

CHAPTER 5. RATIO ANALYSIS, FINANCIAL PLANNING AND FINANCIAL ANALYSIS

The financial statements discussed in Chapter 4 provide valuable information about a firm's financial and business health. Ratio analysis involves the construction of ratios using specific elements from the financial statements in ways that help identify the strengths and weaknesses of the firm.

Ratios help measure the relative performance of different financial measures that characterize the firm's financial health. We could just look at the dollar value of each financial measure and draw conclusions about performance; however, using ratios often provides a standardized measure which is easier to interpret. For example, suppose you go to the grocery store to buy a box of cereal. You see a 10 ounce box sells for \$3.20 and a larger 15 ounce box sells for \$4.50. Which would you buy? You can look at the price of each box and the amount contained in each box but it is difficult to tell which is the better deal because the more expensive box also contains more cereal. If we divide the price of each box, however, by the amount of cereal in the box we see that the small box cost $\$3.20/10 \text{ oz.} = \0.32 per ounce and the large box cost $\$4.50/15 \text{ oz.} = \0.30 per ounce. The large box of cereal costs you less for each ounce of cereal you purchase. This illustrates the power that ratios can have in helping analyze sets of data such as those we encounter in a firm's financial statements.

It is worth noting that different sources often use different names and/or different definitions for a number of the ratios we will discuss. Always make sure you know how each ratio is defined when examining a firm's financial ratios. We will begin by taking a look at some important ratios used in financial analysis. We can group financial ratios into five broad categories: liquidity ratios, leverage ratios; repayment capacity ratio, efficiency ratios, and profitability ratios. After introducing

a number of useful ratios, we will turn the discussion toward the use of these ratios to examine the financial health and performance of the firm.

Liquidity ratios

Liquidity ratios measure a firm's ability to meet its maturing financial obligations. The focus is on short-term solvency as if the firm were liquidated today at book value. The **current ratio** (CR) is the most common liquidity measure and provides an indication of a firm's ability to pay short-term claims with short-term assets. We define the current ratio as:

$$CR = \frac{CA}{CL}$$

where CR is current ratio, CA is current assets, and CL is current liabilities. In principal we would like to see the $CR > 1$ because it suggests that the CA to be liquidated this year are sufficient to cover the CL that will come due this year. If the $CR < 1$, then the CA will be unable to service the maturing obligations as measured by CL. If we continue with our firm from Chapter 4 we see that HiQuality Nursery's CR for 1997 is $\$7,000/6,600 = 1.06$ suggesting the firm is marginally solvent.

As with all the ratios we will consider, there is no generally "correct" value for the CR. Clearly a firm's CR can be too low, in which case the firm might have difficulty paying its maturing debt obligations. Nevertheless, a $CR < 1$ does not mean that a firm will not be able to meet its maturing obligations. The firm may have access to other resources that can be used to help meet

maturing obligations such as earnings from operations, long-term assets that could be liquidated, debt which could be restructured, and/or investments in depreciating assets which can be delayed.

On the flip side, a firm's CR can be too high. CA's usually earn a low rate of return (why?) and holding large levels of current assets may not be profitable to the firm. It may be more efficient to convert some of the CA's to long-term assets that generate larger expected returns. To illustrate, think of the extreme case of firm that liquidates all of its long-term assets and holds them as cash. The firm might have a large CR and be very liquid, but how profitable will this firm be?

Another liquidity ratio is called the **quick ratio**, (or sometimes the acid-test ratio). The quick ratio is defined as:

$$QR = \frac{CA - INV}{CL}$$

where QR is quick ratio and INV represents inventory level. The QR is very similar to the CR except that inventories are subtracted from CA. This is done because inventories are often the least liquid of the current assets and their liquidation value is often the most uncertain. In some businesses, if a firm were liquidated today, inventory would have little or no value. Thus the QR provides a stricter measure of a firm's liquidity than the CR.

HiQuality Nursery's 1997 QR is $(\$7,000 - \$5,200)/\$6,600 = 0.27$. In other words, liquidating all current assets except inventory will generate enough cash to pay for only 27 percent of HiQuality's maturing debt obligations. Once again, there is no right or wrong level for the QR. Clearly, HiQuality's liquidity is much lower if its inventory is not available to meet currently maturing

obligations. Nevertheless, as was discussed with the CR, this does not necessarily mean the firm will be unable to meet the maturing obligations.

Leverage Ratios

Leverage ratios measure the relative amount of funds supplied by equity and debt holders. The focus is on the long-term solvency of the firm. In general, the higher the amount of debt financing relative to equity financing, the more leveraged the firm is and the greater the risk its owner faces. (Why do they face greater risk?) On the other hand, higher leverage is usually associated with higher expected returns. (Again, why would you expect this?). We will explore the advantages and disadvantages of leverage in more detail later.

The **debt-asset ratio**, sometimes just called the debt ratio, measures the relative proportions of debt and equity funds used to finance the firm's assets and is defined as:

$$\text{debt ratio} = D/A$$

where D is debt and A is total assets. Note that, from the balance sheet, $A = D + E$ where E stands for equity. In general, having a lower debt-asset ratio is preferred by creditors because more equity funds are available to meet the firm's financial obligations. High Quality Nursery's debt ratio in 1997 is $\$8,585/\$10,400 = 0.83$. This means that 83% of HiQuality's assets are financed by debt.

The **debt-equity ratio** is an alternative leverage measure that is often used and is defined as:

debt-equity ratio = D/E .

The debt-equity ratio and the debt-asset ratio give exactly the same information, and, if you know one ratio, you can find the other. To see this, remember that $D/A = D/(D+E)$ because $A = D + E$. Now suppose a firm has a $D/E = 1.5$ and you wish to know the firm's debt-asset ratio. The trick is to pick *any* value of D and E that provide the correct D/E ratio, for example, choose $D = 15$ and $E = 10$. Using a property of ratios we can substitute our values for D and E that produced the correct D/E ratio into the debt-asset ratio to get $15/(10+15) = 0.60$. Likewise, you can derive the D/E ratio from the debt-asset ratio. HiQuality Nursery's 1997 debt-equity ratio is 4.73. For every \$1 of assets financed by equity there are \$4.73 of assets finance by debt.

