarko Petroleum at about $41 per share. Because they had negative earnings, their PE ratios would have been negative, so they were not reported. At the time, the typical stock in the S&P 500 Index of large-company stocks was trading at a PE of about 17, or about 17 times earnings, as they say on Wall Street.

Price-to-earnings comparisons are examples of the use of financial ratios. As we will see in this chapter, there are a wide variety of financial ratios, all designed to summarize specific aspects of a firm's financial position. In addition to discussing how to analyze financial statements and compute financial ratios, we will have quite a bit to say about who uses this information and why.

Please visit us at corecorporatefinance.blogspot.com for the latest developments in the world of corporate finance.

3.1 FINANCIAL STATEMENTS ANALYSIS

ExcelMaster coverage online

www.mhhe.com/RossCore5e

In Chapter 2, we discussed some of the essential concepts of financial statements and cash flows. This chapter continues where our earlier discussion left off. Our goal here is to expand your understanding of the uses (and abuses) of financial statement information.

A good working knowledge of financial statements is desirable because such statements, and numbers derived from those statements, are the primary means of communicating financial information both within the firm and outside the firm. In short, much of the language of business finance is rooted in the ideas we discuss in this chapter.

Clearly, one important goal of the accountant is to report financial information to the user in a form useful for decision making. Ironically, the information frequently does not come to the user in such a form. In other words, financial statements don't come with a user's guide. This chapter is a first step in filling this gap.

Standardizing Statements

One obvious thing we might want to do with a company's financial statements is to compare them to those of other, similar companies. We would immediately have a problem, however. It's almost impossible to directly compare the financial statements for two companies because of differences in size.

For example, Tesla and GM are obviously serious rivals in the auto market, but GM is larger, so it is difficult to compare them directly. For that matter, it's difficult even to compare financial statements from different points in time for the same company if the company's size has changed. The size problem is compounded if we try to compare GM and, say, Toyota. If Toyota's financial statements are denominated in yen, then we have size *and* currency differences.

To start making comparisons, one obvious thing we might try to do is to somehow standardize the financial statements. One common and useful way of doing this is to work with percentages instead of total dollars. The resulting financial statements are called **common-size statements**. We consider these next.

Common-Size Balance Sheets

For easy reference, Prufrock Corporation's 2016 and 2017 balance sheets are provided in Table 3.1. Using these, we construct common-size balance sheets by expressing each item as a percentage of total assets. Prufrock's 2016 and 2017 common-size balance sheets are shown in Table 3.2.

Notice that some of the totals don't check exactly because of rounding errors. Also notice that the total change has to be zero because the beginning and ending numbers must add up to 100 percent.

In this form, financial statements are relatively easy to read and compare. For example, just looking at the two balance sheets for Prufrock, we see that current assets were 19.7 percent of total assets in 2017, up from 19.0 percent in 2016. Current liabilities declined from 16.1 percent to 15.1 percent of total liabilities and equity over that same time. Similarly, total equity rose from 68.2 percent of total liabilities and equity to 72.2 percent.

Overall, Prufrock's liquidity, as measured by current assets compared to current liabilities, increased over the year. Simultaneously, Prufrock's indebtedness diminished as a percentage of total assets. We might be tempted to conclude that the balance sheet has grown "stronger."

TABLE 3.1

PRUFROCK CORPORATION
Balance Sheets as of December 31, 2016 and 2017
($ in millions)

Assets	**2016**	**2017**
Current assets		
Cash	$ 84	$ 98
Accounts receivable	165	188
Inventory	393	422
Total	$ 642	$ 708
Fixed assets		
Net plant and equipment	$ 2,731	$ 2,880
Total assets	$ 3,373	$ 3,588
Liabilities and Owners' Equity		
Current liabilities		
Accounts payable	$ 312	$ 344
Notes payable	231	196
Total	$ 543	$ 540

Long-term debt	$ 531	$ 457
Owners' equity		
Common stock and paid-in surplus	$ 500	$ 550
Retained earnings	1,799	2,041
Total	$ 2,299	$ 2,591
Total liabilities and owners' equity	$ 3,373	$ 3,588

TABLE 3.2

PRUFROCK CORPORATION
Common-Size Balance Sheets
December 31, 2016 and 2017

Assets	2016	2017	change
Current assets			
Cash	2.5%	2.7%	+ .2%
Accounts receivable	4.9	5.2	+ .3
Inventory	11.7	11.8	+ .1
Total	19.0	19.7	+ .7
Fixed assets			
Net plant and equipment	81.0	80.3	− .7
Total assets	100.0%	100.0%	.0%
Liabilities and Owners' Equity			
Current liabilities			
Accounts payable	9.2%	9.6%	+ .3%
Notes payable	6.8	5.5	−1.4
Total	16.1	15.1	−1.0
Long-term debt	15.7	12.7	−3.0
Owners' equity			
Common stock and paid-in surplus	14.8	15.3	+ .5
Retained earnings	53.3	56.9	+3.5
Total	68.2	72.2	+4.1
Total liabilities and owners' equity	100.0%	100.0%	.0%

TABLE 3.3 Measures of Earnings

Investors and analysts look closely at the income statement for clues on how well a company has performed during a particular year. Here are some commonly used measures of earnings (numbers in millions).

