



Financial analysis

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1. Return ratios and the Du Pont system

Return-on-investment ratios

Return-on-investment ratios, more commonly called return-on-asset ratios, compare measures of benefits we have not yet considered with measures of investment. What we want to evaluate will determine the benefit that is represented in the numerator and the resources affecting that benefit, represented in the denominator. What distinguishes return-on-investment ratios from the activity ratios (such as an inventory turnover or receivable turnover) is that the numerator is the net benefit, rather than the gross benefit from an activity.

The **return on operating assets ratio** (a.k.a **basic earning power ratio**) is the ratio of operating earnings to assets:

$$\text{Basic earning power ratio} = \text{Operating return on assets} = \frac{\text{Operating income}}{\text{Total assets}}$$

It is a measure of the operating income resulting from the firm's investment in total assets.

The **return on assets** is the ratio of net income to assets and indicates the firm's net profit generated per dollar invested in total assets:

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

The **return on equity** is the ratio of net income to shareholders' equity and represents the profit generated per dollar of shareholders' investment (that is, shareholders' equity):

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

The **return on common equity** is the ratio of net income available to common shareholders to common shareholders' equity. This return is the profit generated per dollar of common shareholders' investment (that is, common shareholders' equity).

We provide the return ratios for Microsoft for 2005 in Exhibit 1. Microsoft has only one type of stock, so therefore the return on common equity is equivalent to the return on equity.

Exhibit 1 Microsoft's 2005 Return Ratios

Basic earning power = \$14,561 / \$94,368 = 15.430%
 Return on assets = \$12,254 / \$94,368 = 12.985%
 Return on equity = \$12,254 / \$74,825 = 16.377%

Source of data: Microsoft Corporation 2005 Annual Report, fiscal year ended June 30, 2005

The DuPont System

The **Du Pont system** was developed by E.I. du Pont Nemours, the system is a method of decomposing the return ratios into their profit margin and turnover components. Suppose the return on assets changes from 20% to 10%. We do not know whether this decreased return is due to a less efficient use of the firm's assets -- that is, due to lower activity or to lower profit margins. A lower return on assets could be due to lower activity, lower margins, or both. Since we are interested in evaluating past operating performance to evaluate different aspects of the management of the firm or to predict future performance, knowing the source of these returns is valuable information. The DuPont system allows us to breakdown the return ratios into components, identifying the sources of the changes in returns.

For example, we can breakdown the operating return on assets and the return on assets to two components, operating margin and total asset turnover:

$$\text{Operating return on assets} = \frac{\text{Operating income}}{\text{Total assets}} = \frac{\text{Operating income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}}$$

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

By looking at the components, turnover and profit margin, and their changes from year to year, we get a better idea of what is behind changes in returns from year to year. Similarly, the return on shareholders' equity can be broken down into three components:

$$\text{Return on equity} = \frac{\text{Net income}}{\text{Total assets}} = \frac{\text{Net income}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{Shareholders' equity}}$$

Exhibit 2: Applying the Du Pont System to Microsoft

Increase is both the more effective use of assets and improved operating margins:

	Ratio	2004	2005
	Total asset turnover	0.39033 times	0.56186times
multiplied by ...	Operating profit margin	24.526%	36.596%
...equals	Return on operating assets	9.573%	15.530%

Source of data: Microsoft Corporation 2005 Annual Report, fiscal year ended June 30, 2005

You can see how Microsoft's return on operating assets is broken down into the turnover and profit margin in Exhibit 2. As you see in this exhibit, the change in the operating return is attributable to both an increase in the turnover and the profit margin.

The task of breaking down ratios into components can be performed on any return ratio and can reduce the ratios to their smallest components. For example, the return on equity can be broken down into five components: net profit margin, asset turnover, equity multiplier, equity's share of income, and tax burden. A breakdown of the return on assets into four components (i.e., asset turnover, operating profit margin, interest burden, and

tax burden) is diagrammed in Exhibit 3. In a similar manner, the return on equity can be broken down into five components: asset turnover, operating profit margin, interest burden, tax burden, and the equity multiplier.