Two additional measures that are sometimes reported are the equity-asset ratio and the equity multiplier. The equity-asset ratio is defined as E/A and simply expresses the percentage of assets financed by equity funds. The equity multiplier is defined as A/E and measures the number of dollars of assets that are supported by each dollar of equity funds. Both the equity-asset ratio and the equity multiplier contain the same information as the debt-asset and debt-equity ratios. The decision regarding which measure(s) to report depends on reporting purpose and your preferences for interpreting the amount of leverage.

As with the liquidity ratios, there is no magic value for the leverage ratios. If too much debt is used the risk of being unable to meet the fixed debt obligations can become great. On the other hand, if too little debt is used the firm may sacrifice returns that can be realized through leverage. The optimal level of debt financing is a complicated issue and will be addressed later in the course.

Repayment Capacity

Repayment capacity ratios examine the debt of a firm in terms of flows (income statement relationships). The idea is to measure the extent to which a firm's income is able to satisfy the firm's fixed payment obligations.

Times interest earned measures the extent to which a firm's earnings can decline before the firm cannot make its interest payments. The **times interest earned ratio** is defined as:

$$\text{TIE} = \frac{\text{EBIT}}{\text{INT}}$$

where INT represents the firm's interest payments during the period. Another way to think about it is that the TIE ratio measures the number of times the firm can make its interest payments using the firm's operating profits (EBIT). In general, we hope that $\text{TIE} > 1$, otherwise the firm won't even be able to make its interest payments using the current income. Also recognize that taxes don't impact the TIE ratio because interest is paid with before-tax dollars. HiQuality Nursery's 1997 TIE ratio is $\$650/\$480 = 1.35$. This indicates that HiQuality is just solvent in terms of making its interest payments from current earnings.

The **debt-service ratio** measures the number of times the firm can pay interest and principal using its operating income and is defined as:

$$\text{DSR} = \frac{\text{EBIT}}{\text{INT} + \left(\frac{\text{Principal}}{1-t} \right)}$$

Note that principal payments are not tax deductible. Thus, they are paid with after-tax dollars. We need to find the before-tax amount needed to pay the principal because EBIT is income on a before-tax basis. If the DSR < 1, a firm will not be able to make its principal interest payments using operating profits. The firm would be forced to obtain funding from other sources such as restructuring debt, selling assets, delaying investments in assets, and/or increasing EBIT. If the situation persists long enough, the firm will need to consider filing bankruptcy. Suppose HiQuality Nursery's marginal tax rate is 40 percent and assume principal payouts are equal to the current portion of notes payable and LTD listed on the firm's 1996 balance sheet. HiQuality Nursery's DSR in 1997 is $\$650/(\$480 + \$2000/(1-.4)) = 0.17$. The firm's operating profits are sufficient to meet only 17 percent of its fixed interest and principle payments.

A number of other repayment ratios are also calculated in practice. For example, the **fixed-charge coverage ratio** (FCC) measures a firm's ability to meet all of its fixed payments and can be defined as:

$$FCC = \frac{EBIT + Lease\ payments + Rent}{Lease\ payments + Rent + Interest + \frac{Principal}{(1-t)}}$$

Note that lease and rent payments are added back to EBIT because they are deductible expenses and would have been previously subtracted. If the FCC > 1, the firm will be able to make all of its fixed payment obligation using its earnings from operations.

Efficiency ratios

Efficiency ratios, sometimes called asset management ratios, measure the efficiency with which a firm manages its assets. The **inventory turnover ratio** measures how well the firm manages its inventory and is defined as:

$$\text{ITO} = \frac{\text{Sales}}{\text{INV}} \text{ or } \frac{\text{COGS}}{\text{INV}}$$

where ITO represents the inventory turnover ratio. The COGS version of the ratio is usually a better measure than sales because inventory is carried at cost on the balance sheet and gives a better measure of the cumulative amount of inventory sold during the period; however, industry figures are sometimes reported at market price, and we would need to use the market price version of the ITO ratio (Sales/INV) make a valid comparison. It is also better to use some type of average measure for inventory over the sales time period to avoid possible difficulties with seasonal effects (remember, the inventory numbers from the balance sheet reflect inventories at a particular point in time while sales were generated across the time period). The 1997 ITO ratio for HiQuality Nursery using the COGS method and average inventory is $\$28,000 / ((\$5,200 + \$3,750) / 2) = 6.26$. This number indicates that for every \$1 of inventory the firm holds, the firm generates \$6.26 in sales. The ITO can be too small and would suggest excess inventory levels are being held given the level of sales. Likewise, the ITO ratio can be too high and may signal potential "stockouts" which could result in lost sales if the firm is unable to meet sales demand.

The **average collection period**, sometimes referred to as days sales outstanding, measures the number of days before a firm's sales made today will be collected and is defined as

$$ACP = \frac{AR}{CS/day} = \frac{AR}{\text{Annual CS}/365}$$

where ACP represents average collection period, AR is accounts receivable, and CS represents credit sales. If CS are not available, we often use total sales as an estimate of CS. Please note that if all sales were cash sales, then $ACP = 0$. Once again, it is better to use an average measure of AR to dampen any seasonal effects. HiQuality Nursery's ACP in 1997 (assuming all sales are CS) without using an average of AR is $\$1,200/(\$40,000/365) = 10.95$ days. This means it takes an average of 11 days from the time the sale is made until the payment is actually received. The length of the ACP typically reflects a firm's credit policy. If the ACP is too low, the firm may have too tight of credit policy and might be losing sales.

On the flip side, remember that AR must be financed by either debt or equity funds. If the ACP is too high, the firm is extending a lot of credit to other firms, and the financing cost may become high. Another concern is that the longer a firm extends credit, the greater the risk that something will happen that results in no payment ever being received. In some cases, it is useful to construct a schedule that breaks AR down by the length of time each amount has been outstanding. For example, the schedule might break the AR into: 1) the amount that is less than 30 days outstanding, 2) the amount that is 30-60 days outstanding, and 3) the amount that is more than 60

days outstanding. This breakdown provides additional information on the risk of the firm's AR and the likelihood of repayment.