Net Income The so-called bottom line, defined as total revenue minus total expenses. Net income for Prufrock in the latest period is $363 million. Net income reflects differences in a firm's capital structure and taxes as well as operating income. Interest expense and taxes are subtracted from operating income in computing net income. Shareholders look closely at net income because dividend payout and retained earnings are closely linked to net income.

EPS Net income divided by the number of shares outstanding. It expresses net income on a per-share basis. For Prufrock, the EPS = (Net income)/(Shares outstanding) = $363/33 = $11.

EBIT Earnings before interest expense and taxes. EBIT is usually called "income from operations" on the income statement and is income before unusual items, discontinued operations, or extraordinary items. To calculate EBIT, operating expenses are subtracted from total operations

revenues. Analysts like EBIT because it abstracts from differences in earnings from a firm's capital structure (interest expense) and taxes. For Prufrock, EBIT is $691 million.

EBITDA Earnings before interest expense, taxes, depreciation, and amortization. EBITDA = EBIT + depreciation and amortization. Here amortization refers to a noncash expense similar to depreciation except it applies to an intangible asset (such as a patent), rather than a tangible asset (such as a machine). The word amortization here does not refer to the payment of debt. There is no amortization in Prufrock's income statement. For Prufrock, EBITDA = $691 + 276 = $967 million. Analysts like to use EBITDA because it adds back two noncash items (depreciation and amortization) to EBIT and thus is a better measure of before-tax operating cash flow.

Sometimes these measures of earnings are preceded by the letters LTM, meaning the last twelve months. For example, LTM EPS is the last 12 months of EPS and LTM EBITDA is the last 12 months of EBITDA. At other times, the letters TTM are used, meaning trailing 12 months. Needless to say, LTM is the same as TTM.

Common-Size Income Statements

Table 3.3 describes some commonly used measures of earnings. A useful way of standardizing the income statement shown in Table 3.4 is to express each item as a percentage of total sales, as illustrated for Prufrock in Table 3.5.

TABLE 3.4

PRUFROCK CORPORATION
2017 Income Statement
($ in millions)

Sales		$2,311
Cost of goods sold		1,344
Depreciation		276
Earnings before interest and taxes		$ 691
Interest paid		141
Taxable income		$ 550
Taxes (34%)		187
Net income		$ 363
Dividends	$121	
Addition to retained earnings	242	

TABLE 3.5

PRUFROCK CORPORATION
Common-Size Income Statement 2017

Sales		100.0%
Cost of goods sold		58.2
Depreciation		11.9
Earnings before interest and taxes		29.9
Interest paid		6.1
Taxable income		23.8
Taxes (34%)		8.1
Net income		15.7%
Dividends	5.2%	
Addition to retained earnings	10.5	

This income statement tells us what happens to each dollar in sales. For Prufrock, interest expense eats up $.061 out of every sales dollar, and taxes take another $.081. When all is said and done, $.157 of each dollar flows through to the bottom line (net income), and that amount is split into $.105 retained in the business and $.052 paid out in dividends.

These percentages are useful in comparisons. For example, a relevant figure is the cost percentage. For Prufrock, $.582 of each $1.00 in sales goes to pay for goods sold. It would be interesting to compute the same percentage for Prufrock's main competitors to see how Prufrock stacks up in terms of cost control.

3.2 RATIO ANALYSIS

ExcelMaster coverage online

www.mhhe.com/RossCore5e

Another way of avoiding the problems involved in comparing companies of different sizes is to calculate and compare **financial ratios**. Such ratios are ways of comparing and investigating the relationships between different pieces of financial information. We cover some of the more common ratios next (there are many others we don't discuss here).

One problem with ratios is that different people and different sources frequently don't compute them in exactly the same way, and this leads to much confusion. The specific definitions we use here may or may not be the same as ones you have seen or will see elsewhere. If you are using ratios as tools for analysis, you should be careful to document how you calculate each one; and, if you are comparing your numbers to those of another source, be sure you know how their numbers are computed.

We will defer much of our discussion of how ratios are used and some problems that come up with using them until later in the chapter. For now, for each ratio we discuss, several questions come to mind: page 47

1. How is it computed?
2. What is it intended to measure, and why might we be interested?
3. What is the unit of measurement?
4. What might a high or low value be telling us? How might such values be misleading?
5. How could this measure be improved?

Go to www.reuters.com/finance/stocks and find the "Financials" link to examine comparative ratios for a huge number of companies.

Financial ratios are traditionally grouped into the following categories:

1. Short-term solvency, or liquidity, ratios.
2. Long-term solvency, or financial leverage, ratios.
3. Asset management, or turnover, ratios.
4. Profitability ratios.
5. Market value ratios.

We will consider each of these in turn. In calculating these numbers for Prufrock, we will use the ending balance sheet (2017) figures unless we explicitly say otherwise.

Short-Term Solvency or Liquidity Measures

As the name suggests, short-term solvency ratios as a group are intended to provide information about a firm's liquidity, and these ratios are sometimes called *liquidity measures*. The primary concern is the firm's ability to pay its bills over the short run without undue stress. Consequently, these ratios focus on current assets and current liabilities.

For obvious reasons, liquidity ratios are particularly interesting to short-term creditors. Because financial managers are constantly working with banks and other short-term lenders, an understanding of these ratios is essential.

One advantage of looking at current assets and liabilities is that their book values and market values are likely to be similar. Often (though not always), these assets and liabilities just don't live long enough for the two to get seriously out of step. On the other hand, like any type of near-cash, current assets and liabilities can and do change fairly rapidly, so today's amounts may not be a reliable guide to the future.