Why is it useful to do such a breakdown? The system of looking at the components of the returns of a company help in:

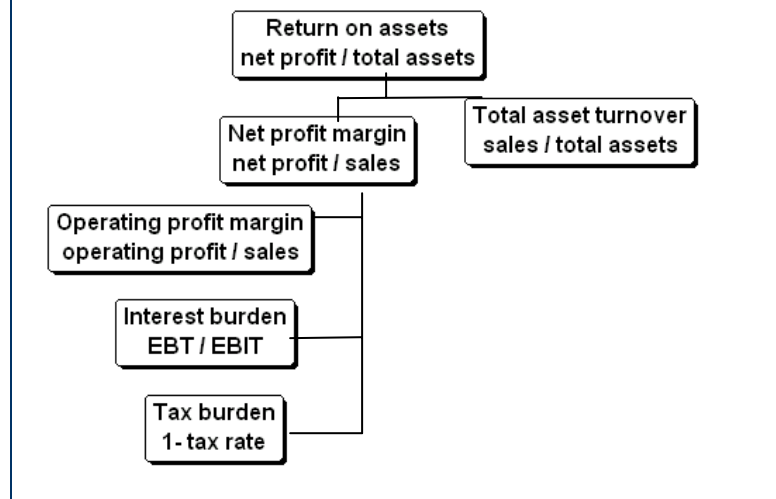
1. Comparing the performance and condition of a company against its competitors;
2. Analyzing trends in the returns of a company in the context of trends of the components; and
3. Forecasting the returns of a company based on forecasts of the components.

Regarding comparisons with competitors, consider that companies in the same line of business should

have similar operating profit margins and asset turnovers. Focusing on these ratios may help explain why companies in the same industry have different returns. Further, the interest burden is influenced by the company's financial decisions. By comparing these dimensions across companies in the same industry, we get a better sense of how these decisions affect a company's fortunes.

Regarding the source of changes in returns, consider Kmart prior to its bankruptcy filing in 2002.¹ Its total asset turnover, profit margin, and return on assets are graphed in Exhibit 4.

Exhibit 3: Du Pont breakdown of the return on assets



¹ Kmart filed for bankruptcy in January of 2002. Kmart and Sears agreed to merge in 2004.

We can see in Exhibit 4, Panel A, that Kmart's return on assets changed over time: dramatic decreases in 1993 and 1995, some recovery in 1997-1998, and then a decline as it approached bankruptcy.²

What was the source of Kmart's woes? There is usually not just one source of a company's financial difficulties, but the use of the du Pont system allows us to get some idea of what led to Kmart's challenges.

We can see in Panel B that the total asset turnover did not change much during the 1990-2000. If we were to compare this turnover with that of its competitors, we would see that Kmart's turnover was quite similar.

Looking at Kmart's net profit margin, as shown in Panel C, we see that the changes in the net profit margin appear to have been a strong influence on Kmart's returns.

What does this mean? What we surmise from this analysis is that Kmart's difficulties are related to the management of expenses, rather than the deployment and use of its assets. If we wanted to get a more detailed look, we could break the net profit margin into components of the operation profit margin, the interest burden, and the tax burden to see what why the net profit margin changed over time.

2. Other tools

Common size analysis

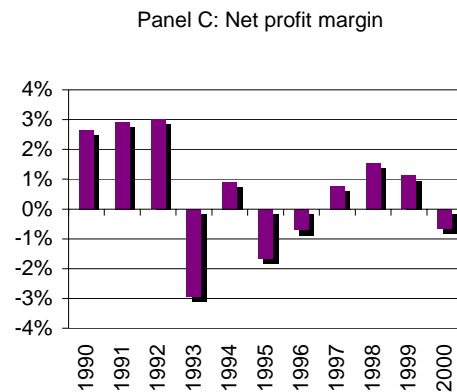
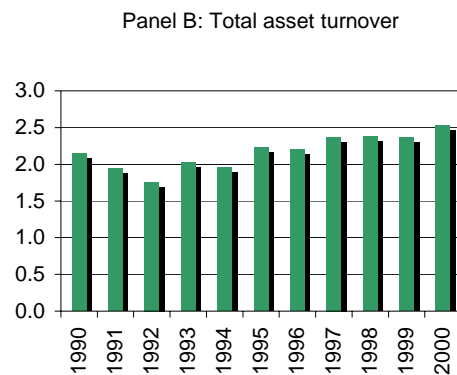
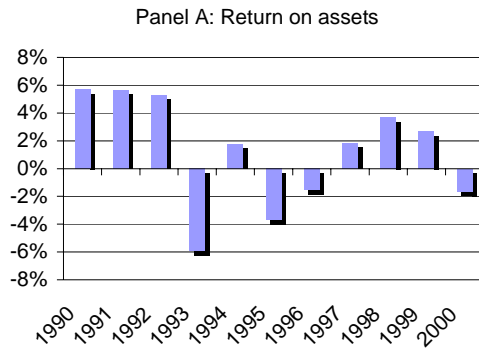
Common size analysis is the analysis of financial statement items through comparisons among these items. In common size analysis, we compare each item in a financial statement with a benchmark item:

For the income statement, the benchmark is sales. For a given period, each item in the income statement is restated as a percentage of sales.

For the balance sheet, the benchmark is total assets. For a given point in time, each item in the balance sheet is restated as a percentage of total assets.

To see how this works, consider The Acme Company's financial statements below. The reported financial data in the right-most columns has been converted into percentages of sales revenues (i.e., common size statements), shown in the left-most columns:

Exhibit 4: Kmart's woes



Source: Kmart's 10-K reports

² Kmart filed for bankruptcy in January of 2002. Kmart and Sears agreed to merge in 2004.

Acme Company Income Statements	Common-size statement stated as			
	a % of Sales		Amount in millions	
	2005	2004	2005	2004
Sales	100.0%	100.0%	\$178,174	\$164,013
Cost of sales	<u>73.0%</u>	<u>75.1%</u>	<u>130,028</u>	<u>123,195</u>
Gross profit	27.0%	24.9%	\$48,146	\$40,818
Selling, general, and administrative expenses	<u>9.1%</u>	<u>8.9%</u>	<u>0</u>	<u>0</u>
Net income	3.8%	3.0%	\$6,698	\$4,963

We can restate also Acme's reported balance sheet items in terms a percentage of total assets:

Acme Company Balance Sheets	Common-sized statement stated as			
	a % of total assets		Amount in millions	
	2005	2004	2005	2004
Cash, cash equiv., and marketable securities	10.0%	10.0%	\$22,984	\$22,262
Finance receivables	25.7%	25.9%	58,870	57,550
Accounts receivable	3.3%	3.0%	7,493	6,557
Inventories	5.3%	5.4%	12,102	11,898
Deferred income taxes	9.8%	8.8%	22,478	19,510
Equipment on operating leases	14.5%	13.6%	33,302	30,112
Property	15.1%	16.9%	34,567	37,504
Intangible assets	5.0%	5.7%	11,469	12,691
Other assets	<u>11.2%</u>	<u>10.8%</u>	<u>25,623</u>	<u>24,058</u>
Total assets	100%	100%	\$228,888	\$222,142

In a similar manner, the liabilities and equity can be restated in terms of total assets:

Acme Company's Balance Sheets, continued	Common-sized statement stated as a % of total assets			
			Amount in millions	
	2005	2004	2005	2004
Accounts payable	6.9%	6.4%	\$15,782	\$14,221
Notes and loans payable	40.6%	38.4%	93,027	85,300
Deferred income taxes	1.3%	1.4%	2,923	3,196
Postretirement benefits other than pensions	18.0%	19.4%	41,168	43,190
Pensions	3.1%	3.4%	7,043	7,581
Accrued expenses and other liabilities	22.1%	20.3%	50,490	45,144
Minority interests	0.3%	0.0%	727	92
Debentures	0.1%	0.0%	222	0
Stockholders' equity	<u>7.6%</u>	<u>10.5%</u>	<u>17,506</u>	<u>23,418</u>
Total liabilities and equity	100%	100%	\$228,888	\$222,142

We can also represent this information in graphical form, which allows us to see trends in these components over time. Using Harley-Davidson as an example, consider the income statements for this company of the period 1991-2004, as shown in Exhibit 5, Panel A. Here we can see that the increasing profitability while the cost of goods sold has declined relative to total revenues. Looking at the company's product line and business operations, we see that this increase in profitability corresponds to the shift in generating profits not just from the sale of motorcycles, but from the financing of these sales and licensing.