The average payment period, sometimes called **days purchases outstanding**, measures the average number of days taken to pay for purchases made today on credit and is defined as:

$$APP = AP/\text{credit purchase/day} = AP/(\text{Annual credit purchases}/365)$$

where APP is the average payment period. Sometimes COGS is used to approximate credit purchases. As you might guess now, an average measure AP is preferred when possible. The correct level of APP depends on credit terms and the cost of violating credit agreements. HiQuality Nursery's 1997 APP using COGS to approximate credit purchases and year-end AP is $\$4,000/(\$28,000/365) = 52.14$ days. This indicates it takes HiQuality 52 days to make payment for goods and services after they are purchased.

The **total asset** and **fixed asset turnover ratios** measure the amount of sales generated by a given level of total assets and fixed assets, respectively, and are defined as:

$$TAT = \frac{\text{Sales}}{A} ; \text{ and}$$

$$FAT = \frac{\text{Sales}}{FA}$$

where TAT represents total asset turnover, A is total assets, FAT is fixed asset turnover, and FA represents fixed assets (usually just long-term assets). The levels of FA and A should be taken from the beginning of the sales period or averaged over the sales period. In general, the more sales generated with a given level of assets, the more efficient the firm is operating. If the turnover ratios are too large, however, the firm may lose sales because of the lack of necessary assets. Also, note that high asset turnover ratios tend to favor old assets that have been depreciated over time and may be obsolete or inefficient today. A small turnover ratio may indicate the firm's assets can be used more efficiently or are, perhaps, obsolete or that the firm has recently made a major investment in new assets. HiQuality Nursery's TAT in 1997 using an average measure of assets is $\$40,060/((\$10,400 + \$10,000)/2) = 3.92$, suggesting every \$1 of assets generates \$3.92 of sales.

Profitability Ratios

Profitability ratios measure the firm's efficiency in generating profits. Remember the operating profit is measured by the firm's EBIT and profit-after-tax is measured by NIAT. **Profit margin** on sales measures the proportion of each dollar of sales that is retained as profit after taxes and is defined as:

$$m = \frac{\text{NIAT}}{\text{Sales}}$$

where m represents the profit margin. HiQuality Nursery had a profit margin of $\$102/\$40,000 = 0.0026$ or 0.26% in 1997. In other words, for every \$1 of sales, HiQuality earned \$0.0026 in profit.

Return-on-assets measures the amount of profit generated by each dollar of assets and is defined as:

$$\text{ROA} = \frac{\text{NIAT}}{\text{A}}$$

where ROA represents return on assets. Again, the asset level at the beginning of the period or an average total asset level should be used when possible. HiQuality Nursery's 1997 ROA using average assets is $\$102/\$10,200 = 0.01$ or 1%. Each dollar of assets held by HiQuality is generating \$0.01 on average.

Return on equity measures the amount of profit generated by each dollar of equity and is defined as

$$\text{ROE} = \frac{\text{NIAT}}{\text{E}}$$

where ROE represents return on equity. Again, you should use beginning or average equity if possible. HiQuality Nursery's ROE for 1997 using average equity is $\$102/\$1,907.50 = 0.054$ or about 5.4%. Each dollar of equity is generating about \$0.054 in profits.

Other important ratios

A number of additional ratios which will be useful in our discussions. **Earnings per share** (EPS) shows the profit earned by each share of common stock in a business organized as a corporation. EPS is defined as

$$\text{EPS} = \text{NIAT}/\text{number shares common.}$$

The **Price-earnings ratio** (P/E) ratio measures the value of a publicly traded firm's stock relative to the firm's current earnings. Generally, the higher the value relative to current earnings, the greater the expected increase in future earnings and/or the lower the perceived risk in future earnings. We will talk more about this later. The P/E ratio is defined as

$$\text{P/E} = \frac{\text{market price/share}}{\text{EPS}}.$$

The **dividend payout ratio** (d) measures the amount of dividends (as withdrawals) generated as a proportion of profits and is defined as

$$d = \frac{\text{dividends}}{\text{NIAT}}.$$

DuPont Analysis

The Dupont analysis is a technique that breaks the return on asset and return on equity measures down into basic components that determine profit efficiency, asset efficiency, and leverage in an attempt to help isolate the causes of strengths and weakness in the firm's performance.

The ROA can be broken down into its components as follows:

$$\begin{aligned} \text{ROA} &= \left(\frac{\text{NIAT}}{\text{Sales}} \right) \left(\frac{\text{Sales}}{\text{A}} \right) \\ &= (m) (\text{ATO}) \end{aligned}$$

The ROA can also be thought of as the product of the profit margin and the asset turnover ratio. This is called the **DuPont Equation**. HiQuality Nursery's 1997 Dupont Equation is $\text{ROA} = (.0026)(3.9216) = .01$ or 1 percent. It is clear that HiQuality can increase its ROA by increasing the amount of profit it generates per dollar of sales (currently $m = .0026$) and/or the amount of sales it generates per dollar of assets held by the firm (currently $\text{ATO} = 3.9216$).

Like ROA we can break ROE down into different components:

$$\begin{aligned} \text{ROE} &= \left(\frac{\text{NIAT}}{\text{Sales}} \right) \left(\frac{\text{Sales}}{\text{A}} \right) \left(\frac{\text{A}}{\text{E}} \right) \\ &= (m) (\text{ATO}) (\text{equity multiplier}) \end{aligned}$$

This is called the **extended DuPont equation**. Also note that ROE is equivalent to ROA times an equity multiplier. It is useful to break these return measures into their underlying components because it allows you to further pinpoint a firm's strengths and weaknesses. For example, suppose that other firms in HiQuality Nursery's industry had ROE's greater than HiQuality's ROE. HiQuality might be interested in learning more about why its ROE is below the industry average. By looking at the DuPont equation, it may be apparent that HiQuality's profit margin is too low, which would signal a more in depth look at the amount of profits generated by each dollar of sales is warranted. Alternatively, HiQuality's ATO may be low suggesting problems with the amount of sales generated by the firm's asset base. The point is that breaking these ratios into their different components will help provide additional information about a firm's strength's and weaknesses.

