

# THE CRIMSON PRESS CURRICULUM CENTER

## THE CRIMSON GROUP, INC.

### *Note on Ratio Analysis*

One way of looking at a set of financial statements is in terms of the information they convey about an organization's financial strengths and weaknesses. In particular, properly analyzed, the income statement, balance sheet, and statement of cash flows can convey a great deal of information about an organization's day to day operations and financial management activities. This information can be classified into four separate but related areas: profitability, liquidity, asset management, and solvency.

Recall that the asset side of the balance sheet contains those items that an organization owns or has claim to, whereas the liability and equity side shows how the assets have been financed. Since the balance sheet is the result of all of the organization's historical financial activities, viewed at a given point in time, it provides what might be thought of as the "long-run" view of an organization's asset acquisition and financing decisions. By contrast, the income statement lets readers look at the quality of the organization's *profitability* during a given accounting period. As we will see, ratios involving both the income statement and the balance sheet can help financial statement readers assess relationships among net income, assets, and liabilities.

One technique used to assess these relationships is ratio analysis, which focuses on mathematical comparisons between or among different sets of financial statements. This note discusses ratio analysis. Its learning objectives are contained in Exhibit 1.

#### **Exhibit 1. LEARNING OBJECTIVES**

Upon completing this Note, you should know about:

- The role of ratios in financial statement analysis
- The four categories of ratios that typically are used—profitability, liquidity, asset management, long-term solvency—and how to calculate several ratios in each category
- The three standards that typically are used for comparison of ratios: industry, historical, and managerial, and their use for understanding of how an organization has managed its profitability, liquidity, assets, and long-term solvency
- The importance of leverage and its drawbacks, including the distinction between financial risk and business risk
- The role of profit, and its importance for financing fixed assets and providing for the cash needs associated with growth
- The general process for analyzing a set of financial statements, including making a strategic assessment, identifying accounting issues, and analyzing financial management issues

### **WHY USE RATIO ANALYSIS?**

Image yourself with, say, \$1,000 to invest in one of two companies: Company A or Company B. You are given the following information about each company:

This background note was prepared by Professor David W. Young. It is intended to assist with case analyses, and not to illustrate either effective or ineffective handling of administrative situations.

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	<u>Company A</u>	<u>Company B</u>
Net income last year	\$100,000	\$1,000,000
Current assets as of the end of last year	50,000	\$500,000

In which company would you invest? Before deciding, suppose you were given the following information about the two companies:

	<u>Company A</u>	<u>Company B</u>
Shareholders' equity as of the end of the last year	\$500,000	\$100,000,000
Current liabilities as of the end of last year	25,000	\$10,000,000

This additional information has told us about two factors that might be of considerable importance to an investor: the relationship between net income and equity, and the relationship between current assets and current liabilities. Each is important for different reasons. If, for example, you are interested in investing in a company that will earn the highest return possible on your \$1,000, you presumably would prefer to have it invested in Company A, where net income is 20 percent of equity ( $\$100,000 \div \$500,000$ ), rather than Company B, where net income is only 1 percent of equity ( $\$1 \text{ million} \div \$100 \text{ million}$ ).

Of course, these are the figures for last year only, and the future may be quite different from the past. Nevertheless, the notion of a *return on investment* would lead you in a quite different direction than simply looking at net income in isolation. Similarly, if you are interested in investing in a company that can meet its current obligations when they come due, you presumably would be somewhat more concerned about Company B than Company A. That is, Company B has \$10 million of liabilities that are current (will be due and payable sometime in the next year), and only \$500,000 of current assets at the moment to provide the cash needed to meet those obligations. Company A, by contrast, while having only \$50,000 in current assets, has only \$25,000 in current liabilities, giving it a comfortable margin of safety.

Clearly there are many other factors you would consider in making an investment decision. The purpose of this example is only to illustrate that the absolute dollar amounts, by themselves, tell you relatively little about an organization's financial strength. Moreover, if we are to make comparisons of any sort—between two or more companies, or between different years of operations for the same company—we must use something other than flat dollar amounts. Ratios allow us to do this.

For a variety of reasons, many of which will be discussed below, even ratios have limitations, and we must supplement them if we are to fully understand and analyze a company's financial statements. Nevertheless, by permitting us to move beyond the absolute magnitude of the numbers on the financial statements to *a set of relationships between and among the numbers*, ratios can assist us greatly in the analytical effort.

## CATEGORIES OF RATIOS

There are many ratios that can be used for purposes of analyzing a set of financial statements. Regardless of the number used, they tend to fall into four categories: profitability, liquidity, asset management, and long-term solvency. In this Note, we will look at only a few ratios in each category.

In all instance, we need to bear in mind that, in addition to computing a ratio, we must consider its validity. With regard to net income, for example, is the figure based on estimates, such as an estimate of bad debts, and, if so, is any information available on its accuracy? If there is a depreciation expense, does it appear to be a reasonably accurate representation of the using up of the associated assets? Similarly, in assessing liquidity or long-term solvency, we would need to know about the nature of the organization's liabilities. Are they truly obligations that must be repaid or are they the result of higher-than-appropriate estimates (e.g., with warranties)? Have some liabilities, such as pensions, been underestimated, such that there may be unanticipated drains on cash in the future?

Once we are assured that we are dealing with reasonably valid data, some of the more important questions we might try to answer using ratios are discussed below, by category.<sup>1</sup>

### Profitability

With regard to an organization's profitability, i.e. the net income on its income statement, we might want to ask the following questions:

<sup>1</sup> A full discussion of the ratios in each category is more appropriate for a course in finance.

- How large was net income relative to revenue? Is it about right or too small?
- What was the organization's return on assets? Is this about right or too low?
- What was the organization's return on equity? Is this about right or too low?

## **Liquidity**

The question of liquidity is essentially one of cash availability and use. Among the questions we might ask are the following:

- How well is the organization using its cash? Does it have enough cash on hand to meet its current obligations? Does it have too much cash sitting idle?
- How well is the organization managing its accounts receivable? Are collection periods too long? Are they lengthening?
- How well is the organization managing its inventory? Does it have too much, thereby tying up cash in an otherwise unproductive asset, or does it have too little inventory?

