

Chapter 7 Ratio and Financial Statement Analysis

The objectives of this chapter are to enable you to:

- *Compute and categorize ratios*
- *Apply ratio analysis to evaluate a company's liquidity, performance and risks*
- *Construct and analyze common-size accounting statements*
- *Be wary of potential pitfalls undermining ratio and financial statement analysis*

A. Introduction to Financial Statement Analysis

Financial statement analysis will usually involve the comparison of financial statement figures based on either a cross-section of different firms or based on a time-series of statements. Among the tools used by the analyst are common-size statements where income statement items are expressed as a percentage of revenues and balance sheet items are expressed as a percentage of assets. Standardizing statement balances enable simplified comparisons either across firms or over time. Financial ratios are also most important and will be discussed in detail later. The construction of pro-forma statements will also be discussed here.

There exist numerous sources for financial statement data. Data will be available from publicly traded companies in annual reports or 10-K reports filed with the S.E.C. Standardized hard copy (paper) statements may be purchased from companies such as Moody's, Standard and Poors, Commerce Clearing House, Value Line and Dun and Bradstreet. Examples for sources of such standardized reports include *Moody's Handbook of Common Stocks*, *Value Line Investment Survey*, *FactSet*, *StockVal*, *WRDS* and *Standard and Poor's Industry Survey*. Computerized data sources such as Yahoo.com, *Compustat* and *CD Disclosure* are available at many libraries and can download data to computer-based spreadsheets. However, users should be aware that these data bases (paper or computer) may exclude firms, particularly those no longer in existence, may be missing recent data, may contain recording errors, may record statement accounts inconsistently across firms and may altogether exclude important accounting statement items.

Some analysts are concerned with the distinction between value and growth stocks. Growth stocks may be thought of as those with exceptional growth potential. Some analysts use historical earnings or returns growth as the indicator for growth stocks. Presumably, stocks with high historical rates of growth may be expected to realize higher growth rates in the future. Value investors are concerned with the market price of the stock relative to some other indicator of value such as book value. The book to market value of a stock is often taken as an indicator of the relative value of the stock. Higher book to market value is perceived as indicating a good buy.

Common Size Accounting Statements

Firms use a variety of accounting conventions to present their financial statements, rendering their comparisons somewhat more difficult. Analysts, newsletters and research companies like Compustat restate financial statements in standardized form, making them easier to compare. In addition, many analysts find *common-size statements* even easier to compare, especially across firms or through time. Common-size income statements normally express all items as a fraction or percentage of sales and common-size balance sheets normally express balance sheet items as a fraction or percentage of assets. Income Statements and Balance Sheets are presented for the Madison Company. Common-size statements for the Madison Company are presented below the original statements.

Madison Company		
Cash Sales	2,000,000	
Credit Sales	4,000,000	
<i>Total Sales</i>	6,000,000	
Other Revenue	1,000,000	
<i>Total Revenue</i>		7,000,000
Raw Material cost	1,900,000	
Direct Labor cost	1,100,000	
<i>Cost of Goods sold</i>	3,000,000	
<i>Gross Margin</i>		4,000,000
Plant operating cost	800,000	
Maintenance cost	500,000	
Managerial salaries	400,000	
Other Fixed costs	300,000	
<i>Fixed Overhead cost</i>	2,000,000	
Depreciation	200,000	
	2,200,000	
<i>Earnings before interest and taxes (EBIT)</i>		1,800,000
Interest on current debt	50,000	
Interest on notes payable	150,000	
Interest on bonds payable	650,000	
<i>Total interest</i>	850,000	
Earnings Before taxes		950,000
Less Taxes @ 30 % of EBT	285,000	
Net Income after taxes (NIAT)		665,000
Dividends	332,500	
Retained Earnings	332,500	
Number of shares outstanding	10,000	
Earnings per share (EPS)	33	

Figure 1: Madison Company Income Statement, 2014

MADISON COMPANY

Balance Sheet: December 31, 2013

Assets		Amount	Liabilities & Equity	Amount
Cash	\$ 100,000		Accounts payable	\$ 500,000
Marketable Securities	\$ 300,000		Taxes payable	\$ 50,000
Inventory	\$ 700,000		Wages payable	\$ 50,000
Accounts Receivable	\$ 400,000			
<i>Current Assets</i>		\$ 1,500,000	<i>Current Liabilities</i>	\$ 600,000
Equipment	\$ 200,000		Notes Payable	\$ 1,000,000
Plant	\$ 3,000,000		Bonds Payable	\$ 5,000,000
Land	\$ 4,000,000		<i>Long Term Debt</i>	\$ 6,000,000
Fixed Assets		\$ 7,200,000	<i>Total Debt</i>	\$ 6,600,000
			Common Equity (Par)	\$ 10,000
			Cumulative Retained Earnings	\$ 2,090,000
			<i>Total Equity</i>	\$ 2,100,000
Total Assets		8,700,000	Total Liabilities and Equity	8,700,000

Note:

Number of shares outstanding = 10,000

Market Price per share December 31, 2013 (Po) = \$ 250

Balance Sheet: December 31, 2014

Assets		Amount	Liabilities & Equity	Amount
Cash	\$ 100,000		Accounts payable	\$ 500,000
Marketable Securities	\$ 300,000		Taxes payable	\$ 100,000
Inventory	\$ 500,000		Wages payable	\$ 50,000
Accounts Receivable	\$ 600,000			
<i>Current Assets</i>		\$ 1,500,000	<i>Current Liabilities</i>	\$ 650,000
Equipment	\$ 900,000		Notes Payable	\$ 1,000,000
Plant	\$ 3,182,500		Bonds Payable	\$ 5,000,000
Land	\$ 3,500,000		<i>Long Term Debt</i>	\$ 6,000,000
Fixed Assets		\$ 7,582,500	<i>Total Debt</i>	\$ 6,650,000
			Common Equity (Par)	\$ 10,000
			Cumulative Retained Earnings	\$ 2,422,500
			<i>Total Equity</i>	\$ 2,432,500
Total Assets		9,082,500	Total Liabilities and Equity	9,082,500

Note:

Number of shares outstanding = 10,000

Market Price per share December 31, 2014 (Po) = \$ 330

Figure 2: Madison Company Balance Sheets

MADISON COMPANY**Common Size Balance Sheet: December 31, 2013**

Assets		Liabilities & Equity	
Cash	1.15	Accounts payable	5.75
Marketable Securities	3.45	Taxes payable	0.57
Inventory	8.05	Wages payable	0.57
Accounts Receivable	4.60		
Current Assets	17.24	Current Liabilities	6.90
Equipment	2.30	Notes Payable	11.49
Plant	34.48	Bonds Payable	57.47
Land	45.98	Long Term Debt	68.97
Fixed Assets	82.76		
		Total Debt	75.86
		Common Equity (Par)	0.11
		Cumulative Retained Earnings	24.02
		Total Equity	24.14
Total Assets	100.00	Total Liabilities and Equity	100.00

Note:

Number of shares outstanding = 10,000

Market Price per share December 31, 2013 (Po) = \$ 250

Common Size Balance Sheet: December 31, 2014

Assets		Liabilities & Equity	
Cash	1.10	Accounts payable	5.51
Marketable Securities	3.30	Taxes payable	1.10
Inventory	5.51	Wages payable	0.55
Accounts Receivable	6.61		
Current Assets	16.52	Current Liabilities	7.16
Equipment	9.91	Notes Payable	11.01
Plant	35.04	Bonds Payable	55.05
Land	38.54	Long Term Debt	66.06
Fixed Assets	83.48		
		Total Debt	73.22
		Common Equity (Par)	0.11
		Cumulative Retained Earnings	26.67
		Total Equity	26.78

Figure 3: Madison Company Common-Size Balance Sheets, 2013-14

MadisonCompany

Income Statement for Year Ending 31 December, 2014

Common Size Income Statement

Cash Sales	29	
Credit Sales	57	
Total Sales	86	
Other Revenue	14	
Total Revenue		100
Raw Material cost	27	
Direct Labor cost	16	
Cost of Goods sold	43	
Gross Margin		57
Plant operating cost	11	
Maintenance cost	7	
Managerial salaries	6	
Other Fixed costs	4	
Fixed Overhead cost	29	
Depreciation	3	
	31	
Earnings before interest and taxes (EBIT)		26
Interest on current debt	1	
Interest on notes payable	2	
Interest on bonds payable	9	
Total interest	12	
Earnings Before taxes		14
Less Taxes @ 30 % of EBT	4	
Net Income after taxes (NIAT)		10
Dividends	5	
Retained Earnings	5	

Figure 4: Madison Company Common-Size Income Statement, 2014

B. Pro-forma Statements

A pro-forma statement is compiled based on forecasted or projected values. For example, a pro-forma statement for 2015 compiled in 2014 lists accounts whose values were forecasted in 2014. The following portrays a historical balance sheet for 2014 along with a pro-forma balance sheet for the Marlowe Company dated December 31, 2015 and a pro-forma income statement for 2015. Because one rarely predicts with certainty, account balances actually realized may differ from the forecasted levels given in the pro-forma statements. Thus, the analyst may rely on a combination of "best outcome", "worst outcome" and "most likely" outcome statements. Computer based simulations and spreadsheets provide an efficient means of generating multiple potential outcome scenarios.

The sales forecast might involve use of regression techniques along with analyses of economy-wide and industry factors. The analyst must distinguish between variable and fixed costs and determine the extent to which these costs are fixed or variable. Balance sheet and income statement items must also reflect any capital investments and acquisitions projected by the firm.

Marlowe Company Balance Sheet: Dec. 31, 2014

<u>Assets</u>		<u>Capital</u>	
Cash	\$77,703	Accounts Payable(AP)	\$90,000
Marketable Securities	15,000	Notes Payable	65,000
Accounts Receivable(AR)	50,000	Taxes Payable	<u>15,000</u>
Inventory (INV)	<u>5,000</u>	Current Liabilities(CL)	170,000
Current Assets(CA)	\$147,703		
		Term Loans	30,000
Land	7,000	Debentures	<u>45,000</u>
Plant (Net)	90,000	Total Debt(D)	245,000
Equipment (Net)	<u>15,000</u>		
Fixed Assets(FA)	\$112,000	Common Equity Par	10,000
Total Assets	\$259,703	Paid in Capital	20,000
		Retained Earnings	-15,297
		Total Equity (E)	<u>14,703</u>
		Total Debt plus Equity	\$259,703

Pro-Forma Marlowe Company Income Statement, 2015

Sales (S)	\$295,000
Income from Securities (ifs)	<u>1,500</u>
Total Revenue (TR)	298,500 S + ifs
Beginning Inventory (bi)	5,000
Production Cost (pc)	175,000
Ending Inventory (ei)	<u>8,000</u>
Cost of Goods Sold (CGS)	172,000 bi + pc - ei
Gross Margin (GM)	116,500 TR - CGS
Fixed Manufacturing Cost (fmc)	70,000
Inventory Carry Cost (ic)	50
Selling and Administrative Costs (sc)	20,000
Depreciation - Plant (depr-p)	10,000
Depreciation - Machines (depr - m)	3,000
Depreciation - Other (depr -o)	400
Earnings Before Interest and Taxes (EBIT)	13,050 GM-fmc-ic-sc-DEPR
Note Payable Interest (int - n)	11,000
Term Loan Interest (int - t)	3,000
Debenture Interest (int - d)	4,500
Earnings Before Taxes (EBT)	-5,450 EBIT - INT
Income Taxes (TAX)	-2,507 EBT * .46
Net Income After Taxes (NIAT)	-2,943 EBT - TAX
Dividends (DIV)	0
Add to Retained Earnings	-2,943 NIAT – DIV