Look again at the extended DuPont equation for ROE. Note that what the equation is saying that the firm's ROE depends on the amount of assets leveraged by equity (A/E) multiplied by how efficient the assets are at generating sales multiplied by how efficient the firm is at converting sales into profits. In other words:

$$\text{ROE depends on} \left(\begin{array}{c} \text{Efficiency in} \\ \text{generating profits} \\ \text{from sales} \end{array} \right) \times \left(\begin{array}{c} \text{Efficiency in} \\ \text{generating sales} \\ \text{from assets} \end{array} \right) \times \left(\begin{array}{c} \text{Amount of} \\ \text{assets generated} \\ \text{by each \$1 of equity} \end{array} \right)$$

HiQuality's extended DuPont equation is $\text{ROE} = (.0026)(3.9216)(5.3473) = .0535$ or 5.35 percent. HiQuality can raise the level of its ROE by increasing the efficiency at which profits are generated from sales ($m = .0026$), the efficiency at which sales are generated from assets ($\text{ATO} =$

3.9216), and/or the amount assets supported by each \$1 of equity ($A/E = 5.3453$) (i.e., the amount leverage used by the firm).

The DuPont analysis helps us start to identify the strengths and weaknesses of firms by focusing on how the profit margin, asset turnover, and leverage ratio combine to impact returns. We can take the analysis further, however, by breaking the profit margin, asset turnover and equity multiplier into their components. Figure 1 is the **expanded DuPont Analysis** and shows how ROE can be broken down to the basic components of the firm's balance sheet and income statement. This allows us to trace weakness (or strengths) in any factor impacting ROE back to its root cause in the firm's operations, assets, or financial structure.

The expanded DuPont analysis is an extremely powerful tool. Over time, a firm's ROE is perhaps its most important measure of financial performance because it measures the rate of return on the equity investment in the firm. If the return on the firm's equity is not at least as great as what can be earned on the next best alternative investment (assuming comparable risk levels), then the equity investment could be put to better use elsewhere and financial attractiveness of equity investment in the firm is questionable.

Note again that the "branch" under profit margin relates to items that influence how efficiently the firm generates profits from sales. The branch under asset turnover relates to items impacting how efficiently sales are generated from assets. As before, the equity multiplier reflects the firm's ability to leverage assets with equity. Understanding this expanded DuPont Analysis provides a detailed picture of the firm's ability to efficiently generate profits from equity investments which is really the bottom line in any business.

Suppose the firm's ROE is low and the firm does not appear to be generating profits efficiently from sales. Looking at the branch in figure 1 under profit margin, you can see how the income statement and the sales level interact to determine profit margin. For example, if everything else remains the same, lowering operating costs increases NIAT, which increases the profit margin, which in turn increases ROE. Likewise, the branch under total asset turnover shows how sales and the various asset items interact to determine how efficiently sales are generated from assets and the resulting impact on the firm's ROE. The expanded DuPont analysis provides a simple, but powerful, framework to analyze and understand the impact of each simultaneous component of the firm on the firm's profit margin, asset turnover, leverage position and its ROE. It is fairly easy to program the expanded DuPont analysis on a computer (e.g. using a spreadsheet) so that it is generated simultaneously from a firm's balance sheet and income statements. This allows you to immediately trace through the expected impacts of any changes in the firm on its performance.

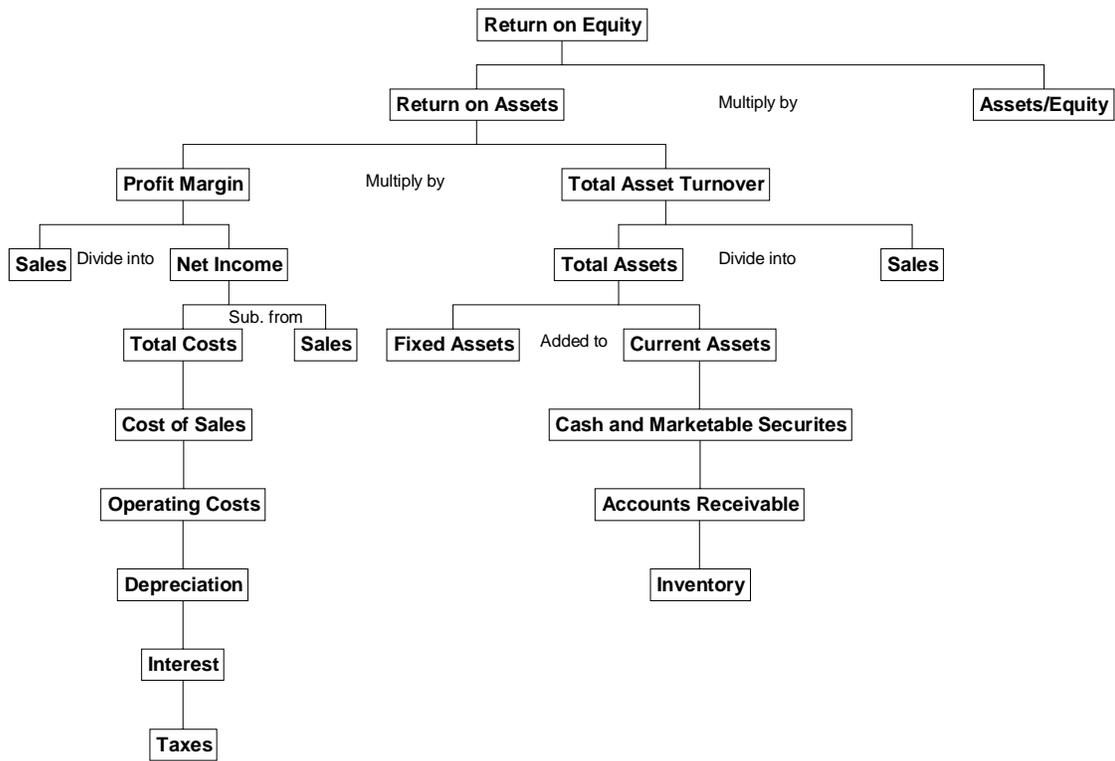


Figure 1: Expanded DuPont Analysis

Using Ratio Analysis

We need to be aware of what ratio analysis can do and what it can not do. Ratio analysis requires a "base" against which to compare each ratio. We often compare a firm's ratios to past measures of the same ratios in the firm. This is called **trend analysis** and allows us to analyze any general movements in the firm's financial situation by looking for patterns in the ratios over time. Trend analysis adds a dynamic aspect to the analysis and provides consistency because each year's numbers are from the same firm.