## **Asset Management**

Assessing an organization's assets requires that we examine both the current and non-current sections of the asset section of the balance sheet. Current assets were examined under the heading of liquidity. With regard to non-current assets, several questions emerge:

- What is the nature of fixed assets? Are they appropriate to the organization's strategy?
- How well are assets being utilized? For example, how much revenue is being generated per dollar of assets?
- How old are the fixed assets? Are they in need of replacement? If so, will funds be available to replace them?

## **Long-Term Solvency**

To determine if the organization has made good financing decisions, and thereby has provided for its solvency over the long-term, we must look at the right side of the balance sheet as well as the income statement. Here, we are attempting to answer the following sorts of questions:

- How well have current liabilities been managed? Will the organization be able to meet these obligations when they become due?
- How much long-term debt is there relative to total equity? Is this about right? Is there too much debt given the inherent riskiness of the organization's operations? Could the organization take on more debt without jeopardizing its ability to repay both the new and existing debt?

## **CALCULATING RATIOS**

Ratio analysis provides a way to begin answering the above questions. A ratio is a mathematical relationship between two or more items on an organization's financial statements, calculated by dividing one or more elements on the statements by one or more others.

The principal purpose of ratio analysis is to facilitate comparisons, either for a single organization over a period of several years or among several similar organizations for a given year or other time period. Ratio analysis allows us to look closely at the issues of profitability, liquidity, asset management, and long-term solvency.

As indicated above, there are many ratios that can be calculated under each of these headings, and in some cases alternative elements can be included in the calculation of a given ratio. The discussion that follows covers the most common ratios and the elements that usually are included in calculating them. These ratios are summarized in Appendix A at the end of the Note.

## Profitability Ratios

Profitability ratios attempt to measure the ability of an organization to generate sufficient funds from its operations to both sustain itself and provide an acceptable return to its owners. Both aspects are important. Over the long term, a company must generate enough funds from operations to allow it to (1) replace fixed assets as they wear out, (2) purchase new fixed assets as revenues grow, (3) service its debt, and (4) provide for the cash needs associated with growth. Beyond this, investors in the company expect that the company's profits will be used to provide them with a reasonable return on their invested funds. Profitability ratios provide some partial evidence of how well an organization is satisfying these requirements.<sup>2</sup>

The first profitability ratio is *profit margin*.

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

This ratio effectively measures how much of each dollar in revenue received by the organization ultimately becomes net income. Profit margins tend to vary widely from one industry to the next. A company in an industry with commodity-like product, will tend to have a relatively low profit margin; it makes money by having a high volume of sales relative to its assets (generally by turning its inventory over many times a year). By contrast, a company in an industry that is highly capital-intensive, such as a manufacturer of earth-moving equipment or airplanes, will tend to have a larger profit margins; because of its large based of fixed assets, its sales volume relative to assets tends to be lower than a company selling commodities. We will examine this matter more fully below.

A second profitability ratio is *return on assets*, or *ROA*.

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

This ratio measures the ability of an organization to use its assets to earn profits. In effect, it provides a rudimentary indication of whether an organization is earning a sufficiently large profit to replace its assets under conditions of inflation, and thus to maintain itself in a steady state. Accordingly, one would hope to see an ROA that is at least as high as the rate of inflation in an organization's industry. A higher ROA is needed if owners are to receive a return on their investment in the company. This issue also be explored in greater detail later in the note.

The final profitability ratio is *return on equity*.

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

This ratio, generally abbreviated as ROE (or sometimes ROI, for “return on investment”), is perhaps the most commonly used indicator of profitability. It allows investors or potential investors to compare the earnings on their investment in one organization with a variety of alternative uses (e.g., savings certificates, treasury notes) of the investment funds.

## Liquidity Ratios

Liquidity ratios measure an organization ability to convert its non-cash assets into cash (i.e., to “liquidate” its assets). Liquidity ratios generally are computed with some portion of an organization's current assets, occasionally comparing them with its current liabilities. Recall that current assets are those assets that will be, or have a reasonable expectation to be, converted into cash within a year; current liabilities are those obligations that must be paid in cash within a year. Consequently, the most commonly used liquidity ratio is the *current ratio*.

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

<sup>2</sup> Note that, except for providing a return to the owners, nonprofit organizations also must satisfy these requirements. For additional details, see *Note on Financial Surpluses in Nonprofit Organizations*, Cambridge, MA: The Crimson Press Curriculum Center.

Although many considerations govern the appropriate size of this ratio for any given company, and there tend to be wide variations across industries, a figure of 2.0 often is used as an appropriate level. That is, current assets should be roughly twice current liabilities.

A variety of other liquidity ratios can be computed to measure some portion of the current ratio. The most frequently used is the *quick ratio* (sometimes called the *acid-test ratio*).

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Marketable securities} + \text{Net accounts receivable}}{\text{Current liabilities}}$$

The purpose of the quick ratio is to eliminate those current assets that, for one reason or another, may not be readily or fully convertible into cash. In particular, the quick ratio excludes inventory and prepaid expenses. If a quick ratio is below 1.0, it suggests that the organization may encounter some difficulties in meeting its current liabilities when they come due.

Although included in both the current and quick ratios, accounts receivable frequently can be a somewhat questionable asset. Both ratios compensate for this uncertainty by using a *net* accounts receivable figure (i.e., gross accounts receivable less the allowance for doubtful accounts). Nevertheless, more detail on accounts receivable frequently is helpful. A third liquidity ratio, *average days receivable*, allows us to make an assessment of how quickly an organization is collecting its accounts receivable.

$$\text{Average days receivable} = \frac{\text{Net accounts receivable}}{\text{Revenue} \div 365}$$

The denominator of this ratio gives us the average revenue earned per day (ideally using credit sales only). When this figure is divided into net accounts receivable, we have an estimate of the average number of days of revenue that are included in the net accounts receivable figure. This gives us a rough estimate of the average number of days needed to collect an account receivable. This figure can be compared with the company's payment policies to determine how well customers, on average, are abiding by the company's expectations.