CURRENT RATIO One of the best-known and most widely used ratios is the *current ratio*. As you might guess, the current ratio is defined as

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}} \quad [3.1]$$

For Prufrock, the 2017 current ratio is

$$\text{Current ratio} = \frac{\$708}{\$540} = 1.31 \text{ times}$$

Because current assets and liabilities are, in principle, converted to cash over the following 12 months, the current ratio is a measure of short-term liquidity. The unit of measurement is either dollars or times. So, we could say Prufrock has $1.31 in current assets for every $1 in current liabilities, or we could say Prufrock has its current liabilities covered 1.31 times over.

To a creditor, particularly a short-term creditor such as a supplier, the higher the current ratio, the better. To the firm, a high current ratio indicates liquidity, but it also may indicate an inefficient use of cash and other short-term assets. Absent some extraordinary

circumstances, we would expect to see a current ratio of at least 1; a current ratio of less than 1 would mean that net working capital (current assets less current liabilities) is negative. This would be unusual in a healthy firm, at least for most types of businesses. page 48

The current ratio, like any ratio, is affected by various types of transactions. For example, suppose the firm borrows over the long term to raise money. The short-run effect would be an increase in cash from the issue proceeds and an increase in long-term debt. Current liabilities would not be affected, so the current ratio would rise.

EXAMPLE 3.1

Current Events

Suppose a firm were to pay off some of its suppliers and short-term creditors. What would happen to the current ratio? Suppose a firm buys some inventory. What happens in this case? What happens if a firm sells some merchandise?

The first case is a trick question. What happens is that the current ratio moves away from 1. If it is greater than 1 (the usual case), it will get bigger, but if it is less than 1, it will get smaller. To see this, suppose the firm has $4 in current assets and $2 in current liabilities for a current ratio of 2. If we use $1 in cash to reduce current liabilities, the new current ratio is ($4 − 1)/($2 − 1) = 3. If we reverse the original situation to $2 in current assets and $4 in current liabilities, the change will cause the current ratio to fall to 1/3 from 1/2.

The second case is not quite as tricky. Nothing happens to the current ratio because cash goes down while inventory goes up—total current assets are unaffected.

In the third case, the current ratio would usually rise because inventory is normally shown at cost and the sale would normally be at something greater than cost (the difference is the markup). The increase in either cash or receivables is therefore greater than the decrease in inventory. This increases current assets, and the current ratio rises.

Finally, note that an apparently low current ratio may not be a bad sign for a company with a large reserve of untapped borrowing power.

QUICK (OR ACID-TEST) RATIO Inventory is often the least liquid current asset. It's also the one for which the book values are least reliable as measures of market value because the quality of the inventory isn't considered. Some of the inventory may later turn out to be damaged, obsolete, or lost.

More to the point, relatively large inventories are often a sign of short-term trouble. The firm may have overestimated sales and overbought or overproduced as a result. In this case, the firm may have a substantial portion of its liquidity tied up in slow-moving inventory.

To further evaluate liquidity, the *quick,* or *acid-test, ratio* is computed just like the current ratio, except inventory is omitted:

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}} \quad [3.2]$$

Notice that using cash to buy inventory does not affect the current ratio, but it reduces the quick ratio. Again, the idea is that inventory is relatively illiquid compared to cash. For Prufrock, this ratio in 2017 was

$$\text{Quick ratio} = \frac{\$708 - 422}{\$540} = .53 \text{ times}$$

The quick ratio here tells a somewhat different story than the current ratio because inventory accounts for more than half of Prufrock's current assets. To exaggerate the point, if this inventory consisted of, say, unsold nuclear

power plants, then this would be a cause for concern.

To give an example of current versus quick ratios, based on recent financial statements, Walmart and Manpower, Inc., had current ratios of .93 and 1.47, respectively. However, Manpower carries no inventory to speak of, whereas Walmart's current assets are virtually all inventory. As a result, Walmart's quick ratio was only .20, and Manpower's was 1.47, the same as its current ratio. page 49

CASH RATIO A very short-term creditor might be interested in the *cash ratio:*

$$\text{Cash ratio} = \frac{\text{Cash}}{\text{Current liabilities}} \quad [3.3]$$

You can verify that this works out to be .18 times for Prufrock.

Long-Term Solvency Measures

Long-term solvency ratios are intended to address the firm's long-run ability to meet its obligations or, more generally, its financial leverage. These ratios are sometimes called *financial leverage ratios* or just *leverage ratios.* We consider three commonly used measures and some variations.

TOTAL DEBT RATIO The *total debt ratio* takes into account all debts of all maturities to all creditors. It can be defined in several ways, the easiest of which is this:

$$\text{Total debt ratio} = \frac{\text{Total assets} - \text{Total equity}}{\text{Total assets}} \quad [3.4]$$

$$= \frac{\$3{,}588 - 2{,}591}{\$3{,}588} = .28 \text{ times}$$

In this case, an analyst might say that Prufrock uses 28 percent debt.[1] Whether this is high or low or whether it even makes any difference depends on whether capital structure matters, a subject we discuss in a later chapter.

The online Women's Business Center has more information about financial statements, ratios, and small business topics at www.sba.gov/content/womens-business-resources.