Another common basis of comparison is to look at how a firm's ratios compare to similar firms in the industry. This can highlight a firm's strengths and weaknesses relative to the other firms in the industry. Major sources of industry and comparative ratios include: Dun and Bradstreet, a publication of Dun and Bradstreet, Inc.; Robert Morris Associates, an association of loan officers; financial and investor services such as the Standard and Poor's survey; government agencies such as the FTC, SEC, and Department of Commerce; trade associations; business periodicals; corporate reports; and other miscellaneous sources such as books and accounting firms.

While ratio analysis can be a powerful and useful tool, it does suffer from a number of weaknesses. We discussed earlier that the use of different accounting practices (for example, depreciation expense) can change a firm's financial statements and, therefore, alter its financial ratios. Thus, it is important to be aware of and understand accounting practices over time and/or across firms.

Difficult problems arise when making comparisons across firms in an industry. The comparison must be made over the same time periods. In addition, firms within an "industry" often

differ substantially in the structure and type of business, making industry comparisons less meaningful. Another difficulty is that a departure from the "norm" may not indicate a problem. As mentioned before, a firm might have apparent weaknesses in one area that are offset by strengths in other areas. Furthermore, things like different production practices in a firm may require a different financial structure than other firms in the industry. Additionally, shooting for financial ratios that look like the industry average may not be very desirable. Would you want your business to be average?

It was mentioned earlier that inflation can have a significant impact on a firm's balance sheet and consequently inflation will impact a firm's corresponding financial ratios. It is important to keep in mind the book value nature of financial statements. Firms that keep a set of market value financial statements in addition to their book value financial statements should conduct financial analysis with both their book value and market value financial statements. It is also important to recognize that a single ratio does not provide adequate information to evaluate the strength or weakness of a firm. A weak ratio in one area might be offset by a strong ratio in another area. Likewise, a perfectly healthy firm, from a financial standpoint, may have some special characteristics which result in a ratio which would be out of line for other firms in the industry who do not have these characteristics. Finally, it must be understood that financial analysis does not make management decisions. The analysis provides information which will be a valuable input into making management decisions but there is no "cook book" formula that you plug the financial analysis number into and produce the correct management decisions.

Financial Forecasting

Financial forecasting (proforma analysis) is a method used by firms to help plan for future financial needs. Pro forma income statements and balance sheets are forecasts of what these statements will look like in the future. There are several ways to construct pro forma statements. The usual technique is to concentrate on a projected level of sales and assume that historical financial statement relationships will hold in the period of projected sales.

For example, suppose that projected sales for a firm are \$1,000,000 next year. Last year the firm's inventory turnover ratio was 4, its profit margin was 10% and its dividend payout ratio was 30%. Assuming that last year's ratios will hold next year, we can use the projected level of sales to forecast the pro forma levels of In, INV, NIAT, and dividends. The first step in these types of problems is to write out the definition of each ratio and their assumed values:

$$\text{ITO} = \frac{\text{Sales}}{\text{INV}} = 4;$$

$$m = \frac{\text{NIAT}}{\text{Sales}} = 0.10; \text{ and}$$

$$d = \frac{\text{dividends}}{\text{NIAT}} = 0.3.$$

From the ITO, we know that $\text{INV} = \text{Sales}/4 = \$1,000,000/4 = \$250,000$. Likewise, from the profit margin we know $\text{NIAT} = \text{Sales} (.10) = \$100,000$. Finally, using the dividend payout ratio and our estimated value for NIAT we project that $\text{dividends} = \text{NIAT} (0.3) = \$100,000 (.3) = \$30,000$.

Again, the technique is to assume that the historical financial relationships will hold in the future and then project the future value of one variable, usually sales. This allows us to calculate projected values of the remaining financial variables based on the historical financial relationships.

Common-Size Statements

When comparing financial statements across time and/or across firms, it is often useful to standardize the statements. The typical way this is done is to express all items in the balance sheet as a percentage of total assets. The items on the income statement are usually expressed as a percentage of total revenue. These standardized statements are also known as **common-size statements**. Common-size statements facilitate comparison with other firms and within the firm over time because size effects are eliminated by expressing the statements in percentage terms.

For example, suppose a firm's cash position was \$100,000 at the end of 1996 and \$110,000 at the end of 1997. In addition, suppose the firm's total assets were \$2,000,000 at the end of 1996 and \$3,000,000 at the end of 1997. Looking at the absolute value of the cash position, it has increased by \$10,000 over the year which might suggest the firm now has more liquidity. However, the firm's cash position must now support a larger amount of total assets. Looking at the cash position as a percentage of total assets, we find the firm's cash position was 5 percent of total assets at the end of 1996 and only 3.67 percent at the end of 1997. Thus, the amount of cash available per dollar of assets held by the firm actually decreased during the year.

FINANCIAL ANALYSIS OF HIQUALITY NURSERY

We now have the tools necessary to conduct an analysis of the financial health of any firm, but using these tools effectively takes practice. It is useful to develop a systematic approach to attacking the financial analysis problem. Our approach will be:

1. Examine financial statements
 - a. Examine the balance sheet and common-size balance sheet looking for trends and items that depart from industry levels.
 - b. Examine the income statement and common-size income statement looking for trends and items that depart from industry levels.
 - c. Examine statement of cash flows and look for trends and major sources and uses of cash.
 - d. Summarize major points of interest from financial statement analysis.
2. Conduct ratio analysis
 - a. Examine financial ratios and look for trends, strong or weak areas, and relationship with industry levels.
 - b. Examine the extended DuPont equation and conduct an expanded DuPont analysis. Identify strengths and weaknesses of firm's performance.
 - c. Summarize major points of interest from ratio analysis.
3. Combine results of financial statement analysis and ratio analysis and develop statement of the financial health for the firm.

Financial Statement Analysis

Let us begin the analysis by taking a more careful look at HiQuality Nursery's balance sheets reported earlier in table 2.1. The first step is to look for any significant changes or trends in the asset

or liability accounts. Current assets have increased over the three year period mostly due to a significant increase in inventory levels. Cash levels declined during the three years. Long-term assets have fallen primarily as a result of a declining the value of property, plant and equipment in the business.