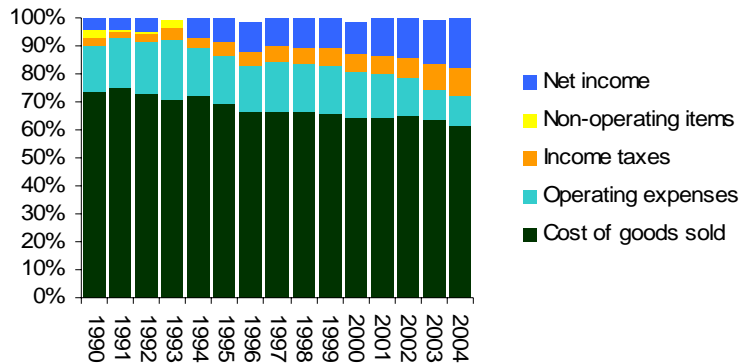
We can see this shift in business purpose in the asset composition over time, as shown in Panel B. Finance receivables have become increasingly more important as a use of funds. This is understandable because the financing of its cycles has increased the profitability of the company.

In Panel C, which is the representation of the company's liabilities and equity, we see that the capital structure – that is, how the business chooses to finance its business, is rather stable over time.

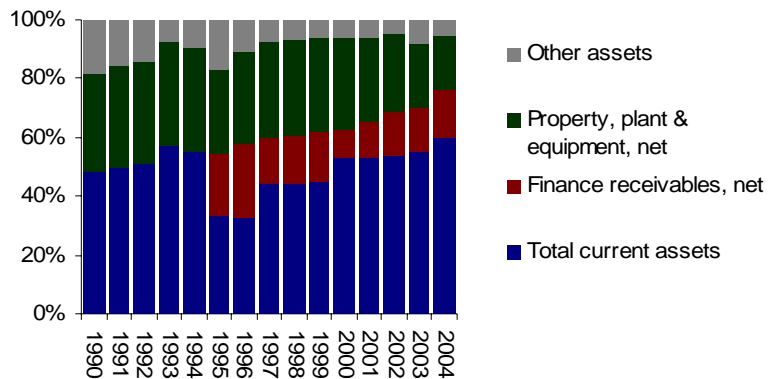
Common size analysis is useful in analyzing trends in profitability (using the common size income statements) and trends in investments and financing (using the common size balance sheet).

Exhibit 5 Graphical representation of the common-size statements for Harley Davidson, 1991-2004

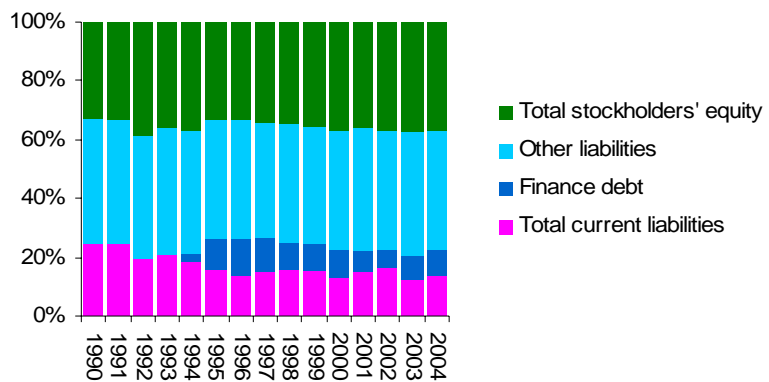
Panel A Income statement



Panel B Assets



Panel C Liabilities



Source of data: Mergent Online

3. Effective use of financial analysis

As we learned in the discussion of financial ratios, we can use financial ratios along with other pertinent data to evaluate the financial condition and operating performance of a company. Though a single ratio for a given company at a point in time tells us very little, if we examine the trends in the ratios over time and compare these trends with those of firms in similar lines of business, we can get a good idea of where this company has been -- financially speaking -- and where it may be heading. Therefore, the analysis of financial ratios and other information involves examining:

- trends over time for the company,
- trends over time for companies in similar lines of business, and
- economic and market conditions.