Prufrock has $.28 in debt for every $1 in assets. Therefore, there is $.72 in equity (= $1 − .28) for every $.28 in debt. With this in mind, we can define two useful variations on the total debt ratio, the *debt–equity ratio* and the *equity multiplier:*

$$\text{Debt–equity ratio} = \text{Total debt}/\text{Total equity} \quad [3.5]$$

$$= \$28/\$.72 = .39 \text{ times}$$

$$\text{Equity multiplier} = \text{Total assets}/\text{Total equity} \quad [3.6]$$

$$= \$1/\$.72 = 1.39 \text{ times}$$

The fact that the equity multiplier is 1 plus the debt–equity ratio is not a coincidence:

$$\begin{aligned}\text{Equity multiplier} &= \text{Total assets/Total equity} = \$1/\$.72 = 1.39 \text{ times} \\ &= (\text{Total equity} + \text{Total debt})/\text{Total equity} \\ &= 1 + \text{Debt–equity ratio} = 1.39 \text{ times}\end{aligned}$$

The thing to notice here is that given any one of these three ratios, you can immediately calculate the other two, so they all say exactly the same thing.

TIMES INTEREST EARNED Another common measure of long-term solvency is the *times interest earned* (TIE) *ratio.* Once again, there are several possible (and common) definitions, but we'll stick with the most traditional:

$$\text{Times interest earned ratio} = \frac{\text{EBIT}}{\text{Interest}} \qquad [3.7]$$

$$= \frac{\$691}{\$141} = 4.90 \text{ times}$$

As the name suggests, this ratio measures how well a company has its interest obligations covered, and it is often called the *interest coverage ratio.* For Prufrock, the interest bill is covered 4.9 times over.

CASH COVERAGE A problem with the TIE ratio is that it is based on EBIT, which is not really a measure of cash available to pay interest. The reason is that depreciation and amortization, noncash expenses, have been deducted out. Because interest is most definitely a cash outflow (to creditors), one way to define the *cash coverage ratio* is

$$\text{Cash coverage ratio} = \frac{\text{EBIT} + (\text{Depreciation and amortization})}{\text{Interest}} \qquad [3.8]$$

$$= \frac{\$691 + 276}{\$141} = \frac{\$967}{\$141} = 6.86 \text{ times}$$

The numerator here, EBIT plus depreciation and amortization, is often abbreviated EBITDA (earnings before interest, taxes, depreciation, and amortization). It is a basic measure of the firm's ability to generate cash from operations, and it is frequently used as a measure of cash flow available to meet financial obligations.

More recently another long-term solvency measure is increasingly seen in financial statement analysis and in debt covenants. It uses EBITDA and interest bearing debt. Specifically, for Prufrock:

$$\frac{\text{Interest bearing debt}}{\text{EBITDA}} = \frac{\$196 \text{ million} + 457 \text{ million}}{\$967 \text{ million}} = .68 \text{ times}$$

Here we include notes payable (most likely notes payable is bank debt) and long-term debt in the numerator and EBITDA in the denominator. Values below 1 on this ratio are considered very strong and values above 5 are considered weak. However, a careful comparison with other comparable firms is necessary to properly interpret the ratio.

Asset Management or Turnover Measures

We next turn our attention to the efficiency with which Prufrock uses its assets. The measures in this section are sometimes called *asset management* or *utilization ratios.* The specific ratios we discuss can all be interpreted as measures of turnover. What they are intended to describe is how efficiently, or intensively, a firm uses its assets to generate sales. We first look at two important current assets: inventory and receivables.

INVENTORY TURNOVER AND DAYS' SALES IN INVENTORY During the year, Prufrock had a cost of goods sold of $1,344. Inventory at the end of the year was $422. With these numbers, *inventory turnover* can be

calculated as

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}} \qquad [3.9]$$

$$= \frac{\$1{,}344}{\$422} = 3.18 \text{ times}$$

In a sense, we sold off, or turned over, the entire inventory 3.18 times during the year. As long as we are not running out of stock and thereby forgoing sales, the higher this ratio is, the more efficiently we are managing inventory.

If we know that we turned our inventory over 3.18 times during the year, we can immediately figure out how long it took us to turn it over on average. The result is the average *days' sales in inventory:*

$$\text{Days' sales in inventory} = \frac{365 \text{ days}}{\text{Inventory turnover}} \qquad [3.10]$$

$$= \frac{365}{3.18} = 114.61 \text{ days}$$

This tells us that, roughly speaking, inventory sits about 115 days on average before it is sold. Alternatively, assuming we used the most recent inventory and cost figures, it will take about 115 days to work off our current inventory.

For example, in December 2015, General Motors had an 82-day supply of vehicles in inventory, more than the 60-day supply considered normal. This figure means that at the then-current rate of sales, it would have taken General Motors 82 days to deplete the available supply, or, equivalently, that General Motors had 82 days of sales in inventory. At the same time, Ford had a 59-day inventory supply and Toyota's inventory level stood at 45 days. Of course, we could also examine these numbers on a per-segment basis. For example, there was only a 26-day inventory for compact trucks and an inventory period of 44 days for midrange luxury SUVs. At the other end, van and large car inventory levels stood at 93 days and 98 days, respectively.