Pro-Forma Marlowe Company Balance Sheet: Dec. 31, 2015

<u>Assets</u>		<u>Capital</u>	
Cash	\$47,000	Accounts Payable(AP)	\$70,000
Marketable Securities	10,000	Notes Payable	55,000
Accounts Receivable(AR)	70,000	Taxes Payable	<u>0</u>
Inventory (INV)	<u>8,000</u>	Current Liabilities(CL)	125,000
Current Assets(CA)	\$135,000	 	
 		Term Loans	42,240
Land	7,000	Debentures	<u>55,000</u>
Plant (Net)	80,000	Total Debt(D)	222,240
Equipment (Net)	<u>12,000</u>	 	
Fixed Assets(FA)	\$99,000	Common Equity Par	10,000
Total Assets	\$234,000	Paid in Capital	20,000
		Retained Earnings	-18,240
		Total Equity (E)	<u>11,760</u>
		Total Debt plus Equity	\$234,000

C. Ratio Analysis

Among the most important tools to fundamental analysts are accounting statement ratios. This is because data taken from accounting statements are much more useful when they can be compared to other data. This is the purpose of ratio analysis: to compare accounting statement data. A financial ratio is simply one accounting statement value relative to another. Ratio Analysis is very useful for measuring performance and risk and for comparing the relative effectiveness of companies.

Figures 1 and 2 provide sample accounting statements for the Madison Company from which ratios may be computed. Various ratios are listed and determined for the Madison Company in Figures 3 and 4.

Ratios can be used to measure a number of important company characteristics. Various ratios can be categorized according to which characteristics they are intended to measure. One category of ratios is the liquidity group. These ratios are analyzed in an attempt to measure the firm's liquidity position; that is, they are used to determine a firm's ability to convert assets into cash in a short period of time. Firms must raise cash in order to operate. Even a firm that in the past has been highly profitable will be unable to operate effectively if it is unable to raise cash to compensate employees and to pay suppliers and taxes, etc. From Figure 3, we see that a sample liquidity ratio is the firm's current ratio. This ratio, simply current assets divided by current liabilities, may be used to measure a firm's ability to meet its short-run obligations. Current Assets are those assets that are generally convertible into cash within a fairly short period of time (frequently about one year). Cash, the most liquid of all assets and is likely to be a major component of these current assets.

A second ratio group is the profitability ratios. These ratios are used to determine the economic efficiency of the firm. An example of such a ratio is the firm's return-on-equity. This ratio measures profits awarded to shareholders relative to how much they have invested in the firm. A second profitability ratio is the firm's return-on-assets. This ratio measures cash flows available to both shareholders and creditors compared to the total sum both have invested in the firm. Thus, this ratio measures the profitability of all of the money invested in the firm.

A third ratio group comprises the leverage ratios. This group of ratios is used to determine a firm's ability to meet its fixed obligations. These ratios are also very useful in determining the risk or variability associated with a firm's profits. An obvious example of a leverage ratio is the firm's debt-equity ratio. This ratio, simply the firm's debt level divided by its equity level, measures the firm's ability to fulfill its obligations to creditors. Degree of Operating Leverage and Degree of Financial Leverage ratios are very useful in the assessment of operating and financial risk.

The fourth group discussed here are the activity ratios. These ratios measure a firm's ability to perform certain activities. An example of such a ratio is the sales-turnover ratio. This ratio measures a firm's capacity to sell its products given a specified level of investment.

The fifth group discussed in this chapter are the market ratios. These ratios, including P/E and market-to-book ratios, focus on market values of shares or equity relative to certain accounting statement values. These ratios are particularly useful for stock valuation.

Figures 1 and 2 display accounting statements for the Madison Company. A variety of ratios for this company are computed in Figure 4. Ratios are defined and grouped in Figure 3.

The use of ratios requires some standards for comparison. Useful standards for comparison include ratios generated by the firm in previous periods, ratios generated by other firms and target levels set by the firm. Contrary to the beliefs of some individuals, there are no

target ratio levels (such as the 2 to 1 current ratio sometimes mentioned) that may be universally applied across all firms in all situations. Often, the most difficult steps in ratio analysis are generating appropriate standards for comparison and inferring reasons for deviation from those standards.

Comparison of ratios across several time periods may provide useful information regarding firm trends. For example, declining profitability ratios over a long period of time may be indicative of serious problems within the firm. If over the same period inventory turnover ratios have been declining, perhaps an associated problem or even a cause for the declining profitability has been pinpointed.

Ratios of one firm may be compared to those of another with similar operating characteristics. Comparison of a bank's liquidity ratios to those of an automobile manufacturer may be meaningless because the operating characteristics of the two types of firms are entirely different. Thus, it may be more practical to compare ratios among firms in the same or a similar industry. Several institutions, such as Dun and Bradstreet provide data useful for ratio comparison. For example, Dun and Bradstreet provides "average" ratio levels for firms in a number of different industries. Deviation from the "industry norm" by a firm may indicate one of the following: 1) a strength in the firm, 2) a weakness in the firm, or 3) a difference in the operating characteristics between the firm and the "industry norm." One must realize that a ratio that is higher than the norm is not necessarily better. This is obviously true for the debt-equity ratio and perhaps less obviously true for the current ratio. A current ratio that is too low may indicate that the firm is not able to raise cash easily; a current ratio that is too high may indicate that the firm is not investing its funds in the most profitable assets (fixed asset investment is often more profitable than current asset investment).

An obvious standard for ratio comparison is a target level that may have been established by management of the firm. For example, a firm that is unable to attain its target 15% return-on-equity level may have operating problems, or it may simply have established an unrealistic target level. Presumably, a firm is successful if it is able to attain or exceed the target ratio levels established by its management.