On the debt side of the balance sheet, current liabilities have increased during the three year period mostly as a result of increases in accounts payable. Long-term debt has declined and owner equity has remained relatively constant.

Next, let's compare HiQuality's balance sheet with the other firms in the industry and look for trends after standardizing for changes in firm size. To do this, we need to use the common-size balance sheets reported in table 2.4 along with the corresponding industry averages. HiQuality Nursery's level of current assets is above the average in the industry and rising primarily as a result of relatively high and increasing inventory levels. The accounts receivable levels are low in terms of the industry levels. Long-term asset levels are also low, relative to industry levels, and declining.

Current liabilities are well above the average levels in the industry and rising mostly as a result of increasingly high levels of accounts payable. Although falling, long-term debt is still above industry averages. Owner equity levels are well below the average firm in the industry.

Switching to the firm's income statement reported earlier in Table 2.2 we see that HiQuality was profitable in both 1996 and 1997 and that both EBIT and NIAT increased in 1997. Now let's compare HiQuality's income statement with other firms in the industry using the common-size statements in shown in table 2.5 along with the corresponding industry averages. HiQuality's EBIT and NIAT were low primarily as a result of relatively high operating expenses and interest expenses.

The statement of cash flows in table 2.3 reconfirms that cash levels in the firm have been declining. However, cash flows from operation were positive in both 1996 and 1997. The firm had positive income and additional cash flow was generated by depreciation expense and increases in current liabilities. A large cash inflow was also received in 1997 as a result of a decrease in accounts receivable. One thing that sticks out is that the firm used significant amounts of cash in 1996 and 1997 to increase inventory levels.

Cash was used each year to increase investments in long-term assets. However, note that the amount of assets used each year was significantly greater than the amount reinvested in long-term assets. For example, in 1997 the firm used up \$350,000 in assets (the amount of depreciation expense) and only had a net investment of \$70,000, a depletion of \$280,000 in the firm's assets.

Cash was also used each year in the firm's financing activities. The firm made a large payment of long-term debt in 1996. Then in 1997, a large equity withdrawal was made. Both of the payments were larger than the cash flow produced out of the firm's operations.

It is often useful to write down notes as you work through the financial analysis, so that you can start to relate different pieces of information and draw more general conclusions. Table 2.6 summarizes some of the major issues that have arisen in the analysis so far.

Ratio Analysis

We have started to get a feel for how well HiQuality Nursery is performing by studying the firm's financial statements. Now we will see what HiQuality's financial ratios tell us by looking for trends in the ratios and comparing the ratios to those of other firms in the industry. Table 5.1 shows HiQuality Nursery's ratios for 1996 and 1997 as well ratios for other firm's in the industry. The industry ratios are broken in quartiles. For example, 1/4 of the firms in the industry have current ratios above 2.0.

Table 5.1 Common-Size Balance Sheet for HiQuality Nursery

ASSETS	<u>1997</u>	<u>1996</u>	<u>1995</u>	<u>Ind Avg</u>
Cash and Mkt. Securities	5.77%	9.30%	12.13%	6.3%
Accounts Receivable	11.54	16.40	15.77	26.4
Inventory	<u>50.00</u>	<u>37.50</u>	<u>31.85</u>	25.6
CURRENT ASSETS	<u>67.31</u>	<u>63.20</u>	<u>59.76</u>	<u>58.3</u>
Prop, Plant, and Equip	26.92	29.90	33.06	35.7
Other Assets	<u>5.77</u>	<u>6.90</u>	<u>7.18</u>	<u>6.0</u>
LONG TERM ASSETS	<u>32.69</u>	<u>36.80</u>	<u>40.24</u>	<u>41.7</u>
TOTAL ASSETS	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100</u>
LIABILITIES				
Notes Payable	12.21	15.00	14.16	13.9
Current Portion LTD	4.33	5.00	7.08	3.6
Accounts Payable	38.46	30.00	24.27	18.7
Accrued Liabilities	<u>8.46</u>	<u>9.58</u>	<u>8.80</u>	<u>6.8</u>
CURRENT LIABILITIES	<u>63.46</u>	<u>59.58</u>	<u>54.30</u>	<u>43</u>
Long Term Debt	<u>19.09</u>	<u>20.42</u>	<u>25.88</u>	<u>13.4</u>
TOTAL LONG TERM DEBT	<u>19.09</u>	<u>20.42</u>	<u>25.88</u>	<u>13.4</u>
Equity				
TOTAL EQUITY	<u>17.45</u>	<u>20.00</u>	<u>19.82</u>	<u>43.6</u>
TOTAL DEBT AND EQUITY	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100</u>

Table 5.2 Common-Size Income Statement for HiQuality Nursery

	<u>1997</u>	<u>1996</u>	<u>Ind Avg</u>
Net Sales	100.00%	100.00%	100%
Cost of Sales			
Operating Expenses	70.00	67.37	71.4
Depreciation	27.50	29.82	22.5
	<u>0.88</u>	<u>1.24</u>	<u>1.75</u>
EARNING BEFORE INTEREST AND TAXES			
	1.62	1.58	4.35
Interest			
	<u>1.20</u>	<u>1.22</u>	<u>0.55</u>
EARNINGS BEFORE TAXES			
	0.42	0.36	3.8
Taxes			
	<u>0.17</u>	<u>0.17</u>	<u>1.52</u>
NET INCOME AFTER TAXES			
	<u>0.25</u>	<u>0.19</u>	<u>2.28</u>

Table 5.3 Summary of Financial Statement Analysis

Summary Worksheet for Financial Statements

Balance Sheet

<u>Assets</u>	<u>Liabilities and Equity</u>
A/R Low	A/P High and Increasing
IN High and Increasing	CL High and Increasing
CA High and Increasing	LTD High
LTA Low	Equity Low

Income Statement

<u>Revenues</u>	<u>Expenses</u>	<u>Profits</u>
Stable	Operating Expense High Interest Expense High	Profits Low

Statement of Cash Flows

<u>Operations</u>	<u>Investments</u>	<u>Financing</u>
Large Investment in IN	Asset Depletion?	Large Debt Payoff (92) Large Equity Withdrawal (93)

The liquidity ratios suggest HiQuality has some short-term solvency problems. The current ratio is 1.06 which suggests the firm is just solvent, but the ratio is near the lower quartile of firms in the industry. The quick ratio is 0.27 suggesting the firm is insolvent without relying on inventory. HiQuality's quick ratio is in the lower quartile of firms in the industry indicating the firm is less solvent than most of its competitors.