RECEIVABLES TURNOVER AND DAYS' SALES IN RECEIVABLES Our inventory measures give some indication of how fast we can sell products. We now look at how fast we collect on those sales. The *receivables turnover* is defined in the same way as inventory turnover:

$$\text{Receivables turnover} = \frac{\text{Sales}}{\text{Accounts receivable}} \qquad [3.11]$$

$$= \frac{\$2{,}311}{\$188} = 12.29 \text{ times}$$

Loosely speaking, we collected our outstanding credit accounts and lent the money again 12.29 times during the year.[2]

This ratio makes more sense if we convert it to days, so the *days' sales in receivables* is

$$\text{Days' sales in receivables} = \frac{365 \text{ days}}{\text{Receivables turnover}} \qquad [3.12]$$

$$= \frac{365}{12.29} = 29.69 \text{ days}$$

Therefore, on average, we collect on our credit sales in about 30 days. For obvious reasons, this ratio is frequently called the *average collection period* (ACP). Also note that if we are using the most recent figures, we can also say that we have 30 days' worth of sales currently uncollected.

EXAMPLE 3.2

Payables Turnover

Here is a variation on the receivables collection period. How long, on average, does it take for Prufrock Corporation to *pay* its bills? To answer, we need to calculate the accounts payable turnover rate using cost of goods sold. We will assume that Prufrock purchases everything on credit.

The cost of goods sold is $1,344, and accounts payable are $344. The turnover is therefore $1,344/$344 = 3.91 times. So, payables turned over about every 365/3.91 = 93.42 days. On average, then, Prufrock takes about 93 days to pay. As a potential creditor, we might take note of this fact.

TOTAL ASSET TURNOVER Moving away from specific accounts like inventory or receivables, we can consider an important "big picture" ratio, the *total asset turnover* ratio. As the name suggests, total asset turnover is

$$\text{Total asset turnover} = \frac{\text{Sales}}{\text{Total assets}} \quad [3.13]$$

$$= \frac{\$2,311}{\$3,588} = .64 \text{ times}$$

In other words, for every dollar in assets, we generated $.64 in sales.

EXAMPLE 3.3

More Turnover

Suppose you find that a particular company generates $.40 in annual sales for every dollar in total assets. How often does this company turn over its total assets?

The total asset turnover here is .40 times per year. It takes 1/.40 = 2.5 years to turn assets over completely. The 2.5 number is frequently referred to as the firm's capital intensity.

Profitability Measures

The three types of measures we discuss in this section are probably the best-known and most widely used of all financial ratios. In one form or another, they are intended to measure how efficiently the firm uses its assets and how efficiently the firm manages its operations.

PROFIT MARGIN Companies pay a great deal of attention to their *profit margin:*

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Sales}} \quad [3.14]$$

$$= \frac{\$363}{\$2,311} = .157, \text{ or } 15.7\%$$

This tells us that Prufrock, in an accounting sense, generates a little less than 16 cents in net income for every dollar in sales.

EBITDA MARGIN Another commonly used measure of profitability is the EBITDA margin. As mentioned, EBITDA is a measure of before-tax operating cash flow. It adds back noncash expenses and does not include taxes or interest expense. As a consequence, EBITDA margin looks more directly at operating cash flows than does net income and does not include the effect of capital structure or taxes. For Prufrock, EBITDA margin is

$$\frac{\text{EBITDA}}{\text{Sales}} = \frac{\$967 \text{ million}}{\$2{,}311 \text{ million}} = .418, \text{ or } 41.8\%$$

All other things being equal, a relatively high margin is obviously desirable. This situation corresponds to low expense ratios relative to sales. However, we hasten to add that other things are often not equal.

For example, lowering our sales price will usually increase unit volume but will normally cause margins to shrink. Total profit (or, more importantly, operating cash flow) may go up or down, so the fact that margins are smaller isn't necessarily bad. After all, isn't it possible that, as the saying goes, "Our prices are so low that we lose money on everything we sell, but we make it up in volume"?[3]

Margins are very different for different industries. Grocery stores have a notoriously low profit margin, generally around 2 percent. In contrast, the profit margin for the pharmaceutical industry is about 18 percent. So, for example, it is not surprising that recent profit margins for Kroger and Pfizer were about 1.6 percent and 17.6 percent, respectively.

RETURN ON ASSETS *Return on assets* (ROA) is a measure of profit per dollar of assets. It can be defined several ways,[4] but the most common is

$$\text{Return on assets} = \frac{\text{Net income}}{\text{Total assets}} \qquad [3.15]$$

$$= \frac{\$363}{\$3{,}588} = .101, \text{ or } 10.1\%$$

RETURN ON EQUITY *Return on equity* (ROE) is a measure of how the stockholders fared during the year. Because benefiting shareholders is our goal, ROE is, in an accounting sense, the true bottom-line measure of performance. ROE is usually measured as

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}} \qquad [3.16]$$

$$= \frac{\$363}{\$2{,}591} = .140, \text{ or } 14.0\%$$

Therefore, for every dollar in equity, Prufrock generated 14 cents in profit; but, again, this is correct only in accounting terms.

Because ROA and ROE are such commonly cited numbers, we stress that it is important to remember they are accounting rates of return. For this reason, these measures should properly be called *return on book assets* and *return on book equity.*

The fact that ROE exceeds ROA reflects Prufrock's use of financial leverage. We will examine the relationship between these two measures in the next section.

Market Value Measures

Our final group of measures is based, in part, on information not necessarily contained in financial statements—the market price per share of the stock. Obviously, these measures can be calculated directly only for publicly traded companies.