Madison Company Income Statement, 2014

Cash Sales (S)	\$2,000,000		
Credit Sales (CRS)	<u>4,000,000</u>		
Total Sales		\$6,000,000	
Other Revenue			1,000,000
Total Revenue (TR)			\$7,000,000
Raw Materials Cost	1,900,000		
Direct Labor Costs	<u>1,100,000</u>		
Cost of Goods Sold (CGS)		<u>3,000,000</u>	
Gross Margin (GM)			4,000,000
Plant Operating Cost	800,000		
Maintenance Costs	500,000		
Managerial Salaries	400,000		
Other Fixed Costs	<u>300,000</u>		
Fixed Overhead Costs (FC)		2,000,000	
Less Depreciation (Depr.)		<u>200,000</u>	
Earnings Before Interest and Taxes (EBIT)			1,800,000
Interest on Current Debt	50,000		
Interest on Notes Payable	150,000		
Interest on Bonds Payable	650,000		
Total Interest Charges (INT)		<u>850,000</u>	
Earnings Before Taxes (EBT)			950,000
Taxes (30% *EBT)		<u>285,000</u>	
Net Income After Taxes (NIAT)			565,000
Dividends (Div)		<u>282,500</u>	
Retained Earnings			282,500
Shares Outstanding (#shs)		10,000 shs.	
Earnings Per Share		28.25	

Figure 1: Madison Company Income Statement, 2014

Madison Company Balance Sheet; Dec. 31, 2013

Cash	100,000	Accounts Payable(AP)	\$500,000
Marketable Securities	300,000	Taxes Payable	50,000
Inventory (INV)	700,000	Wages Payable	<u>50,000</u>
Accounts Receivable(AR)	<u>400,000</u>	Current Liabilities(CL)	<u>600,000</u>
Current Assets(CA)	\$1,500,000		
Equipment(Book Value)	200,000	Notes Payable	1,000,000
Plant(Book Value)	3,000,000	Bonds Payable	<u>5,000,000</u>
Land	<u>4,000,000</u>	Long Term Debt(LTD)	6,000,000
Fixed Assets(FA)	<u>7,200,000</u>	Total Debt(D)	6,600,000
Total Assets	8,700,000	Common Equity Par	10,000
		Cumulative Retained	
		Earnings	2,090,000
		Total Equity (E)	<u>2,100,000</u>
		Liabilities and Equity	
		(D&E)	8,700,000

Madison Company Balance Sheet; Dec. 31, 2014

Cash	100,000	Accounts Payable	\$500,000
Marketable Securities	300,000	Taxes Payable	100,000
Inventory (INV)	500,000	Wages Payable	<u>50,000</u>
Accounts Receivable	<u>600,000</u>	Current Liabilities(CL)	<u>650,000</u>
Current Assets (CA)	\$1,500,000		
Equipment(Book Value)	900,000	Notes Payable	1,000,000
Plant(Book Value)	3,500,000	Bonds Payable	<u>5,000,000</u>
Land	<u>3,500,000</u>	Long Term Debt	6,000,000
Fixed Assets(FA)	<u>7,900,000</u>	Total Debt (D)	6,650,000
Total Assets	9,400,000	Common Equity Par	10,000
		Cumulative Retained	
		Earnings	2,740,000
		Total Equity	<u>2,750,000</u>
		Liabilities & Equity	9,400,000

Figure 2: Madison Company Balance Sheets

LIQUIDITY RATIOS

$$\text{Current Ratio: } \frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{\text{CA}}{\text{CL}}$$

$$\text{Acid Test or Quick Ratio: } \frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}} = \frac{\text{CA} - \text{INV}}{\text{CL}}$$

$$\text{Avg. Collection Period (days): } \frac{\text{Avg. Receivables} * 365}{\text{Credit Sales}} = \frac{\text{AR} * 365}{\text{CRS}}$$

$$\text{Receivables Turnover: } \frac{\text{Annual Credit Sales}}{\text{Avg. Receivables}} = \frac{\text{CRS}}{\text{AR}}$$

$$\text{Duration of Payables (days): } \frac{\text{Avg. Payables} * 365}{\text{Appropriate Purchases}} = \frac{\text{AP} * 365}{\text{RM}}$$

$$\text{Inventory } \frac{\text{Cost of Goods Sold}}{\text{CGS}}$$

Turnover: Avg. Inventory Avg. Inv

Net Working Capital to Total Assets: $\frac{\text{Current Assets} - \text{Current Liab.}}{\text{Total Assets}} = \frac{\text{CA} - \text{CL}}{\text{TA}}$

PROFITABILITY RATIOS

Return on Equity: $\frac{\text{Net Income After Tax}}{\text{Equity}} = \frac{\text{NIAT}}{\text{E}}$

Return on Assets: $\frac{\text{Net Income After Tax} + \text{Int.}}{\text{Assets}} = \frac{\text{NIAT} + \text{Int.}}{\text{A}}$

Gross Profit Margin Ratio: $\frac{\text{Sales} - \text{Cost of Goods Sold}}{\text{Sales}} = \frac{\text{S} - \text{CGS}}{\text{S}}$

Net Profit Margin Ratio: $\frac{\text{Net Profit After Tax}}{\text{Sales}} = \frac{\text{NIAT}}{\text{S}}$

LEVERAGE RATIOS

Financial Leverage: $\frac{\text{Debt}}{\text{Debt} + \text{Equity}} = \frac{\text{D}}{\text{D} + \text{E}}$

Debt-Equity Ratio: $\frac{\text{Debt}}{\text{Equity}} = \frac{\text{D}}{\text{E}}$

Times Interest Earned: $\frac{\text{Earnings Before Int. and Taxes}}{\text{Interest Payment}} = \frac{\text{EBIT}}{\text{Int.}}$

ACTIVITY AND OTHER RATIOS

Sales Turnover: $\frac{\text{Total Sales}}{\text{Total Assets}} = \frac{\text{S}}{\text{A}}$

Dividend Payout: $\frac{\text{Dividends}}{\text{Net Income After Tax}} = \frac{\text{DIV}}{\text{NIAT}}$

Figure 3: LIST OF RATIOS

Ratio and Financial Statement Analysis

LIQUIDITY RATIOS

Current Ratio: $\frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{CA}{CL} = 2.31$

Acid Test or Quick Ratio: $\frac{\text{Current Assets} - \text{Inventories}}{\text{Current Liabilities}} = \frac{CA - INV}{CA} = 1.54$

Avg. Collection Period (days): $\frac{\text{Avg. Receivables} * 365}{\text{Credit Sales}} = \frac{AR * 365}{CRS} = 45.625$ days

Receivables Turnover: $\frac{\text{Annual Credit Sales}}{\text{Avg. Receivables}} = \frac{CRS}{AR} = 8$ times per year