A final liquidity ratio is one that is comparable to the average days receivable ratio: *average days inventory*.

$$\text{Average days inventory} = \frac{\text{Merchandise Inventory}}{\text{Cost of goods sold} \div 365}$$

Cost of goods sold, when divided by 365 gives the average cost of goods sold per day. When this is divided into merchandise inventory, the result is the average number of days that inventory was on hand before being sold.

Some organizations do not sell their inventory. Rather, they use up an inventory of supplies (e.g., office supplies) in order to conduct their business. In these cases, there will be no cost of goods sold figure. When this happens, total expenses (or, better yet, total expenses less salaries and depreciation) can be used in place of cost of goods sold. Although some precision is lost, such a ratio, when used in a comparative way overall several years, may help to reveal potential weaknesses in inventory management.

### Asset Management Ratios

The average-days-receivable and average-days-inventory ratios lie at the intersection of liquidity and asset management, since they have aspects of each included in them. Asset management ratios help us to assess how effectively an organization is using its assets (which include accounts receivable and inventory). In addition to average days receivable and average days inventory, a commonly used asset management ratio is *asset turnover*.

$$\text{Asset turnover} = \frac{\text{Revenue}}{\text{Total assets}}$$

This ratio allows us to determine how many dollars of revenue the organization has earned for each dollar it has invested in assets. Organizations that have an asset base consisting largely of accounts receivable and inventory would be expected to have a relatively high asset turnover; that is,

each item in the asset base is used up and replaced many times a year, and revenue is earned each time an inventory item is sold and a new accounts receivable is created. By contrast, organizations with a high proportion of fixed assets, such as plant and equipment, generally would have a low asset turnover, since it takes several years for a fixed asset to be used up (via depreciation).

If an organization is fairly capital intensive, such as an oil refinery, a modified ratio may shed more light on the quality of its asset management; this is the *fixed-asset turnover ratio*.

$$\text{Fixed-asset turnover} = \frac{\text{Revenue}}{\text{Net fixed assets}}$$

In a rough sense, this ratio permits us to assess the relative productivity of new plant and equipment, compared to plant and equipment assets that are highly depreciated. One would expect that, as assets depreciated (and, hence, *net* fixed assets fell), the ability of those assets to earn revenue also would fall. The magnitude of this fall can be assessed by use of this ratio. A comparison might be made to the organization's past performance (when the assets were newer), for example, or to other organizations with relatively new assets.

### Long-Term Solvency Ratios

Long-term solvency ratios provide an indication of the way an organization has financed its assets over the long term (i.e., beyond one year). Generally, two issues are of concern here. First, the balance between debt and equity financing. The former consists of loans, mortgages, bonds, and similar debt instruments; the latter of contributed capital and retained earnings. Second, the ability of the organization to meet its debt obligations.

In looking at the balance between debt and equity, the most commonly used ratio is the *debt/equity ratio*.

$$\text{Debt/Equity} = \frac{\text{Total liabilities}}{\text{Equity}}$$

The higher this ratio, the greater the organization's "leverage," i.e., the greater the extent to which it has used external funds (debt) to supplement its internal funds (equity).

Several other measures of leverage exist also. A common one is obtained by dividing total assets by equity.

$$\text{Leverage} = \frac{\text{Total assets}}{\text{Equity}}$$

Effectively, this ratio is the same as the debt/equity ratio plus one,<sup>3</sup> a distinction that will become more important later in the Note.

Because of the need to make both short- and long-term assessments, analysts frequently distinguish between short- and long-term debt (i.e., between current and long-term liabilities). This gives rise to a modified—and more frequently used—version of the debt/equity ratio: the *long-term debt/equity ratio*.

$$\text{Long-term debt/equity} = \frac{\text{Non-current liabilities}}{\text{Equity}}$$

Looked at over time, this ratio can reveal the extent to which an organization is relying increasingly on long-term debt to finance asset acquisition.

As indicated above, debt—either long- or short-term—gives rise to a debt service obligation, i.e., the payment of both principal and interest. An organization's ability to meet its debt-service obligation in a timely way can be measured by a ratio called *debt service coverage*:

$$\text{Debt service coverage} = \frac{\text{Net income} + \text{Depreciation} + \text{Interest payments}}{\text{Principal} + \text{Interest payments}}$$

<sup>3</sup> This is true by virtue of the fundamental accounting identity: Assets = Liabilities + Equity. If A = L + E, then

A/E = L/E + E/E, or A/E = L/E + 1, i.e. assets/equity is debt/equity plus one.

The numerator of this ratio is a rough estimate of the cash available to meet debt-service obligations; the denominator is the debt-service obligation itself. Depreciation is included in the numerator because it is a non-cash expense. Interest payments are added because we want to determine the funds available to meet principal *and* interest payments, and net income measures the funds left *after* interest payments have been made. Thus, the ratio provides some indication of the extent to which the debt service obligation is “covered” by available cash, subject, of course, to the caveat that not all of net income is available in cash.

Since principal payment amounts frequently are not known to individuals outside an organization (although they usually can be found on the SCF), a surrogate ratio, called *times-interest-earned*, occasionally is used by outside analysts in lieu of debt service coverage.

$$\text{Times-interest-earned} = \frac{\text{Net income} + \text{Interest payments}}{\text{Interest payments}}$$

Since it does not include principal payments, however, this ratio can be a misleading measure of an organization's ability to meet its debt service obligations. To illustrate this phenomenon, consider the following situation:

Net income (N)	\$20
Depreciation (D)	5
Interest (I)	2
Principal payment (P)	8

Under these circumstances, the debt service coverage ratio is 2.7, calculated as follows:

$$\frac{N + D + I}{P + I} = \frac{27}{10} = 2.7$$

Its times-interest-earned ratio, by contrast, is 11, calculated as follows:

$$\frac{N + I}{I} = \frac{22}{2} = 11.0$$

Thus, while the organization has earned enough cash to cover its interest payment eleven times, it can only cover its entire *debt service* obligation about three times. Since *all* debt service payments must be made (not just interest), this discrepancy is of some concern.