We assume that Prufrock has 33 million shares outstanding and the stock sold for $88 per share at the end of the year. If we recall that Prufrock's net income was $363 million, then we can calculate that its earnings per share (EPS) was

$$\text{EPS} = \frac{\text{Net income}}{\text{Shares outstanding}} = \frac{\$363}{33} \quad [3.17]$$

PRICE–EARNINGS RATIO The first of our market value measures, the *price–earnings* or *PE ratio* (or multiple), is defined as

$$\text{PE ratio} = \frac{\text{Price per share}}{\text{Earnings per share}} \quad [3.18]$$

$$= \frac{\$88}{\$11} = 8 \text{ times}$$

In the vernacular, we would say that Prufrock shares sell for eight times earnings, or we might say that Prufrock shares have, or "carry," a PE multiple of 8.

Because the PE ratio measures how much investors are willing to pay per dollar of current earnings, higher PEs are often taken to mean that the firm has significant prospects for future growth. Of course, if a firm had no or almost no earnings, its PE would probably be quite large; so, as always, care is needed in interpreting this ratio.

MARKET-TO-BOOK RATIO A second commonly quoted measure is the *market-to-book ratio:*

$$\text{Market-to-book ratio} = \frac{\text{Market value per share}}{\text{Book value per share}} \quad [3.19]$$

$$= \frac{\$88}{\$2{,}591/33} = \frac{\$88}{\$78.5} = 1.12 \text{ times}$$

Notice that book value per share is total equity (not just common stock) divided by the number of shares outstanding.

Book value per share is an accounting number that reflects historical costs. In a loose sense, the market-to-book ratio therefore compares the market value of the firm's investments to their cost. A value less than 1 could mean that the firm has not been successful overall in creating value for its stockholders.

MARKET CAPITALIZATION The market capitalization of a public firm is equal to the firm's stock market price per share multiplied by the number of shares outstanding. For Prufrock, this is:

$$\text{Price per share} \times \text{Shares outstanding} = \$88 \times 33 \text{ million} = \$2{,}904 \text{ million}$$

shares of stock, it measures the market value of outstanding shares of stock plus the market value of outstanding interest bearing debt less cash on hand. We know the market capitalization of Prufrock but we do not know the market value of its outstanding interest bearing debt. In this situation, the common practice is to use the book value of outstanding interest bearing debt less cash on hand as an approximation. For Prufrock, enterprise value is (in millions)

page 55

$$\text{EV} = \text{Market capitalization} + \text{Market value of interest bearing debt} - \text{Cash} \qquad [3.20]$$
$$= \$2{,}904 + (\$196 + 457) - \$98 = \$3{,}459 \text{ million}$$

The purpose of the EV measure is to better estimate how much it would take to buy all of the outstanding stock of a firm and also to pay off the debt. The adjustment for cash is to recognize that if we were a buyer the cash could be used immediately to buy back debt or pay a dividend.

ENTERPRISE VALUE MULTIPLES Financial analysts use valuation multiples based upon a firm's enterprise value when the goal is to estimate the value of the firm's total business rather than just focusing on the value of its equity. To form an appropriate multiple, enterprise value is divided by EBITDA. For Prufrock, the enterprise value multiple is

$$\frac{\text{EV}}{\text{EBITDA}} = \frac{\$3{,}459}{\$967 \text{ million}} = 3.58 \text{ times}$$

The multiple is especially useful because it allows comparison of one firm with another when there are differences in capital structure (interest expense), taxes, or capital spending. The multiple is not directly affected by these differences.

Similar to PE ratios, we would expect a firm with high growth opportunities to have high EV multiples.

This completes our definition of some common ratios. We could tell you about more of them, but these are enough for now. We'll leave it here and go on to discuss some ways of using these ratios instead of just how to calculate them. Table 3.6 summarizes some of the ratios we've discussed.

This is a useful number for potential buyers of Prufrock. A prospective buyer of all of the outstanding shares of Prufrock (in a merger or acquisition) would need to come up with at least $2,904 million plus a premium.

ENTERPRISE VALUE Enterprise value (EV) is a measure of firm value that is very closely related to market capitalization. Instead of focusing on only the market value of outstanding

TABLE 3.6 Common Financial Ratios

I. Short-Term Solvency, or Liquidity, Ratios

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

$$\text{Quick ratio} = \frac{\text{Current assets} - \text{Inventory}}{\text{Current liabilities}}$$

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

II. Long-Term Solvency, or Financial Leverage, Ratios

$$\text{Total debt ratio} = \frac{\text{Total assets} - \text{Total equity}}{\text{Total assets}}$$

$$\text{Debt–equity ratio} = \frac{\text{Total debt}}{\text{Total equity}}$$

$$\text{Equity multiplier} = \frac{\text{Total assets}}{\text{Total equity}}$$

$$\text{Times interest earned ratio} = \frac{\text{EBIT}}{\text{Interest}}$$

$$\text{Cash coverage ratio} = \frac{\text{EBITDA}}{\text{Interest}}$$

III. Asset Utilization, or Turnover, Ratios

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}}$$

$$\text{Days' sales in inventory} = \frac{\text{365 days}}{\text{Inventory turnover}}$$

$$\text{Receivables turnover} = \frac{\text{Sales}}{\text{Accounts receivable}}$$

$$\text{Days' sales in receivables} = \frac{\text{365 days}}{\text{Receivables turnover}}$$