The leverage ratios indicate the use of debt is relatively high in the firm. The debt ratio shows that 83 percent of the firm's assets are financed with debt and that the amount of debt financing appears to be increasing. Another way of interpreting the same information is to look at the debt-equity ratio, which says for every \$1 of assets financed by equity, there are \$4.47 of assets financed by debt. Comparison with industry ratios shows that HiQuality is highly leveraged relative to other firms in the industry.

The repayment capacity ratios indicate HiQuality will have a difficult time paying its fixed debt obligations out of earnings. The times-interest-earned ratio in 1997 is 1.35 and indicates that earnings are sufficient to pay interest cost although HiQuality's ratio is again in the lower quartile of firms in its industry. HiQuality's debt-service ratio in 1997 is 0.17, which implies that only about 17 percent of the firm's interest and principal can be paid out of current earnings. HiQuality will need to refinance, raise additional capital, or liquidate some assets in order to make the interest and principal payments and remain in business.

Table 5.4 Ratio Analysis for HiQuality Nursery Inc.

	1997	1996	Industry		
			Upper Quartile	Median	Lower Quartile
LIQUIDITY RATIOS					
Current Ratio	1.06	1.06	2.0	1.3	0.9
Quick Ratio	0.27	0.43	1.1	0.7	0.5
LEVERAGE RATIOS					
Debt/Asset	0.83	0.80			
Debt/Equity	4.73	4.00	0.9	1.9	2.8
Equity/Asset	0.17	0.20			
REPAYMENT CAPACITY					
Times Interest Earned	1.35	1.29	5.8	2.5	1.6
Debt Service Ratio	0.17	0.15			
EFFICIENCY RATIOS					
Inventory Turnover	6.26	7.42	14.9	7.7	4.8
Asset Turnover	3.92	3.82	3.9	3.2	1.5
Average Collection Period	10.95	15.75	24	32	41
Average Payment Period	52.14	42.77	24	29	39
PROFITABILITY RATIOS					
Margin	0.26%	0.19%	1.79%	1.03%	0.44%
Return on Assets	1.00%	0.71%	7%	3.3%	0.66%
Return on Equity	5.35%	3.59%	17.2%	10.7%	2.1%

The efficiency ratios send mixed signals about HiQuality's performance. The inventory turnover ratio in 1997 is 6.26 indicating HiQuality has sold its inventory over 6 times during the year. This inventory turnover ratio is roughly at the median value for firms in this industry and appears acceptable. One concern however is that the ratio fell significantly from its 1996 level. This decline in the ratio coupled with the rising levels of inventory on the balance sheet signal that this area needs further analysis. The asset turnover ratio has a 1997 value of 3.92 indicating the firm had sales of nearly 4 times the value of its assets, which is in the upper quartile of firms in the industry. The firm appears to be using assets efficiently; however, the apparent depletion of asset that was indicated by the statement of cash flows causes some concern and is a signal for further analysis.

The average collection period has a 1997 value of 10.95, down significantly from the previous year. This value is also well below industry averages and raises a question about the firm's credit policies. The average payment period is 52.14 which is well above its value in the previous year and significantly higher than most firms in the industry. The firm appears to be having difficulty paying its trade credit debts.

The profitability ratios indicate that firm is profitable, but the level of profits is relatively low. The 1997 profit margin is 0.26% which is in the lower quartile of firms in the industry. The return on assets is only about 1% but falls in the second quartile of firms in the industry. The return on equity is 5.35% and again falls in the second quartile. All three measures of profit improved marginally in 1997.

DuPont Analysis

In an effort to pinpoint the cause of the low returns, we can turn to the DuPont analysis. The extended DuPont equation for HiQuality is

$$\begin{aligned}\text{ROE} &= (\text{M})(\text{ATO})(\text{Equity Multiplier}) \\ &= (0.0026)(3.92)(5.35) \\ &= 0.01\end{aligned}$$

The industry extended DuPont equation using the upper quartile ratios is

$$\begin{aligned}\text{ROE} &= (0.0179)(3.9)(2.46) \\ &= 0.17\end{aligned}$$

Comparing the DuPont equations we see that HiQuality's ROE is low primarily because of the low profit margin. HiQuality's asset turnover ratio is comparable with the better firms in the industry (although we need to remember we had some questions about it). The high level of leverage actually helped HiQuality generate a higher ROE this year because the firm made profits. The high leverage, however, could not overcome the extremely low profit margin HiQuality experienced.

To explore this further, figure 2 shows the expanded DuPont analysis. From figure 2 we see that the low profit margin is determined by the level of NIAT, which depends on the level of sales and the cost to generate those sales. Our earlier analysis suggested that operating cost and interest cost were relatively high, and these may be having a major impact on the profit margin.

Looking at the asset turnover, we see that fixed assets impact the ratio, and we were concerned that the firm may not be reinvesting enough in replacing assets. Failing to replace assets as they are used up would artificially inflate the ATO and the firm's ROE. Also the inventory levels may be too high. Lowering the inventory levels would increase the ATO and improve ROE. Finally, the high level of leverage helped ROE but is putting the firm in a risky position. The large withdrawal of equity this year has further increased this risk.

As with the financial statements, it is often useful to take notes or summarize the major points as you work through the ratio analysis. Table 5.2 notes some of the major points that stuck out as we worked through the ratio analysis.

At this point, you generally need to gather additional information from the firm's management, unless you are the management. The firm is very highly leveraged and is in a risky position. Why is the firm relying so heavily on debt, and why is equity being withdrawn at such a relatively high rate? The operating expenses seem to be too high. What is the cause, and how can the situation be improved? Why are the firm's assets being depleted? What is the cause of the increasingly high level of inventory being held?