From a cash management perspective, we are very interested in debt service coverage. Yet unless we have information on principal payments (which frequently we do not), we cannot calculate the debt-service-coverage ratio. However, as the above example suggests, to calculate only times-interest-earned could give a misleading sense of comfort about the organization's ability to meet its debt service obligations. What might we do?

One approach is to assume that depreciation and principal payments are the same. Although this approach will rarely yield a completely accurate measure of debt service coverage, it generally is reasonably easy to calculate since all the elements are fairly readily available. And it ordinarily will come reasonably close to the true debt service coverage ratio, as indicated below.<sup>4</sup>

$$\frac{N + D + I}{D + I} = \frac{27}{7} = 3.9$$

Thus, when principal payments exceed depreciation (which usually will be the case (since lenders rarely will provide a debt instrument whose term exceeds the economic life of the asset being financed), this surrogate ratio will make debt service coverage look somewhat better than it really is. But, in general, the result will not be as misleading as the times-interest-earned ratio in measuring an organization's ability to meet its debt-service obligations.

Even with this modification, we must bear in mind that most organizations have more fixed-cash obligations than debt service. It therefore is extremely important that the debt-service-coverage ratio

<sup>4</sup> Note that if an organization has matched the term of its debt (i.e. the number of years for which the loan has been written or the bonds are outstanding) with the “life” of the assets being financed with that debt, the depreciation add-back on the SCF will be equal to the principal payments on the debt. When this happens, there is no net cash outflow from repaying principal.

(or the times-interest-earned ratio) be analyzed in the context of other related ratios, most notably those relating to liquidity.

## VARIATIONS ON THE THEME

There are many other ratios that could be calculated. Several of these are discussed below. Interested readers can find more information on ratio calculations and ratio analysis in books dedicated to that topic.<sup>5</sup>

$$\text{Gross margin percentage} = \frac{\text{Gross margin}}{\text{Sales revenues}}$$

This is a variation on profit margin, looking only at sales revenue and only at gross margin, i.e. sales revenue minus cost of goods sold. It is a measure of profitability before the inclusion of operating expenses, sales and administrative expenses, interest, and taxes.

$$\text{Earnings per share} = \frac{\text{Net income minus Dividends to preferred shareholders}}{\text{Average shares of common stock outstanding for the year}}$$

In general, EPS is calculated by dividing a corporation's net income for a year by the average number of shares of common stock that were outstanding during that year. Since investors frequently are interested in comparing the financial performance of several corporations in which they have invested their funds, EPS provides a measure that they can use rather easily to compare one corporation with another. Other things equal, investors would prefer to have their funds invested in corporations that have comparatively high earnings per share.

$$\text{Price-earnings ratio} = \frac{\text{Average market price of common stock}}{\text{Earnings per share}}$$

The price-earnings or P/E ratio is perhaps the most widely used indicator of performance employed by the investment community. When it is high, a stock is said to be selling in "high multiples." From the corporation's perspective, a high P/E ratio is good; it indicates that investors like the company's stock relative to its current earnings, and relative to companies with lower P/E ratios. From an investor's perspective, however, a high P/E ratio is less desirable; it indicates that the corporation's stock price is high relative to its earnings.

Of course, an investor's decision to purchase a particular stock includes many more considerations than just EPS and the P/E ratio. A discussion of these considerations is more appropriate for a finance text than an accounting text, however.

$$\text{Return on permanent capital} = \frac{\text{Net income} + \text{interest} + \text{taxes}}{\text{Equity} + \text{non-current liabilities}}$$

This ratio is a variation on return on equity. It, like return on equity, sometimes is called ROI. Permanent capital is defined as equity plus long-term debt (or non-current liabilities). Therefore, this ratio measures the earnings on all sources of long-term financing (debt and equity). It also does so before taxes and interest are deducted. Interest is added back since we are interested in the return on debt capital as well as equity capital. Therefore, we must include the earnings before the interest payment (i.e., the cost of the debt capital). Similarly, by adding back income tax, we are able to look at how well the company performed despite its particular tax situation.

The numerator of this ratio frequently is called earnings before interest and taxes, or *EBIT*. The term "EBIT" is used quite frequently in finance and by the investment community. It is a term you should be familiar with, as you are likely to hear it often.

$$\text{EBIT margin} = \frac{\text{EBIT}}{\text{Sales revenues}}$$

This is a variation on profit margin, using EBIT instead of net income.

<sup>5</sup> One of the most popular books is Helfert, Erich A., *Techniques of Financial Analysis: A Practical Guide to*

*Measuring Business Performance*. New York: McGraw-Hill, 1997.



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$$\text{Capital turnover} = \frac{\text{Sales revenue}}{\text{Equity} + \text{Non-current liabilities}}$$

This ratio is a variation on asset turnover, but the denominator looks only at permanent capital (i.e., it excludes current liabilities), and thus is less than total assets.

## USING RATIOS FOR FINANCIAL STATEMENT ANALYSIS

Ratio calculations are an important aspect of financial statement analysis because they allow us to look at the relationship among various parts of a single statement, such as the balance sheet, or at the relationship between elements on two different statements, generally the income statement and the balance sheet. The current ratio—which examines the relationship between current assets and current liabilities—is an example of the former; the return on assets ratio—where net income (from the income statement) is compared with assets (from the balance sheet)—is an example of the latter.

### Standards for Comparison

Although ratios can assist us in analyzing a set of financial statements, they do not provide all the answers. One important question that emerges in the use of ratios is the standard to which the ratio should be compared. For example, as indicated above, the current ratio should give us some indication of an organization's liquidity, and therefore can assist us in assessing the way the organization is managing its current assets. A figure of 2.0 was suggested as about right.

Suppose we calculate the current ratio and find that it is 1.5; that is, current assets are 1.5 times greater than current liabilities. Is this too low? Are there circumstances that would make 1.5 acceptable? Is it possible that under some circumstances 1.5 might be too high? Answering these questions requires that we have some standard for comparison. In general, three possible standards exist: industry, historical, and managerial.