$$\text{Total asset turnover} = \frac{\text{Sales}}{\text{Total assets}}$$

$$\text{Capital intensity} = \frac{\text{Total assets}}{\text{Sales}}$$

IV. Profitability Ratios

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Sales}}$$

$$\text{Return on assets (ROA)} = \frac{\text{Net income}}{\text{Total assets}}$$

$$\text{Return on equity (ROE)} = \frac{\text{Net income}}{\text{Total equity}}$$

$$\text{ROE} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}}$$

V. Market Value Ratios

$$\text{Price–earnings ratio} = \frac{\text{Price per share}}{\text{Earnings per share}}$$

$$\text{Market-to-book ratio} = \frac{\text{Market value per share}}{\text{Book value per share}}$$

$$\text{EV multiple} = \frac{\text{Enterprise value}}{\text{EBITDA}}$$

EXAMPLE 3.4

Atlantic and Pacific

Consider the following 2017 data for Atlantic's Companies and Pacific Depot (billions except for price and earnings per share):

	ATLANTIC'S COMPANIES, INC.	PACIFIC DEPOT, INC.
Sales	$48.3	$77.3
EBIT	$ 4.8	$ 7.3

Net income	$ 2.8	$ 4.4
Cash	$ .5	$ .5
Depreciation	$ 1.5	$ 1.9
Interest bearing debt	$ 6.7	$13.4
Total assets	$30.9	$44.3
Price per share	$24	$27
Shares outstanding	1.5	1.7
Shareholder equity	$16.1	$17.7
Earnings per share	$ 1.87	$ 2.6

1. Determine the profit margin, ROE, market capitalization, enterprise value, PE multiple, and EV multiple for both Atlantic's and Pacific Depot.

	ATLANTIC'S COMPANIES, INC.	PACIFIC DEPOT, INC.
Equity multiplier	30.9/16.1 = 1.9	44.3/17.7 = 2.5
Asset turnover	48.3/30.9 = 1.6	77.3/44.3 = 1.7
Profit margin	2.8/48.3 = 5.8%	4.4/77.3 = 5.7%
ROE	2.8/16.1 = 17.4%	4.4/17.7 = 24.9%
Market capitalization	1.5 × 24 = $36 billion	1.7 × 27 = $45.9 billion
Enterprise value	(1.5 × 24) + 6.7 − .5 = $42.2 billion	(1.7 × 27) + 13.4 − .5 = $58.8 billion
PE multiple	24/1.87 = 12.8	27/2.6 = 10.4
EBITDA	4.8 + 1.5 = $6.3	7.3 + 1.9 = $9.2
EV multiple	42.2/6.3 = 6.7	58.8/9.2 = 6.4

2. How would you describe these two companies from a financial point of view? These are similarly situated companies. In 2017, Pacific Depot had a higher ROE (partially because of using more debt and higher turnover), but Atlantic's had slightly higher PE and EV multiples. Both companies' multiples were somewhat below the general market, raising questions about future growth prospects.

3.3 THE DUPONT IDENTITY

ExcelMaster coverage online

www.mhhe.com/RossCore5e

As we mentioned in discussing ROA and ROE, the difference between these two profitability measures reflects the use of debt financing or financial leverage. We illustrate the relationship between these measures in this section by investigating a famous way of decomposing ROE into its component parts.

A Closer Look at ROE

To begin, let's recall the definition of ROE:

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}}$$

If we were so inclined, we could multiply this ratio by Assets/Assets without changing anything:

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total equity}} = \frac{\text{Net income}}{\text{Total equity}} \times \frac{\text{Assets}}{\text{Assets}}$$

$$= \frac{\text{Net income}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Total equity}}$$

Notice that we have expressed the ROE as the product of two other ratios—ROA and the equity multiplier:

$$\text{ROE} = \text{ROA} \times \text{Equity multiplier} = \text{ROA} \times (1 + \text{Debt–equity ratio})$$

Looking back at Prufrock, for example, we see that the debt–equity ratio was .39 and ROA was 10.1 percent. Our work here implies that Prufrock's ROE, as we previously calculated, is

$$\text{ROE} = 10.1\% \times 1.39 = 14.0\%$$

The difference between ROE and ROA can be substantial, particularly for certain businesses. For example, based on recent financial statements, Wells Fargo has an ROA of only 1.29 percent, which is actually fairly typical for a bank. However, banks tend to borrow a lot of money, and, as a result, have relatively large equity multipliers. For Wells Fargo, ROE is about 11.83 percent, implying an equity multiplier of 9.17.

We can further decompose ROE by multiplying the top and bottom by total sales:

$$\text{ROE} = \frac{\text{Sales}}{\text{Sales}} \times \frac{\text{Net income}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Total equity}}$$

If we rearrange things a bit, ROE is

$$\text{ROE} = \underbrace{\frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Assets}}}_{\text{Return on assets}} \times \frac{\text{Assets}}{\text{Total equity}} \qquad [3.21]$$

$$= \text{Profit margin} \times \text{Total asset turnover} \times \text{Equity multiplier}$$

What we have now done is to partition ROA into its two component parts, profit margin and total asset turnover. The last expression of the preceding equation is called the **DuPont identity** after the DuPont Corporation, which popularized its use. page 58

We can check this relationship for Prufrock by noting that the profit margin was 15.7 percent and the total asset turnover was .64. ROE should thus be

$$\begin{aligned} \text{ROE} &= \text{Profit margin} \times \text{Total asset turnover} \times \text{Equity multiplier} \\ &= .157 \times .64 \times 1.39 \\ &= .140, \text{ or } 14.0\% \end{aligned}$$

This 14.0 percent ROE is exactly what we had before (aside from a small rounding error).