Choosing a benchmark

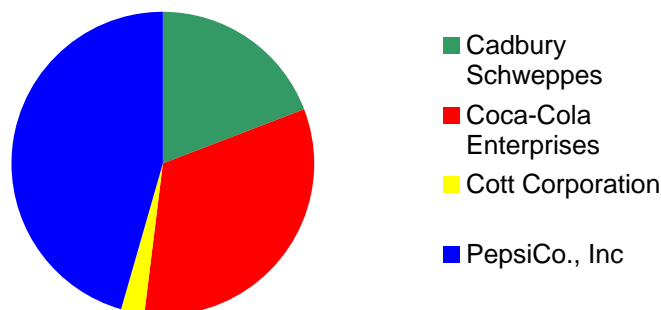
To make comparisons, the analyst most likely will want to compare the firm with other firms. But identifying the other firms in the same or similar lines of business presents a challenge. A system that has been used for many years for classifying firms by lines of business is the Standard Industrial Classification (SIC) system, which was developed by the Office of Management and Budget. However, starting in 1997, another classification system, North American Industry Classification System (NAICS) replaces SIC codes with a system that better represents the current lines of business. Using the NAISC, we can classify a firm and then compare this firm with other of that class.

Classifying firms into industry groups is difficult because most firms have more than one line of business. Most large corporations operate in several lines of business. Do we classify a firm into an industry by the line of business that represents:

- the most sales revenue generated?
- the greatest investment in assets?
- the greatest share of the firm's profits?

It is not clear which is the most appropriate method and a firm may be classified into different industries by different financial services and analysts.

Exhibit 6 Breakdown of the Beverage Industry's Sales



Source of data: *Value Line Investment Survey*

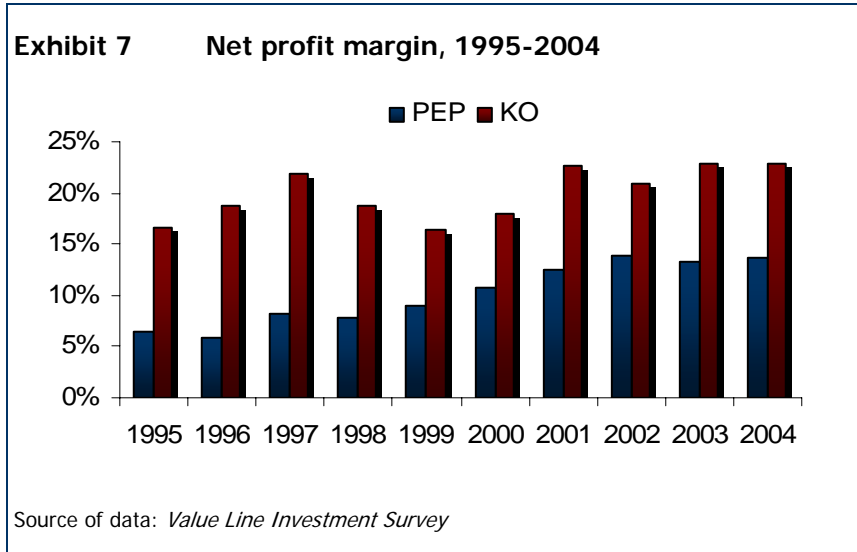
In making comparisons, there is an issue of whether the benchmark should be all other firms in the industry (say, an average), or the leading firms in the industry. Consider the case of PepsiCo, Inc.. PepsiCo, Inc. is a producer of beverages and snacks. The primary competitors to PepsiCo in this industry are Coca-Cola, Cadbury Schweppes, and Cott Corporation.. The breakdown of sales in this industry for 2005 is shown in Exhibit 6.

When comparing PepsiCo to the industry,

- Should we use just the two major competitors as the industry benchmark? If so, so we simply average Cadbury's, Cott's and Coca Cola's ratios or do we weight them in some manner (e.g., by market share)?
- Should we consider the smaller competitors at all?
- Should we compare PepsiCo with the other large firm in the industry, Coca-Cola?