**Industry Standards.** Industry standards are popular and can form an easy basis for assessing the quality of an organization's financial ratios. However, industry standards also can be misleading. We typically have several concerns when using industry standards. The first, is whether the organization we are analyzing is truly a member of the “industry” for which the standards have been developed. For example, considerable work has been expended developing industry norms for hospitals, and yet within this so called “industry” there may be a number of subindustries that are more relevant for analysis. There are teaching hospitals and community hospitals, rural hospitals and urban hospitals, large hospitals and small hospitals, investor-owned hospitals and nonprofit hospitals, hospitals in the Southwest and hospitals in the Northeast.

For several reasons, such as regulatory requirements, regional payment patterns by insurance companies, and so on, a hospital in a particular region of the country may, by necessity, have a ratio that diverges from the so-called norm. Certainly, we would expect the financial ratios for a large, nonprofit teaching hospital in an urban setting in the Northeast to be somewhat, if not considerably, different from those of a small, investor-owned, rural community hospital in the Southwest.

Second, since industry norms generally are derived from published data, it is possible that the ratios for both the organization under analysis and the industry overall have been calculated in different ways. With some ratios, there is only one method of calculation, and there are no problems. With others, there may be several different ways that the ratio can be calculated, each of which is legitimate, but each of which will produce slightly different results. Moreover, despite the presence of generally accepted accounting principles, there is a lack of a uniform chart of accounts or uniform reporting for almost all industries. This means there is a good possibility that some ratio comparisons will not be valid ones even if we think the same elements are being included.

Finally, we must be certain that the ratios are for roughly the same time period. This is particularly important if there have been changes in the organization's environment or its strategy. For example, assume that the industry norm for an accounts receivable collection ratio for a company doing business with a state government had been calculated during a period when the state's resources were plentiful and payments were being made in a timely way. It would be quite misleading to compare that ratio with one calculated when the state's fiscal resources were less plentiful and its payments less timely. As many organizations have learned quite painfully, changes of this sort frequently do not happen gradually, but rather, quite dramatically, such that a comparison of ratios to an industry norm that was developed only one year previously could be quite misleading.

These latter concerns suggest that, apart from the regional variations and calculation differences, an “industry norm” is not necessarily the right level for a ratio. Some studies that have attempted to develop industry norms, for example, have looked at organizations that ultimately went bankrupt; this hardly provides a standard to aspire to. Moreover, as interest rates rise and fall, many companies will shift the mix of their permanent capital, sometimes having high debt and sometimes shifting away from debt into a greater proportion of equity. Thus, what was a norm five or ten years ago may no longer be appropriate. In short, managers should view industry norms with skepticism.

**Historical Standards.** Historical standards avoid many of the problems associated with industry norms. Since they consist of ratios calculated over time for the same organization, there is no question that the industry is the same (unless the organization has had a major strategic shift and moved into a new industry). It is also quite easy to avoid the problem of calculating the ratios in different ways.

The weakness of historical ratios, of course, is that they have no external validation. For example, an organization's accounts receivable collection period may have remained at 60 days for a number of years, but management may be unaware of a technique that other similar organizations in the same industry are using to accelerate collections to, say, 30 days. Without some sort of external validation, management may continue to think that a 60-day collection period is appropriate.

**Managerial Standards.** Industry ratios are not the only way an organization's management learns of practices in its industry. For example, consider the above situation in which a 60-day collection period was thought to be reasonable when other organizations in the industry had achieved a 30-day period.

It should not be necessary to bring information of this sort to management's attention via an industry norm for an accounts receivable collection period. Managers generally engage in a variety of activities that make them aware of how other organizations in their industry are being managed. It would be a rare case, indeed, for the manager of an organization with a 60-day collection period not to be aware of the fact that all other organizations in the same industry were achieving 30 days, even if no published industry ratios were available.

Because of the availability of external information such as the above, and because different organizations have different strategic objectives, an organization's senior management may establish certain standards that deviate from historical patterns, but that are consistent with its chosen strategic directions, and its own sense of how the organization's balance sheet needs to be managed. It is even possible, of course, that where industry norms are available, management will decide that it wishes to deviate from these norms for one reason or another. It may wish, for example, to tolerate longer collection periods for its accounts receivable than other organizations in its industry because it knows that many of its customers have long inventory holding periods. Rather than insist on timely payment, (which effectively would result in a loss of sales), it chooses instead to accept a longer collection period. Indeed, this may be how it gains market share in an very competitive environment. Without knowing this kind of information, it is extremely difficult for an external analyst to be critical of a particular organization's financial management practices.

## The Need for Judgment

In summary, using ratio analysis to make comparisons between an organization and its competitors—or among several similar organizations—must be done with great care. Not all organizations, even those in the same industry, prepare their financial statements in the same way or incorporate the same information into accounts with similar names. Thus, when ratios are used to compare two or more organizations, even if the ratios included in the comparison use very specific accounts on the financial statement, the results should be viewed with some skepticism.

In general, then, while comparisons among organizations *can* be made, or the ratios of a given organization *can* be related to some industry norm, the most valid comparisons usually are those that are made over time for a single organization.

Even when ratios are calculated historically for the same organization, however, changes in the organization's environment, strategy, or managerial tactics may invalidate the comparisons. In short, it seems quite clear that an external analyst must exercise considerable caution in interpreting an organization's ratios. About all the analyst can do is raise questions about the quality of the organization's profitability, liquidity, asset management, or long-term solvency decisions, but it is quite difficult to be critical or judgmental without some understanding of the organization's environment, strategy, and overall management. We will return to these matters later.

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### Accounting Vignette *Standard and Poor*

According to an article in *Fortune*, Standard and Poor's 500-stock index sold for 19.8 times earnings over the four quarters ending September 30, 1991, and offered a dividend yield of only 3.1 percent. While history would suggest that stock prices soon would begin to fall, the article indicated that there was little cause for concern. The co-chair of the investment policy committee of Goldman Sachs said "... it's wrong to look at a market P/E based on trailing earnings when they reflect a recession." He expected operating profits of S&P 500 companies to rise 13 percent in 1992. He also thought that the market's small dividend yield was not so bad compared to the recent three-month Treasury bill rate of 5.04 percent.<sup>6</sup> Obviously, considerable judgment was being exercised in interpreting these ratios.