Duration of Payables (days): $\frac{\text{Avg. Payables} * 365}{\text{Appropriate Purchases}} = \frac{AP * 365}{\text{Not Given}} = \text{N/A}$

Inventory Turnover: $\frac{\text{Cost of Goods Sold}}{\text{Avg. Inventory}} = \frac{CGS}{\text{Avg. Inv}} = 2.5$

Net Working Capital to Total Assets: $\frac{\text{Current Assets} - \text{Current Liab.}}{\text{Total Assets}} = \frac{CA - CL}{TA} = .0904$

PROFITABILITY RATIOS

Return on Equity: $\frac{\text{Net Income After Tax}}{\text{Equity}} = \frac{NIAT}{E} = .269$

Return on Assets: $\frac{\text{Net Income After Tax} + \text{Int.}}{\text{Assets}} = \frac{NIAT + \text{Int.}}{A} = .163$

Gross Profit Margin Ratio: $\frac{\text{Sales} - \text{Cost of Goods Sold}}{\text{Sales}} = \frac{S - CGS}{S} = .33$

Net Profit Margin Ratio: $\frac{\text{Net Profit After Tax}}{\text{Sales}} = \frac{NIAT}{S} = .094$

LEVERAGE RATIOS

Financial Leverage: $\frac{\text{Debt}}{\text{Debt} + \text{Equity}} = \frac{D}{D + E} = .707$

Debt-Equity Ratio: $\frac{\text{Debt}}{\text{Equity}} = \frac{D}{E} = 2.418$

Times Interest Earned: $\frac{\text{Earnings Before Int. and Taxes}}{\text{Interest Payment}} = \frac{EBIT}{\text{Int.}} = 2.11$

ACTIVITY AND OTHER RATIOS

Sales Turnover: $\frac{\text{Total Sales}}{\text{Total Assets}} = \frac{S}{A} = .689$

$$\text{Dividend Payout: } \frac{\text{Dividends}}{\text{Net Income After Tax}} = \frac{\text{DIV}}{\text{NIAT}} = .5$$

Figure 4: FINANCIAL RATIOS FOR THE MADISON COMPANY
December 31,2014 or for Fiscal Year 2014

Ratio Disaggregation

Ratio analysis can be quite useful in locating firm difficulties. Common sense is sometimes the best guide for their use; however, a number of useful analytical ratio techniques have been devised. The multi-discriminant analysis described later in this chapter and methodologies involving ratio disaggregation or decomposition such as DuPont analysis have proven very useful tools for financial statement analysis and projections. Ratio disaggregation decomposes a ratio into various component ratios facilitating analysis of the factors affecting the original ratio in question. For example, consider the following disaggregation of Return on Assets:

$$\text{ROA} = \text{EBIT/Assets} = \text{Sales/Assets} * \text{GM/Sales} * \text{EBIT/GM}$$

Thus, the firm's return on assets can be disaggregated into the product of sales turnover, gross margin and the inverse of the Degree of Operating Leverage. Hence, if the firm's Return on Assets were undesirably low, one or more of these ratios in the disaggregation would be low. In fact, identification of the unexpected low ratio in the disaggregation might lead to explaining why Return on Assets was so low. Suppose that the .1762 ROA for the Martin Company were considered to be unacceptably low relative to the .2068 ROA ratio for the Madison Company. The companies' ROA ratios might be decomposed as follows:

$$\begin{aligned} .1762 &= .4796 * .88 * .4176 \text{ (Martin)} \\ .2068 &= .6897 * .6667 * .45 \text{ (Madison)} \end{aligned}$$

One might observe that the Martin Company has a large sales to asset ratio relative to the Madison Company. This might, at least in part, explain why its return on assets is lower.

Consider this second example, known as the DuPont identity, disaggregating return on equity:

$$\text{ROE} = \text{NIAT/Equity} = \text{NIAT/Sales} * \text{Sales/Assets} * \text{Assets/Equity}$$

$$\begin{aligned} .221 &= .1295 * .4796 * 3.564 \text{ (Martin)} \\ .317 &= .1108 * .6897 * 4.143 \text{ (Madison)} \end{aligned}$$

Balance sheet items were taken from the 2013 Balance sheets. This return on equity ratio (ROE) is expressed as the product of one ratio from each of three ratio categories listed above: Profitability * Activity * Leverage. Combining ratios from different categories demonstrates how each category might impact shareholder returns. This Dupont identity reveals that Madison Company seems to use its assets more efficiently, leading to a higher return on equity. Each of these ratios could be further disaggregated. For example, the net margin ratio, NIAT/sales can be decomposed as follows:

$$\text{NIAT/Sales} = \text{NIAT/EBT} * \text{EBT/EBIT} * \text{EBIT/Sales}$$

If a problem existed with a firm's net profit margin, this decomposition and comparisons might enable the analyst to better determine whether the source of the problem appears to be with tax payments, interest payments or operations (gross margin).

More generally, any ratio can be decomposed into a combination of other ratios. The profitability ratios are most frequently decomposed. The decomposition method is to select (or make up) ratios in such a manner such that when they are multiplied, all numerators cancel out all denominators with the exception of one each. The remaining numerator and denominator should be identical to those of the ratio being decomposed. Notice how the numerators and denominators in the DuPont identity above cancel to leave NIAT and Equity as the remaining numerator and denominator. The following factors might be called “profit drivers,” as they are factors that will tend to increase returns on equity:

1. Net profit margin. Net profit margin is $\text{Net Income}/\text{Net Sales}$. It measures how much of every sales dollar is profit. It can be increased by
 - a. Increasing sales volume.
 - b. Increasing sales price.
 - c. Decreasing expenses.
2. Asset turnover (efficiency). Asset turnover is $\text{Net Sales}/\text{Average Total Assets}$. It measures how many sales dollars the company generates with each dollar of assets. It can be increased by
 - a. Increasing sales volume.
 - b. Disposing of (decreasing) less productive assets.
3. Financial leverage. Financial leverage is $\text{Average Total Assets}/\text{Average Stockholders' Equity}$. It measures how many dollars of assets are employed for each dollar of stockholder investment. It can be increased by
 - a. Increased borrowing.
 - b. Repurchasing (decreasing) outstanding stock.