The DuPont identity tells us that ROE is affected by three things:

1. Operating efficiency (as measured by profit margin).
2. Asset use efficiency (as measured by total asset turnover).
3. Financial leverage (as measured by the equity multiplier).

Weakness in either operating or asset use efficiency (or both) will show up in a diminished return on assets, which will translate into a lower ROE.

Considering the DuPont identity, it appears that the ROE could be leveraged up by increasing the amount of debt in the firm. However, notice that increasing debt also increases interest expense, which reduces profit margins, which acts to reduce ROE. So, ROE could go up or down, depending. More important, the use of debt financing has a number of other effects, and, as we discuss at some length in later chapters, the amount of leverage a firm uses is governed by its capital structure policy.

The decomposition of ROE we've discussed in this section is a convenient way of systematically approaching financial statement analysis. If ROE is unsatisfactory by some measure, then the DuPont identity tells you where to start looking for the reasons.

Yahoo! and Alphabet (formerly Google) are among the most important Internet companies in the world. They may be good examples of how DuPont analysis can be useful in helping to ask the right questions about a firm's financial performance. The DuPont breakdowns for Yahoo! and Alphabet are summarized in Table 3.7.

TABLE 3.7 The DuPont Breakdown for Yahoo! and Alphabet

Yahoo!

TWELVE MONTHS ENDING	ROE	=	PROFIT MARGIN	×	TOTAL ASSET TURNOVER	×	EQUITY MULTIPLIER
12/15	.001%	=	.01%	×	.110	×	1.56
12/14	.4%	=	3.1%	×	.075	×	1.60
12/13	4.5%	=	12.6%	×	.279	×	1.29

Alphabet

TWELVE MONTHS ENDING	ROE	=	PROFIT MARGIN	×	TOTAL ASSET TURNOVER	×	EQUITY MULTIPLIER
12/15	12.3%	=	22.9%	×	.430	×	1.24
12/14	13.8%	=	21.9%	×	.503	×	1.25
12/13	15.3%	=	24.0%	×	.501	×	1.27

As can be seen, in 2015, Yahoo! had an ROE of .001 percent (excluding non-recurring charges), down from its ROE in 2013 of 12.6 percent. In 2015, Alphabet

had an ROE of 12.3 percent, down from its ROE in 2013 of 15.3 percent. Given this information, how is it possible that Alphabet's ROE could be so much higher than the ROE of Yahoo! during this period of time, and what accounts for the decline in Yahoo!'s ROE?

On close inspection of the DuPont breakdown, we see that Yahoo!'s profit margin in 2015 was .01 percent. Meanwhile Alphabet's profit margin was 22.9 percent in 2015. Yet Yahoo! and Alphabet have similar financial leverage. What can account for Alphabet's advantage over Yahoo! in ROE? Clearly, it is profit margin and asset utilization. Asset utilization can come from higher volumes, higher prices, and/or lower costs. It is clear that the big difference in ROE between the two firms can be attributed to the difference in these two ratios.

Problems with Financial Statement Analysis

We continue our chapter by discussing some additional problems that can arise in using financial statements. In one way or another, the basic problem with financial statement analysis is that there is no underlying theory to help us identify which quantities to look at and to guide us in establishing benchmarks.

As we discuss in other chapters, there are many cases in which financial theory and economic logic provide guidance in making judgments about value and risk. Little such help exists with financial statements. This is why we can't say which ratios matter the most and what a high or low value might be.

One particularly severe problem is that many firms are conglomerates, owning more or less unrelated lines of business. GE is a well-known example. The consolidated financial statements for such firms don't really fit any neat industry category. More generally, the kind of peer group analysis we have been describing is going to work best when the firms are strictly in the same line of business, the industry is competitive, and there is only one way of operating.

Another problem that is becoming increasingly common is that major competitors and natural peer group members in an industry may be scattered around the globe. The automobile industry is an obvious example. The problem here is that financial statements from outside the United States do not necessarily conform to GAAP. The existence of different standards and procedures makes it difficult to compare financial statements across national borders.

Even companies that are clearly in the same line of business may not be comparable. For example, electric utilities engaged primarily in power generation are all classified in the same group. This group is often thought to be relatively homogeneous. However, most utilities operate as regulated monopolies, so they don't compete much with each other, at least not historically. Many have stockholders, and many are organized as cooperatives with no stockholders. There are several different ways of generating power, ranging from hydroelectric to nuclear, so the operating activities of these utilities can differ quite a bit. Finally, profitability is strongly affected by the regulatory environment, so utilities in different locations can be similar but show different profits.

Several other general problems frequently crop up. First, different firms use different accounting procedures—for inventory, for example. This makes it difficult to compare statements. Second, different firms end their fiscal years at different times. For firms in seasonal businesses (such as a retailer with a large Christmas season), this can lead to difficulties in comparing balance sheets because of fluctuations in accounts during the year. Finally, for any particular firm, unusual or transient events, such as a one-time profit from an asset sale, may affect financial performance. Such events can give misleading signals as we compare firms. The nearby *Finance Matters* box discusses some issues along these lines.