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## A Disclaimer

There is no general agreement that the four categories of ratios discussed in this Note are the most appropriate ones. In addition, some analysts would classify some of the ratios into categories differently than is done here. Still others would calculate the ratios themselves somewhat differently. They would use different numerators or denominators, for example, or they would use averages rather than ending amounts for balance sheet items.

You should be aware of these different approaches to ratio analysis. But, more importantly, you should not lose sight of the fundamental thrust of ratio analysis. Its purpose is not to arrive at the "right" ratio or the "right" classification of a ratio. Rather, the purpose is to help analyze a set of financial statements in an effort to understand how an organization is being managed financially. In this regard, the goal is to see what sort of "story" a set of ratios tells about the company. In general, greater precision in calculating certain ratios, or a reclassification of some of the ratios into different categories will not change that story much, if at all. We thus must beware of the trap that many analysts fall into of worrying about the precision of specific ratio calculations and classifications rather than the overall story the ratios tell.

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### Accounting Vignette *General Motors Corp.*

In 1991, after incurring a \$6 billion operating loss, General Motors Corp. found that its debt was becoming an increasingly serious issue. Its poor operating performance meant that its credit ratings were in danger of falling, adding an estimated \$200 million to \$300 million a year to its borrowing costs (due to higher interest payments). An article in *Business Week* discussed the nature of GM's problem by reference to its debt-to-capital ratio, which at the end of 1991 was 70 percent, up from 40 percent in 1989. A Standard and Poor vice president for corporate finance noted that GM was "aggressively leveraged at this point."<sup>7</sup>

Note that although this ratio is not one discussed in the Note, it is intuitively understandable. Moreover, almost any other debt-related ratio—such as long-term debt to equity or leverage—would tell essentially the same story.

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## TWO TRICKY ISSUES

In conducting an analysis of a set of financial statements, there are two issues that must be given special consideration: leverage and the role of profit. Each is a little tricky to analyze.

### Leverage

Leverage is a subject of concern to managers of many organizations. The purpose of this section is to describe it more fully, and to put it into a context for a discussion of the role of profit. Recall that leverage can be defined as:

$$\frac{\text{Assets}}{\text{Equity}}$$

<sup>6</sup> "Why the Bull Won't Tumble," *Fortune* /1992 Investor's Guide.

<sup>7</sup> "GM Slices and GM Slashes, But the Flab Survives," *Business Week*, December 23, 1991.

As we know from the fundamental accounting equation  $\text{Assets} = \text{Liabilities} + \text{Equity}$ , if an organization had no debt whatsoever, its assets and equity would be equal. Its leverage ratio, therefore, would be one. As an organization begins to rely on debt to finance its assets, however, the ratio increases. Exhibit 2 illustrates this phenomenon with a simple example, beginning with a balance sheet in which assets and equity are equal, and moving to a situation in which total debt and equity are equal. As can be seen, the ratio increases to a level of 2.0 under these circumstances.

### Exhibit 2. EXAMPLES OF LEVERAGE

<b>Situation 1:</b>	<u>Assets</u>	<u>Liabilities</u>	<u>Equity</u>
<b>No debt</b>	1,000	0	1,000
Leverage = $1,000/1,000 = 1.0$			
-----			
<b>Situation 2:</b>	<u>Assets</u>	<u>Liabilities</u>	<u>Equity</u>
<b>Debt of \$500</b>	1,500	500	1,000
Leverage = $1,500/1,000 = 1.5$			
-----			
<b>Situation 3:</b>	<u>Assets</u>	<u>Liabilities</u>	<u>Equity</u>
<b>Debt of \$1,000</b>	2,000	1,000	1,000
Leverage = $2,000/1,000 = 2.0$			

Most significantly, as Exhibit 2 shows, leverage allows an organization to finance more assets than would be possible if it relied only on its own equity. Note that equity has remained unchanged in this example while assets have doubled. In a very real sense, the organization is using debt as a “lever” to expand its asset base. This, in turn, allows it to deliver more services or to produce more goods than otherwise would be possible, and therefore to earn more revenue.

Leverage does not come without some drawbacks. Borrowed funds must be repaid, generally with an interest charge. Organizations that rely heavily on borrowed funds spend considerable time and effort predicting and managing their cash flows so as to assure themselves of sufficient cash on hand to meet their debt service obligations.

One way to think about leverage is in terms of the *financial risk* it creates as compared with the organization's overall *business risk*. Financial risk and leverage are synonymous. That is, other things equal, the higher an organization's leverage, the higher its debt service obligation, and the greater the risk that it will be unable to meet this obligation. Thus, it has a high financial risk.

Business risk, by contrast, refers to the certainty of cash flows. Specifically, organizations that have a relatively high business risk have a high degree of *uncertainty* about their cash flows. A good example of an organization with a high business risk is a farm, where product availability and cost are greatly influenced by unpredictable climactic conditions. A good example of an organization with a low business risk is a fast food restaurant located in a neighborhood with many children. The farm would face a great deal of uncertainty from one year to the next about its annual cash flows, whereas the fast food restaurant would be almost completely certain of its. The combined effect of these two kinds of risk is illustrated in Exhibit 3.

### Exhibit 3. FINANCIAL RISK VERSUS BUSINESS RISK

<b>Financial Risk</b>	<b>High</b>	<i>Possible</i>	<i>Danger Zone</i>
	<b>Low</b>	<i>Very Safe</i>	<i>Necessary</i>
		<b>Low</b>	<b>High</b>
		<b>Business Risk</b>	

As Exhibit 3 suggests, other things equal, it is *possible* for an organization with low business risk to have a high financial risk. Assuming it does not take on more debt service obligations than its cash flow can support, the relative certainty of its annual cash flows gives it some reasonable assurance that it will be able to meet these obligations from one year to the next. By contrast, an organization with a high business risk generally would find it *dangerous* to have high financial risk, i.e., a great deal of leverage. Since debt service obligations remain constant each year, the organization could quite easily find itself in a situation where, because of events beyond its control, cash flows were not sufficient to meet these obligations. The result could threaten the organization's continued viability. Thus, an organization with a high business risk generally finds it *necessary* to have low financial risk.