The benchmark that we choose may affect the conclusions that we draw with respect to a firm's operating performance.

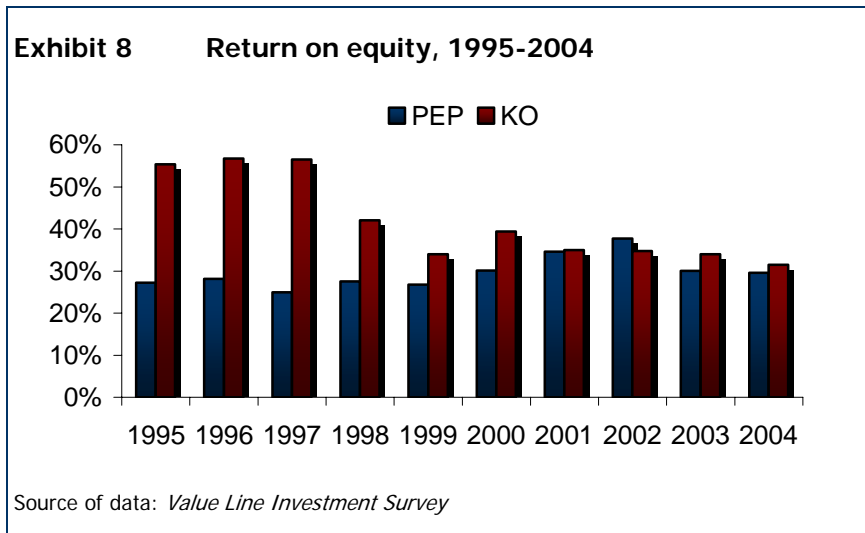
Let's see how we would use information over time for PepsiCo (PEP) and Coca-Cola (KO). Consider the net profit margins for both companies, as shown in Exhibit 7.



Looking at the net profit margin, we see that the profit margin of PepsiCo has improved over time and that of Coca-Cola has improved slightly.

The net profit margin measures the company's ability to manage its expenses. Both companies are subject to similar operating risk, but PepsiCo relies more on debt financing than does Coca-Cola, as indicated by the higher debt to equity ratio; PepsiCo has a debt to equity ratio of 18

percent in 2004, compared to Coca-Cola's 7 percent. However, both companies have debt-to-equity ratios much lower than the next two largest competitors: Cott Corporation has a debt-equity ratio of 60 percent, whereas Cadbury Schweppes has a debt-equity ratio of 95 percent.



Comparing the return on equity for the two companies, as shown in Exhibit 8, we get a slightly different picture: PepsiCo's return on equity has remained about the same over the 1995-2004 period, yet the return on equity for Coca-Cola has declined over this same period.

Evaluating creditworthiness

One use of financial analysis is to evaluate the credit-worthiness or debt quality of a business. Credit-rating services (e.g., Dun & Bradstreet, Standard & Poor's, and Moody's Investor Service) provide an evaluation of a firm's ability to meet its obligations. Rating services use both financial analysis and the characteristics of the obligations to evaluate credit-worthiness.

Bond ratings reflect the credit quality of a particular debt issue. These ratings reflect not only the credit-worthiness of the issuer, but also the features of the debt issue, such as security or a sinking fund. Bonds are often classified according to credit quality. Bond ratings for both Moody's and Standard & Poor's are summarized in Table 1.

We can classify bonds into broader groups based on these ratings: investment grade debt and non-investment grade debt. Investment grade debt is debt with little credit risk -- the borrowers are expected to be able to pay the promised interest and principal. In terms of the bond ratings in Table 1, investment grade debt encompasses the top four rating classes (AAA through BBB for Standard and Poor's and Aaa through Baa for Moody's). Non-investment grade debt, also referred to as ***junk bonds*** or ***speculative grade*** debt, on the other hand, are debt securities with a great deal of credit risk -- that is, there is a good chance the borrowers will not be able to pay the promised interest and principal.

Predicting bankruptcy

Financial analysis is often used to evaluate the likelihood that a firm will be unable to pay its obligations. We can see that there are often indications of a firm's financial distress prior to the actual declaration of bankruptcy.