D. Misreading and Misleading Financial Statements

In an ideal world, financial statements would be intended to give clear and accurate portrayals of economic value and information needed to make economic decisions. Unfortunately, it is not possible to follow through on this ideal, and financial statements are, in reality, subject to a myriad of complicated accounting rules and regulations, differences in interpretation and application, subject to omissions and, in the worst cases, deception. An equities analyst would certainly benefit from training in accounting, at a minimum, introductory and intermediate accounting along with financial statement analysis. There are a number of excellent books that deal with the subject, including those that are used to prepare candidates for the CFA certification.¹

First, managers are under intense pressure to meet revenue and earnings targets. For example, Skinner and Sloan [2002] find that when firms announce quarterly earnings beating consensus analyst forecasts, stock prices show abnormal price increases averaging 5.5%. Negative earnings surprises result in abnormal price declines averaging -5.04%. Most professional analysts are aware that they must view income statements and earnings reports with at least some skepticism. For example, consider some of the abuses that occur with revenue recognition. To realize sales projections or revenue increases, a company may slash prices, relax credit standards and cut deals at the end of the quarter to off-load products to dealers when there is no underlying retail demand. These deliveries of goods still count as sales. Sometimes firms will ship their products on or close to Dec. 31 in order to record the sale for the year just ending. However, the company receiving the shipment after the new-year may record the purchase expense for the new-year. For example, under the leadership of “Chainsaw” Al Dunlap, appliance maker Sunbeam Corp. was forced to restate financial results for 1996 and 1997 after the firm was accused of using this type of phony accounting to boost profits. The company later filed for bankruptcy. At the root of this fraud was Sunbeam’s having made side agreements with customers to accept product deliveries prematurely, where products were shipped to warehouses with rights to refuse the shipment. IBM (with its 2001 \$340 million sale of optical transceiver business to JDS Uniphase on the final day of the quarter) and Xerox were among the many companies to have been accused of such practices.

Many analysts and investors are impressed with companies that can demonstrate a long history of uninterrupted earnings growth. Myers, Myers and Skinner (2007) found that firms that experienced the same average rate and growth rate of returns over 20 quarters, those firms whose earnings growth rates were consistently positive sold at a 6% premium over those firms that had experienced at least one quarter where earnings did not grow. In their study concerning earnings manipulation, they calculated that over the 42-year period of their study, no more than 18-46 companies should have experienced more than 20 consecutive quarters of uninterrupted earnings growth. This figure, based on simulations, assumed that no companies manipulated their earnings levels. However, in their study, the actual number of firms with more than 20 quarters of uninterrupted earnings growth was 587, suggesting that companies do manage their earnings to maintain consistent earnings growth.

Consider a survey by Graham, Harvey and Rajgopal [2005] of 401 corporate CFOs asking the following question: “Near the end of the quarter, it looks like your company might come in below the desired earnings target. Within what is permitted by GAAP, which of the

¹ For example, see White, Gerald I., Ashwinpaul C. Sondhi and Dov Fried (2002). *The Analysis and Use of Financial Statements*, 3rd Ed. New York: Wiley Publishers.

following choices might your company make?” Their survey results indicated that 80% of these CFOs companies would be willing to delay discretionary spending such as R&D, advertising and maintenance, and over 55% would knowingly sacrifice small value increases by delaying the project starts. Almost 40% would speed revenue generation. Glater.[2005] reported that a record number (253) of public companies restated their annual audited financial statements in 2004 and 161 companies restated their quarterly statements.²

The analyst should take care to examine sudden changes in sales levels, performing comparisons with peer firms and with prior years’ data. Common size accounting statements (where sales are standardized at 100 and other income statement items are expressed as fractions of 100) are often helpful for such comparisons. Checks for relaxation in credit standards (e.g., significant growth in Accounts Receivable relative to sales) should be performed when suspicion arises.

Similar sorts of games have been played with operating expenses. The GAAP guideline known as the matching principle requires companies to match expenses with corresponding reported revenues. Companies have ignored this requirement, deferring current expenses or by capitalizing normal operating expenses as assets. This technique can temporarily boost current earnings. Enron, WorldCom and AOL (both by capitalizing expenses) and Cendant (whose \$100 million restatement cost shareholders \$15 billion in a single day) are among the firms that have been accused of these abuses.

Accounting restatements may create even more significant problems for the firm’s investors. The United States General Accounting Office (GAO) reported that the number of restatements grew by 300% from 1997 through 2004. Numerous studies have shown that financial restatements adversely impact firm value (e.g., Dechow, Sloan and Sweeney [1996]). For example, Kinney and McDaniel (1989) characterized firms filing restatements of quarterly earnings reports, finding that these firms were smaller, less profitable, exhibited slower growth; had greater leverage and received more qualified audit opinions than their industry counterparts. Financial restatements are costly to the firm. They lead to unfavorable publicity, can trigger SEC and other formal investigations, impair the credibility of firm executives and can lead to their replacement. Financial restatements imply impaired transparency and reduce the reliability of the accounting statements of the firm. In addition, restatements can be expected to alter investors’ perceptions of current and future performance and value.

Relatively recent bankruptcies related to accounting fraud include Enron, McKesson HBOC, ConAgra, Sybase, S3, Fine Host, Versatility, Physicians’ Computer, Medaphis, Parmalat, Centennial Technology, WorldCom, Norland Medical, Premier Laser, Altris Software, Micro Warehouse, Transcrypt, Sunbeam, Paracelsus, DonnKenny, RasterGraphics, Covad and TriTeal. However, much of the difficulty in interpreting financial statements is not related to fraud; it is simply difficult to use accounting statements to accurately reflect economic values. But, there may not be any better alternatives.

Balance sheets can also be affected by deception and questions of interpretation. Contingent liabilities are always a source of difficulty, especially when potential payoffs and their probabilities simply cannot be known. Footnotes should be carefully scrutinized. Special purpose entities, subsidiaries, pyramid structures and cross ownership should always be carefully examined.

² See Jensen [2005] for a discussion of these and related results.