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### **Accounting Vignette** **Safeway Stores, Inc.**

An article in *Progressive Grocer* concerning Safeway Stores, Inc. quoted the chairman of Safeway as follows: "... with interest rates of less than 10 percent, it does not pay to cut back on capital expenditures to reduce debt because the rate of return is 25 percent on new stores and 30 percent on remodels." The article went on to say that the high-leverage climate has resulted in some new ways of looking at financial figures. In particular, three factors were discussed that govern the success of leveraged firms: the business environment, how well the company is operated, and the ability to spend money on capital improvements.<sup>8</sup> In many respects, these factors indicate the nature of the company's business risk.

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## **THE ROLE OF PROFIT**

Economists frequently cite profit as fundamental to capitalism. According to them it motivates, measures success, and rewards. Indeed, economists see an adequate profit as a legitimate cost of operating an organization. It is excess profits (i.e., those greater than a normal return) that provide an impetus for new organizations to enter a market. In the purely competitive model, excess profits entice new organizations to enter a market and increase the supply of goods and services. This goes on until prices fall to a level at which all organizations can earn a normal profit. At that point, the market is in "equilibrium."

The accountants' and managers' view of profit is somewhat different. In the first place, profit for an accountant is simply the numerical difference between revenues and expenses. Second, in addition to providing a return to the owners of an organization, one of profit's principal purposes is to finance asset acquisitions. In fact, as indicated previously, a basic financial management maxim is that an organization should finance its fixed assets with some combination of long-term debt and equity. Direct contributions by the owners or shareholders of the company, as well as retained earnings from operations, are the sources of equity.

The financing role of profits is an important one. Manufacturing organizations that must add to plant capacity, purchase new and more sophisticated equipment, and upgrade their facilities have large fixed-asset bases that require large amounts of financing. But even small service organizations, that must add office equipment, desktop computers, and other small assets as they develop and grow, have financing needs. Moreover, any organization that wishes to remain in a steady state must provide for the replacement of assets, since inflation, however slight, effectively serves to erode an organization's asset base.

### **Financing Fixed Assets**

Most organizations have a need to retain some of their earnings, and thus establish selling prices so as to provide for both dividends plus the desired amount of retained earnings to help meet capital needs. The company's selling price, then, becomes part of the profit formula, a formula that includes both volume and cost. Further, the required profit level generally is related to the organization's desired return on equity (ROE).

As indicated in the section on calculating ratios, ROE is closely related to another figure of concern to managers: return on assets, or ROA. Indeed, as indicated in the discussion of ROA, if an organization does not obtain a sufficiently high return on assets, it will be unable to sustain itself over the long term. This is because, as assets wear out or become technologically obsolete, manage-

<sup>8</sup> Weinstein, Steve, "Living with Leverage," *Progressive Grocer*, Volume 71, Issue 5, May 1992.

ment must replace them and, because of inflation, doing so requires more funds than depreciation provides.

One way of analyzing this problem is with a combination of several of the ratios discussed above. The set of ratios contained in Exhibit 4 demonstrates some important relationships. In particular, two important questions emerge from a careful analysis of the distinction between ROA and ROE: (1) Which is the preferable measure? and (2) How much is enough?

The first question is not trivial. By using leverage, an organization can transform a low ROA into a high ROE. A high ROE, however, is no guarantee that assets can be replaced as they wear out. Indeed, if an organization is highly leveraged, and if managers wish to replace assets without a decline in ROE, they must maintain their organization's leverage at the initial level, but they often cannot either obtain more debt or refinance existing debt. As a result, it may not be possible to provide for asset replacement.

The second question can be answered by recognizing that, other things equal, in an inflationary economy an ROA equivalent to the rate of inflation is necessary to replace assets as they wear out. Therefore, the desired ROA figure needs to be at least as high as the rate of inflation, and higher if the organization is expanding its asset base or wishes to pay dividends.

#### Exhibit 4. TWO SETS OF RATIOS

##### #1. Components of ROA (a measure of operating performance)

$$\frac{\text{Net Income}}{\text{Revenue}} \times \frac{\text{Revenue}}{\text{Assets}} = \frac{\text{Net Income}}{\text{Assets}}$$

$$\text{Profit margin} \times \text{Asset turnover} = \text{ROA}$$

##### #2. Components of ROE (a measure of operating performance combined with financing strategy)

$$\frac{\text{Net Income}}{\text{Assets}} \times \frac{\text{Assets}}{\text{Equity}} = \frac{\text{Net Income}}{\text{Equity}}$$

$$\text{ROA} \times \text{Leverage} = \text{ROE}$$

Once a desired ROA figure has been chosen, it can be attained with many combinations of margin and asset turnover. In general, the easiest approach is to determine a reasonable asset turnover—based on, say, past performance—and to use it, in conjunction with the desired ROA figure, to calculate the necessary profit margin percentage. This, in turn, can be used to set *desired* prices at an appropriate level above expenses. While market forces clearly will affect the prices an organization actually can charge, such an approach nevertheless provides a starting point. Moreover, it allows a manager to determine which services and products are priced below their desired level, and therefore to better manage the needed cross-subsidization from other services and products.

## THE ANALYTICAL PROCESS

In undertaking a ratio analysis, it is important to have a context. Thus, a helpful first step is to seek to understand the organization's strategy. Doing so includes assessing the organization's environment and determining such factors as (1) the relevant competitive and regulatory forces, (2) the nature of the organization's customers, (3) any possible changes in customer needs in the future. In conducting this analysis, an analyst should be attempting to identify the organization's critical success factors? That is, what must the organization do well in order to succeed? How, if at all, will these factors show up on the financial statements?