After gathering information on these questions and others, a detailed report of the firm's financial health can be produced. Management decisions regarding key issues can be explored and forecasts of future financial needs and situations can be made. Continued monitoring of the firm's financial statements and ratios will allow management to gain a solid understanding of the relationship between the firm's operations and its financial performance and, over time, will allow changes in the firm's performance (good or bad) to be quickly recognized and evaluated.

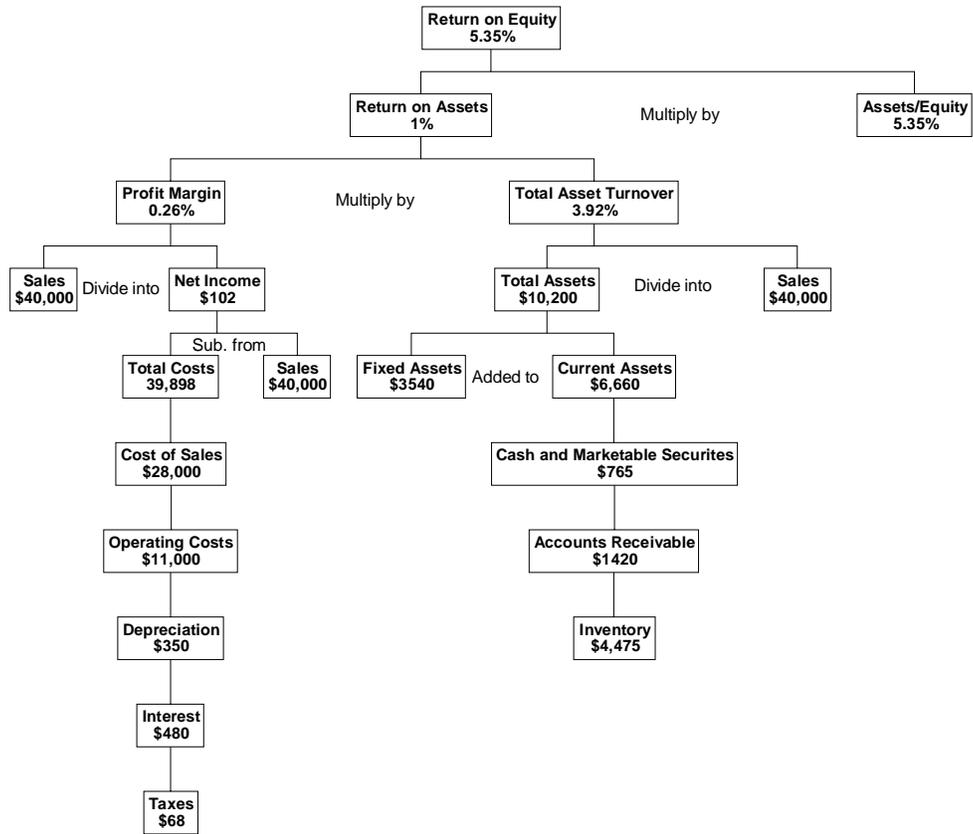


Figure 2: Expanded DuPont Analysis

Table 5.4 Summary of Ratio Analysis

Summary Worksheet for Ratio Analysis				
<u>Ratio</u>	<u>Trend</u>	<u>Industry Comparison</u>	<u>Strength Rating</u>	<u>Comments</u>
CR	<u> </u>	<u>low</u>	<u> </u>	<u> </u>
QR	<u>falling</u>	<u>low</u>	<u> </u>	<u> </u>
Overall Liquidity	<u> </u>	<u> </u>	<u>weak</u>	<u>Increased reliance on IN</u>
D/E	<u>rising</u>	<u>very high</u>	<u> </u>	<u> </u>
Overall Leverage	<u> </u>	<u> </u>	<u>weak</u>	<u>Appears excessive-high risk</u>
TIE	<u>rising</u>	<u>low</u>	<u> </u>	<u> </u>
DAR	<u>rising</u>	<u>low</u>	<u> </u>	<u> </u>
Repayment Capacity	<u> </u>	<u> </u>	<u>weak</u>	<u>Not solvent using earnings</u>
ITO	<u>falling</u>	<u>average</u>	<u>o.k.</u>	<u>High IN is a concern</u>
ATO	<u>rising</u>	<u>high</u>	<u>strong</u>	<u>Asset depletion?</u>
ACP	<u>falling</u>	<u>low</u>	<u>strong</u>	<u>Credit policy - lost sales?</u>
APP	<u>rising</u>	<u>high</u>	<u>?</u>	<u>Solvent?</u>
Efficiency	<u> </u>	<u> </u>	<u> </u>	<u> </u>
Margin	<u>rising</u>	<u>very low</u>	<u>weak</u>	<u> </u>
ROA	<u>rising</u>	<u>low</u>	<u>weak</u>	<u> </u>
ROE	<u>rising</u>	<u>low</u>	<u>poor</u>	<u> </u>
Profitability	<u> </u>	<u>low</u>	<u> </u>	<u>Low margin due to operating expense and interest cost. High leverage concern? Asset depletion?</u>

Questions

1. The Denning Company had a quick ratio of 1.3, a current ratio of 3.0, and annual inventory turnover of 6 times, total current assets of \$650,000, and cash and marketable securities of \$110,000 in 1997. What were Denning's annual sales and its ACP for that year? (Assume $CA = \text{Cash} + \text{Mkt. Sec.} + \text{A/R} + \text{Inventory}$).
2. A group of investors is planning to set up a new company. To help determine the new company's financial requirements, the president has asked you to construct a pro forma balance sheet for December 31, 1995, the end of the first year of operations, and to estimate the company's external financing requirements for 1995. Sales for 1995 are projected at \$20 million, and the following are industry average ratios for similar companies:

Sales to common equity (S/E)	5x
Current debt to equity (CL/E)	50%
Total debt to equity (D/E)	80%
Current ratio (CR/CL)	2.2x
Sales to inventory (S/Inv)	9x
Accounts receivable to sales ((A/R)/S)	10%
Fixed assets to equity (FA/E)	70%
Profit margin (NIAT/S)	5%
Dividend payout ratio (DIV/NIAT)	30%

- a. Complete the pro forma balance sheet below, assuming that 1995 sales are \$20 million and that the firm maintains industry average ratios.
- b. What would be the amount of equity financing that must be supplied by the investors?