Example: Cross-ownership and Share Value Inflation

Cross ownership exists when firms own shares of each others' stock. Firms often purchase shares for investment purposes and may own each other's shares to forge strategic alliances ad for other purposes. Cross ownership of shares is a very common phenomenon in many parts of the world such as in Japan with the keiretsu, Korea with the chaebol and in Europe with privately held companies. It has also been used to create deceptions of several types. For example, Enron Corporation created a number of "special purpose entities" that it used to place the parent firm's debt and equity securities. Such placements contributed to the fall of Enron. Parmalat, in a case that we will discuss later, used off shore subsidiaries to hide non-performing assets and certain liabilities. In the late 1990s (and even today), many companies in the telecommunications and cable industries hold shares of each other's stock. Such cross holdings inflated the book values of equity of these firms since the equity held by each company increased the book value of the equity held by other companies that hold its shares. This will be illustrated below. Pyramid schemes employing cross-ownership have long been used to create the perception of wealth that simply does not exist.

This example demonstrates the impact of cross-ownership of shares between companies and its apparent impact on share values. Each of the two firms will hold \$5,000 in plant and equipment plus shares of stock in the other company. Consider a scenario where two firms, A and B own 90% of the shares of each other's stock. Balance sheets (partially completed) for each of the two companies, A and B, are given below:

Firm A		Firm B	
<u>Assets</u>	<u>Capital</u>	<u>Assets</u>	<u>Capital</u>
Plant and Equip.	5,000	Plant and Equip.	5,000
90% of B stock	_____	90% of A Stock	_____
	Equity _____		Equity _____
Totals		Totals	

The value of Company A equals \$5,000 plus 90% of the value of Company B. To determine the value of Company A, we need to determine the value of Company B equity. This, in turn requires that we determine the value of Company A equity. Thus, we can value A and B as follows:

$$V_A = 5,000 + .9(5,000 + .9V_A)$$

$$V_B = 5,000 + .9(5,000 + .9V_B)$$

The solutions for V_A and V_B are \$50,000; that is, each firm is worth \$50,000, that is, \$100,000 total, even though the value of their productive assets totals only \$10,000. Cross-holdings have inflated each of the two companies' asset and equity levels by \$45,000. Another way to look at this balance sheet inflation caused by cross-holdings is to note that the value of Firm A equals \$5,000 plus 90% of the value of Firm B, which has \$5,000 in plant and equipment plus 90% of the stock in Firm A:

$$V_A = 5,000 + .9(5,000 + .9(5,000 + V_A))$$

which, since Firm A value equals \$5000 plus 90% of the value of Firm B:

$$V_A = 5,000 + .9(5,000 + .9(5,000 + (5,000 + V_B)))$$

or, more generally,

$$V_A = 5,000 \times (.9^0 + .9^1 + .9^2 + \dots + .9^\infty)$$

We can simplify this expression with a geometric expansion to obtain:³

$$V_A = 5,000/.1 = 50,000$$

Regardless, cross ownership has inflated the value of each company from \$5,000 to \$5,000/(1-.9) = \$45,000. Cross ownership, in and of itself, is not necessarily fraudulent or abusive, but it is a practice that analysts need to be aware of when examining accounting statements.

³ Multiply both sides by $.9V_A$ to obtain $.9V_A = 5,000 \times (.9^1 + .9^2 + \dots + .9^{\infty+1})$ and then subtract this equation from V_A to obtain $V_A - .9V_A = 5,000 \times (.9^0 - .9^{\infty+1})$. Simplify further to obtain $V_A(1-.9) = 5,000(1)$, which leads to $V_A = 5,000/.1 = 50,000$.

E. Comparables-Based Valuation

While we have spent much time on growth models and forecasting dividends, earnings and free cash flows, market-based ratios from comparable firms are used more frequently by equity analysts to derive firm values. The results of such comparisons seem less sensitive to estimation errors and require less forecasting ability. Using the Relative Valuation (Comparables) Approaches involves comparing the target firm to a group of other firms with similar operating circumstances. In some instances, there will be obvious firms to serve as comparisons. Many analysts rely on *Standard Industrial Classification (SIC)* or *North American Industry Classification System (NAICS)* codes to identify a target firm's peer group. Several institutions such as Dun and Bradstreet provide data useful for comparisons of ratios. For example, Dun and Bradstreet provides "average" ratio levels for firms in a number of different industries.

For valuation purposes, various market ratios will be most useful. For example, the P/E ratio (which is the same as market value of equity divided by net income after taxes) will price the target firm as a function of its net earnings. One might expect that firms with similar operating circumstances would have relatively comparable P/E ratios, implying that the market might be expected to value each dollar of earnings fairly consistently. Suppose that the Polk Company, the target of a bid might be regarded as being comparable to the Taylor, Fillmore and Pierce Companies:

Firm	P/E (Market to Net Income)	Market to Book	Market to Sales
Taylor	25	0.9	0.8
Fillmore	28	1.1	0.7
Pierce	30	1.2	0.9
Average	27.67	1.067	0.8

The three most commonly used ratios are the P/E, Market to Book and Market to Sales ratios. The numerator of each the three ratios in the table, Market, is interpreted to be the market value of equity for the firm. Each of the denominators of the ratios may be taken from accounting statements of the three firms. Similarly, the Polk Company will generate accounting statement values from which the three ratios might be implied. The averages reported on the bottom line of the table might be taken as ratio values from which the market value of equity for the Polk Company might be computed. Suppose that relevant accounting statement data for the Polk Company is given in the following table:

Data	P/E (Market to Net Income)	Market to Book	Market to Sales
Average	27.67	1.067	0.8
Accounting Statement Entry for Polk	NIAT: \$450,000	Book Value: Equity: \$10,000,000 0	Total Sales: of \$11,000,000
Implied Market Value	12,451,500	10,067,000	8,800,000
			Average: 10,439,500

With data from each of the three peer firms weighted identically, and values taken from Polk Company accounting statements, we find that potential values of the Polk Company are \$12,451,500, \$10,067,000 and \$8,800,000. If we were to weight these values equally, we would value the Polk Company at \$10,439,500. A share price for Polk can be obtained by dividing \$10,439,500 by the number of outstanding shares.