Because financial distress is generally signaled through financial characteristics well before a formal bankruptcy, statistical models are often used to discriminate between financially healthy and financially unhealthy firms based on financial ratios or other characteristics over several years.

The general characteristics of a firm used in these models include liquidity, profitability, financial leverage, and asset turnover. Statistical models employ techniques, such as discriminant analysis and regression analysis, to identify the characteristics of firms most likely to experience difficulty meeting financial obligations.

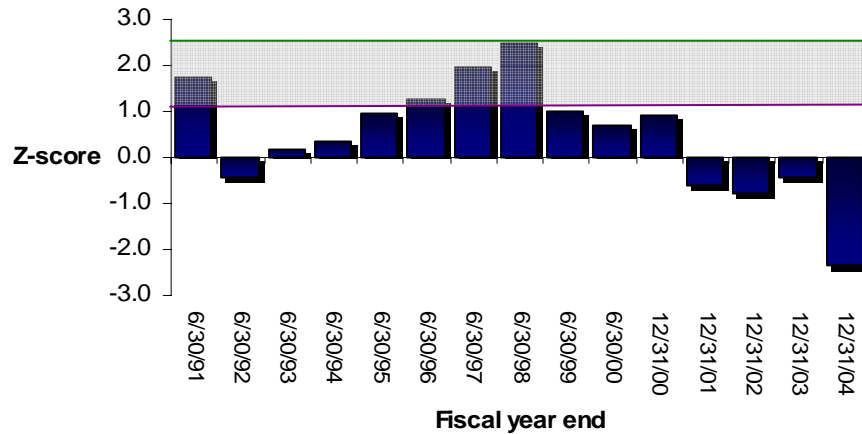
In the case of discriminant analysis, for example, scores are calculated based on financial ratios and these scores are then

associated with the likelihood of financial distress. Ed Altman developed a series of models of bankruptcy prediction using discriminant analysis.³ For example, applying his model for publicly-traded non-manufacturing companies to Delta Airlines, as we show in Exhibit 9, we see that Delta Airlines' financial health improved during the 1993 through 1998, but its health deteriorated up until its bankruptcy filing in 2005.

Exhibit 9

Delta Airlines and the Altman Z-score

- A healthy company generally has a Z-score above 2.6
- An unhealthy company generally has a Z-score below 1.11.2006
- A company with a Z-score between 1.11-2.6 bears watching.



Source of data: Mergent Online and Delta Air Lines' 10-K filings

4. Problems and dilemmas in financial analysis

Using accounting data

There are a number of issues that arise simply from the fact that much of the financial data we use in analysis is accounting information. The problems associated with using reported accounting data include:

- **Use of historical costs and inflation.** Accounting data are not adjusted for inflation and represent historical cost instead of current or replacement costs for most assets. It is likely that the reported book value of assets do not reflect the market value or replacement value of a firm's assets.
- **The different methods of accounting.** Firms can select from alternative accounting procedures (e.g., LIFO vs. FIFO), which makes comparisons among firms difficult. The analyst must often look beyond the basic financial statement information to remove distortions that may arise from specific accounting practices.
- **The occurrence of extraordinary and special items.** The analyst must determine whether the effects of extraordinary and special items should be included in the analysis. In recent years,

³ For a summary of these models, see *Bankruptcy, Credit Risk, and High Yield Junk Bonds*, by Edward I. Altman, Blackwell Publishing, 2002.

extraordinary items have become quite "ordinary", with some firms reported extraordinary items each year.

- **The difficulty in classify "fuzzy" items.** Some accounting items are difficult to classify, especially when distinguishing between liabilities and equity accounts. Therefore, the analyst must understand not only the accounting principles behind the numbers, but also understand business practices. For example, in the case of the deferred taxes, the analyst must understand not only what gives rise to the deferred taxes, but whether this accounting item represents an on-going difference between tax and accounting income (and, hence, is more suitably classified as equity) or whether this item represents a temporary timing difference (and, hence, is more suitably classified as a liability).