Following this, it probably is best to conduct the analysis along the lines of the ratios discussed above. A set of questions for each of the four ratio areas was given earlier. Some further considerations are given below:

- How does this organization generate a profit? Selling many units of a relatively low margin item, or selling a few units of a relatively high-margin item? A supermarket is a good example of the former. A heavy equipment or steel manufacturer is a good example of the latter.
- How do the ratios compare to the conclusions you drew in your strategic analysis?
- Is the organization earning a sufficiently high return on assets to counteract the forces of inflation? If not, what steps has it taken to correct for the deficiencies? What else might be done?
- How does the asset turnover compare to the expectations for this organization, given its industry? For example, is this an industry with low profit margins where high asset turnover is key to success? If so, how is this organization doing?
- How is the organization managing its current assets, particularly accounts receivable and inventory? Have these turnover rates been improving or worsening over the time period for which financial statements are available? Why?
- How much leverage does this organization have? Does it have too much financial risk compared to its business risk (i.e. is it in the “danger zone” on Exhibit 3)?
- What kind of debt-service coverage does the organization have? Is there a reasonable margin for safety given its business risk?
- Given the strategic assessment, what is the “business risk” of this organization? That is, are its cash flows fairly predictable and certain from year to year (low business risk) or is there considerable uncertainty (high business risk)?
- What does an environmental assessment indicate about the future for this organization? Are any of the circumstances surrounding its business risk likely to change? If so, how will the changes affect its business risk? What does this suggest for its debt?

## SUMMARY OF THE NOTE

This Note has looked at the role of ratio analysis, and has discussed the 14 ratios that are summarized in Appendix A, plus some other ratios that are used on occasion. The analysis inevitably results in the need to pay some attention to the issue of leverage, and the Note addressed both the advantages and some of the risks of leverage. Indeed, one of the most important aspects of financial management is the management of debt, or leverage. Further, however, managers must be aware of the need to earn a sufficiently large profit to provide for dividends and asset replacement.

You are now ready to analyze the practice case. Please do so to the best of your ability before looking at the solutions.

## Appendix A. SUMMARY OF 14 KEY RATIOS

### Profitability Ratios

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Operating revenues}}$$

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

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

### Liquidity Ratios

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

$$\text{Quick ratio} = \frac{\text{Cash} + \text{Marketable securities} + \text{Net accounts receivable}}{\text{Current liabilities}}$$

$$\text{Average days receivable} = \frac{\text{Net accounts receivable}}{\text{Revenue} \div 365}$$

$$\text{Average days inventory} = \frac{\text{Inventory}}{\text{Cost of goods sold} \div 365}$$

### Asset Management Ratios

$$\text{Asset turnover} = \frac{\text{Revenue}}{\text{Total assets}}$$

$$\text{Fixed-asset turnover} = \frac{\text{Revenue}}{\text{Net fixed assets}}$$

### Long-Term Solvency Ratios

$$\text{Debt/Equity} = \frac{\text{Total liabilities}}{\text{Equity}}$$

$$\text{Leverage} = \frac{\text{Total assets}}{\text{Equity}}$$

$$\text{Long-term debt/equity} = \frac{\text{Non-current liabilities}}{\text{Equity}}$$

$$\text{Debt-service coverage payments} = \frac{\text{Net income} + \text{Depreciation} + \text{Interest}}{\text{Principal payments} + \text{Interest payments}}$$

$$\text{Times-interest-earned} = \frac{\text{Net income} + \text{Interest payments}}{\text{Interest payments}}$$



## PRACTICE CASE. ENERGY DEVICES, INC.

Energy Devices, Inc., (EDI) was a corporation that dealt in energy-saving devices. The company purchased storm windows, shower nozzles that restricted the flow of water, and other similar devices in bulk, repackaged them, and resold them. Exhibit 1 contains the company's balance sheets as of December 31, 2010 and 2011, and its income statements for 2010 and 2011.

### Assignment

1. Calculate the 14 ratios summarized in Appendix A for EDI.\*
2. What do the ratios tell you about EDI?
3. What additional information would you like to have about EDI to better analyze its financial statements?

\* Try to set up a spreadsheet to calculate the ratios. Set it up to be as “formula driven” as possible, i.e., in such a way that you need to enter as few items as possible from the financial statements. Then use the spreadsheet for other organizations when you need to calculate ratios. If you set the spreadsheet up correctly, you should be able to calculate ratios for the next organization you analyze by copying the EDI file and entering the numbers from the new set of financial statements. All relevant ratios then should be calculated automatically by the spreadsheet formulas.

### Exhibit 1. Comparative Financial Statements Balance Sheets as of December 31, 2010 and 2011 (\$000)

<b>Assets</b>	<b><u>2010</u></b>	<b><u>2011</u></b>
Cash	\$ 19,000	\$ 30,000
Accounts receivable	24,000	15,000
Inventory	<u>31,000</u>	<u>59,000</u>
Total current	\$ 74,000	\$104,000
Plant and equipment	\$ 48,000	\$ 72,000
Accumulated depreciation	(12,000)	(24,000)
Land	<u>20,000</u>	<u>20,000</u>
Total	\$130,000	\$172,000
<b>Liabilities and equity</b>		
Accounts payable	\$ 16,000	\$ 20,000
Notes payable (short-term)	<u>7,000</u>	<u>0</u>
Total current	\$ 23,000	\$ 20,000
Bonds payable	\$ 0	\$ 20,000
Contributed capital	80,000	80,000
Retained earnings	<u>27,000</u>	<u>52,000</u>
Total	\$130,000	\$172,000

### Income Statements for the Years Ended December 31, 2010 and 2011 (\$000)

	<b><u>2010</u></b>	<b><u>2011</u></b>
Revenues	\$150,000	\$200,000
Less: Cost of goods sold	<u>105,000</u>	<u>130,000</u>
Gross margin	\$ 45,000	\$ 70,000
Other expenses:		
Administrative salaries	\$15,000	\$17,000
Depreciation	9,500	12,000
Other	<u>7,200</u>	<u>3,600</u>
	<u>31,700</u>	<u>32,600</u>
Income from operations	\$ 13,300	\$ 37,400
Interest expense	<u>800</u>	<u>1,900</u>
Income before tax	\$ 12,500	\$ 35,500
Income tax	<u>5,000</u>	<u>10,500</u>
Net income	\$ 7,500	\$ 25,000