Performance: DCF versus Comparables

We have discussed DCF and Comparables analysis in this chapter. Which works better? First, it is clear that most analysts make more extensive use of price multiples than DCF. However, as we will discuss later, in their study of 51 highly leveraged transactions, Kaplan and Ruback [1995] found that DCF analysis provided better estimates of value than price-based multiples, though the price-based multiples did add useful information to the valuation process. Some analysts have noted that the comparables approach does not provide a proper accounting for risk differences among companies and does not allow for differences in growth and super-growth opportunities. Such market-based comparisons may be vulnerable to short-term price fluctuations or temporary accounting statement changes.

Other research (e.g., Lie and Lie [2002]) has suggested that price multiples may be more useful for IPOs and other valuations where future cash flows are particularly difficult to estimate. However, highly comparable companies must still be made available for comparison. In addition, negative earnings, as is so common for IPO companies and their peers, can create bias or render the more simple comparisons meaningless.

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Exercises

7.1. The following are accounting statements for the Jeffries Sporting Goods Company:

<u>Income Statement, 2014</u>	<u>Balance Sheet, Dec.31,2013</u>	
Rev.....\$800,000	<u>ASSETS</u>	<u>CAPITAL</u>
CGS.....100,000	Cash.....\$25,000	Tax Payable.\$25,000
FC.....300,000	Mkt. Secs.....75,000	A.P.....75,000
EBIT.....400,000	Accts. Rec...350,000	C.L.....100,000
INT.....100,000	Inv.....250,000	Notes Pay...300,000
EBT.....300,000	C.A.....700,000	Bonds Pay...600,000
Taxes.....100,000	Plant&Equip..900,000	L.T.D.....900,000
NIAT.....200,000	Fixed Assets.900,000	Debt.....1,000,000
Div..... 50,000		Equity.....600,000
RE.....150,000	Assets.....1,600,000	Capital...1,600,000

The following are accounting statements for the Tunney Sporting Goods Company:

<u>Income Statement, 2014</u>	<u>Balance Sheet, Dec.31,2013</u>	
Rev.....\$600,000	<u>ASSETS</u>	<u>CAPITAL</u>
CGS.....60,000	Cash.....\$100,000	Tax Payable.\$75,000
FC.....300,000	Mkt. Secs.....30,000	A.P.....225,000
EBIT.....240,000	Accts. Rec...170,000	C.L.....300,000
INT.....150,000	Inv.....200,000	Notes Pay...200,000
EBT.....90,000	C.A.....500,000	Bonds Pay...400,000
Taxes.....30,000	Plant&Equip..950,000	L.T.D.....600,000
NIAT.....60,000	Fixed Assets.950,000	Debt.....900,000
Div.....50,000		Equity.....550,000
RE.....10,000	Assets.....1,450,000	Capital...1,450,000

- a. Compute the following ratios for each of the two sporting goods companies:
 - i. Current Ratio
 - ii. Acid Test Ratio
 - iii. Net Working Capital to Total Assets
 - iv. Return on Equity
 - v. Return on Assets
 - vi. Gross Profit Margin
 - vii. Net Profit Margin
 - viii. Financial Leverage Ratio
 - ix. Debt-Equity Ratio
 - x. Times Interest Earned Ratio
 - xi. Dividend Payout
- b. Which of the two companies seems to operate more efficiently?
- c. How did you measure efficiency?
- d. Why is this company capable of operating more efficiently?
- e. What advice would you give to managers of the two companies on the basis of the accounting statement information and ratios?
- f. Which company would you prefer to lend money to? Why?

Ratio and Financial Statement Analysis

g. In your opinion, what are the probabilities associated with either company defaulting on its debt obligations?

h. What are your estimates for NIAT for both companies in 2015, given that each expects a 2015 sales level of \$500,000?

7.2. Given the following ratios, answer parts (a) through (d):

CHARLES COMPANY HISTORICAL RATIOS

YEAR	CURRENT RATIO	ACID TEST RATIO	DEBT TO EQUITY RATIO	RETURN ON ASSETS	SALES TURNOVER RATIO	RETURN ON EQUITY
2012	2.1	0.5	0.6	.11	1.5	.05
2011	2.1	0.6	0.5	.10	1.6	.04
2010	2.0	0.7	0.4	.10	1.7	.10
2009	1.9	0.7	0.4	.11	1.9	.12
2008	1.9	0.8	0.3	.12	1.9	.13
2007	1.8	0.9	0.3	.12	2.0	.14
2006	1.7	1.0	0.3	.13	2.0	.14

INDUSTRY AVERAGE HISTORICAL RATIOS

YEAR	CURRENT RATIO	ACID TEST RATIO	DEBT TO EQUITY RATIO	RETURN ON ASSETS	SALES TURNOVER RATIO	RETURN ON EQUITY
2012	1.4	0.6	0.4	.16	1.9	.19
2011	1.3	0.5	0.3	.15	1.9	.21
2010	1.4	0.7	0.3	.14	2.0	.18
2009	1.5	0.7	0.3	.14	1.9	.17
2008	1.5	0.7	0.3	.13	1.9	.16
2007	1.6	0.9	0.3	.12	2.0	.14
2006	1.7	0.9	0.3	.13	2.0	.15

a. How do the profitability ratios of the Charles Company compare to those of the industry average? How do the trends compare?

b. How do the liquidity and activity ratios of the Charles Company compare to those of the industry averages? How do the trends compare?

c. What connections seem to exist between profitability ratios and the liquidity and activity ratios? Can we infer a likely causal effect?

d. If the Charles Company's profits and performance are poor relative to the industry, what seems to be the cause? Does the Charles seem to be as good a credit risk as the "average" company in its industry?

7.3. Create common-size income statements and balance sheets for the Jeffries and Tunney Sporting Goods Companies in Problem 7.1.

7.4. Structure the DuPont Identity for the Jeffries and Tunney Sporting Goods Companies in Problem 7.1.

7.5. Based on your computations for Problem 7.4, why might it appear that Jeffries generates a

much higher return to shareholders?