Selecting and interpreting ratios

Interpretation of ratios one at a time is difficult since there is no "good" or "bad" value when viewed in isolation. Ratios should be selected that have meaning for that firm. For example, inventory turnover for a hospital doesn't make much sense. What is inventory for a hospital? Bed pans? But inventory turnover is very important for, say, a retailer such as Wal-Mart.

Further, some ratios do not make sense under certain circumstances. For example, if a firm has negative earnings, the price-earnings ratio is meaningless. As another example, consider a firm that has negative book value of equity (and, yes, this can happen). In this case, any ratio that uses book value of equity, such as the debt-equity ratio, is meaningless.

Forecasting

We often examine trends in ratios and other financial data to predict the future, forecasting the future based on historical trends. For example, we may extrapolate a trend in sales or a trend in operating profit. And though this may result in a reasonable forecast for the immediate future, the business environment is very complex and many factors can affect the future performance or conditions of a company. Therefore, we generally develop forecasts using information in addition to the basic trend, such as forecasts of economic and market conditions.

But we need to be careful in predicting the future revenues or income of a company based solely on the past. As companies mature, growth slows and this needs to be considered in making any forecasts. How much does growth slow? It depends on many factors, including industry structure (e.g., degree of competition), changing demographics, and government regulation.

We can also look to analysts' forecasts. We could look to individual analysts' forecasts or look at **consensus forecasts** collected by financial service firms including IBES, Zack's, and First Call. These forecasts are typically in the form of forecasts of earnings per share. This information is reported by many web-based services, including Yahoo! Finance. For example, we can see the consensus forecasts for USX-U.S. Steel, as reported by Yahoo!, which tells us not only whether there was an **earnings surprise** (that is, actual earnings deviated from consensus or expected earnings) for the latest quarter, but the consensus forecast for the next quarter, the next reported fiscal year, and one-year ahead.⁴

⁴ The desire to meet and beat analysts' forecasts of earnings put a great deal of pressure on the management of some companies, resulting in unethical management of reported earnings.

5. Summary

Financial analysis of a company requires a wealth of information. There is so much information available and so much of the analysis can be computerized, that the task of the analyst is to select the appropriate tools, gather the pertinent information, and interpret the information.

Analysis is becoming more important following the recent scandals as investors and financial managers are learning to become more skeptical of accounting information and look more closely at trends in data, comparisons with other firms, the relation between management compensation and earnings, and footnote disclosures. It is not necessarily the case that all of the scandals could have been detected with closer scrutiny, but there were warning signs in the trends and hints in footnotes that should have at least raised the caution flags among analysts.

Table 1: Bond Rating Classifications: Standard & Poor's, Moody's

Standard & Poor's

Investment grade

AAA	Highest quality. Ability to pay interest and principal very strong.
AA	High quality. Ability to pay interest and principal strong.
A	Medium to high quality. Ability to pay interest and principal, but more susceptible to changes in circumstances and the economy.
BBB	Medium quality. Adequate ability to pay, but highly susceptible to adverse circumstances.

Speculative grade

BB	Speculative. Less near-term likelihood of default relative to other speculative issues.
B	Current capacity to pay interest and principal, but highly susceptible to changes in circumstances.
CCC	Likely to default, where payment of interest and principal is dependent on favorable circumstances.
CC	Debt subordinate to senior debt rated CCC
C	Debt subordinate to senior debt rated CCC-
D	Currently in default, where interest or principal has not been made as promised.

Source: Standard & Poor's *CREDITWEEK*, "Long-term Rating Definitions," February 11, 1991, p. 128.

Moody's

Investment Grade

Aaa	Best quality. Smallest investment risk.
Aa	High quality.
A	Upper to medium grade. Favorable investment attributes.
Baa	Medium grade. Adequate ability to pay interest and principal.

Speculative grade

Ba	Speculative. Ability to pay interest and principal uncertain in the future
B	Lack of desirable investment characteristics. Likelihood of paying interest and principal in the future is small.
Caa	Poor standing. May be in default or other problems with respect to payment of interest and principal.
Ca	Very speculative. May be in default
C	Poor prospects of becoming investment standing

Source: Moody's *Industrial Manual*, "Key to Moody's Corporate Bond Ratings," 1991, pp. vi-vii.