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Financial Statement Analysis

Second Edition

George Foster

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PREFACE

This book provides an intensive study of financial statement analysis, seeking to describe and explain:

- The demand and supply forces underlying the provision of financial statement data,
- The properties of numbers derived from financial statements,
- The key aspects of decisions that use financial statement information, and
- The features of the environment in which these decisions are made.

The perspective adopted is that readers who have a solid grasp of these four factors are in a strong position to exploit the richness of the information contained in many financial statements as well as to appreciate fully the limitations of that information.

Two key features of the first edition that were received with much enthusiasm by reviewers and adopters of the text were the explicit linkage to the research literature and the emphasis placed on empirical evidence. Both features have been retained in this edition. Each chapter contains much discussion of and many references to research on the topics covered. At the end of each chapter is a section titled "Some General Comments" that includes discussion of unresolved issues in existing research, analysis of future research directions, or discussion of individual studies. One objective of this book is to increase the reader's appreciation of the important role that research has played and will continue to play in the analysis of financial statement information.

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THE DEMAND FOR FINANCIAL STATEMENT INFORMATION

sum of the following calculations:

> 10% of profits above the minimum 2.3% return on sales, but below a 4.6% return on sales;
>
> plus 12.5% of profits above a 4.6% return on sales but below a 6.9% return on sales;
>
> plus 15% of profits above a 6.9% return on sales.

Note that the payouts are cumulative—i.e., each step of the calculation is added to the next step—and that the profit sharing percentages increase as the return on sales increases. To illustrate:

Assume:

Profits	= $1.8 billion
Sales	= $36 billion
Return on Sales	= $1.8 billion/$36 billion
	= 5.0%

Minimum Return:

$$.023 \times \$36 \text{ billion} = \$828 \text{ million}$$

Total Profit Share:

.10 × (.046 × $36 billion − .023 × $36 billion)	= $ 82.8 million
plus .125 × ($1,800 million − $1,656 million)	= $ 18.0 million
	$100.8 million

Profits represent the earnings of all of Ford's U.S. operations with two exceptions: Ford Aerospace (including a new sister subsidiary, Ford Electronics and Refrigeration Corporation) and Ford Land.

> Profits are measured before income taxes in the case of consolidated manufacturing operations, and after income taxes for unconsolidated non-manufacturing subsidiaries such as Ford Motor Credit. Profits are also calculated before supplemental compensation payments to Ford executives, profit sharing payments under this and all other profit sharing plans, extraordinary items of income or expense, and gains or losses from the disposal of operations.
>
> Sales are for the same U.S. operations covered by the profits definition, except that revenues from unconsolidated subsidiaries are excluded from the calculation.
>
> All of the calculations and underlying sales and profit data are to be certified by a firm of independent certified public accountants. Ford is also required to respond to requests from the Union for information supporting such calculations.[2]

In this case, employees of Ford (or their representatives) clearly have a vested interest in monitoring financial statement-based variables such as profits and sales.

D. Lenders and Other Suppliers

In the ongoing relationship that exists between suppliers and a firm, financial statements can play several roles. Consider the relationship between a firm and the suppliers of its loan capital, for example, a bank. In the initial loan-granting stage of the relationship, financial statements typically are an important item. Indeed, many banks have standard evaluation procedures that stipulate that in-

and (3) had been incurring excessive maintenance costs (costs "well above those of other southern railroads and far above the average for the country as a whole"). The Court restated the earnings of Central of Georgia and required it to make retroactive interest payments to the income bondholders.

Contracts between individual parties in some cases explicitly recognize the ability of one party to appropriate wealth from other parties. As noted earlier, lenders typically include covenants in loan agreements that restrict the ability of the borrower to make decisions that can significantly reduce his or her ability to repay the loan principal and accrued interest. As a second example, consider the employee profit sharing agreement signed in 1982 between the UAW and Mack Trucks Inc. (a 41-percent-owned subsidiary of Renault, the French automobile maker). The agreement stipulated that profits are for continuing operations, specifically excluding profits or losses from discontinued operations. The agreement also stipulated that Mack Trucks' profits from U.S. operations were to be calculated before any corporate administrative expenses assessed by its parent. The effect of these stipulations is to restrict the ability of the management of Mack (and Renault) to reduce the reported profits of Mack via charges associated with discontinued operations or via an increase in the corporate administrative expense charged to the Mack operation.

The existence of conflicts of interest does not mean that each party necessarily will take actions that disadvantage other parties. For instance, conflicting parties first may seek ways to make their interests congruent. However, at an empirical level, a model predicting that individual behavior will be guided by vested self-interest appears to have considerable explanatory power (especially relative to competing models). The advice given by an Australian state premier (Jack Lang) to a (then) novice politician is of interest in this regard: "In the race of life always back self-interest . . . you know it will be trying."

1.4 FACTORS AFFECTING DEMAND FOR FINANCIAL STATEMENT INFORMATION

The demand for financial statement information is derived from the improvement in decision making or monitoring that arises with its use. Factors that determine whether such an improvement is expected to occur include (A) the potential of the information to reduce uncertainty and (B) the availability of competing information sources.

A. Potential of the Information to Reduce Uncertainty

An important element in many decisions is uncertainty. For instance, there may be uncertainty over the future profitability of a firm, the quality of its management, or the ability of a supplier to fulfill obligations under a warranty agree-

are the source with the most consistently high ranking of importance. Panel B of Table 1.1 reports the rankings for ten items included in annual reports. The income statement is the item with the most consistently high ranking of importance.

The reliability of inferences drawn from such studies about the demands of individual participants is contingent (in part) upon how severe the methodological problems with survey research are perceived to be. For instance, non-response bias is a common problem; see Stinchcombe, Jones, and Sheatsley (1981); Kalton (1983); and Omura (1983). The response rates in the Chang, Most, and Brain (1983) study ranged from 21.3% for U.K. individual investors to 43.4% for N.Z. financial analysts. The setting in this study was hypothetical; no costs were associated with the provision of information from the various sources and the incentives of individual respondents to misrepresent their preferences were not explicitly considered. The approach adopted in this book is that, notwithstanding these limitations, such survey research can be a useful part of a broader research program into the demand for financial statement information by the diverse parties discussed in Section 1.2.

2. Differential disclosure arises when there are differences in the content (or timing) of information provided to individual recipients. Examples include

- Major lenders receiving information that is more detailed and updated more frequently than that provided to shareholders
- Bond rating agencies being provided with more details about individual product profit margins than is disclosed in annual reports
- Venture capitalists receiving more details about new product development and research and development projects than is disclosed to other external parties.

Part of the information given "private" or "selective" distribution to these parties may result in a competitive disadvantage if given wider distribution; for example, the public disclosure of R&D budgets by a high-technology start-up company could enable competitors to use this information to better target their own R&D budgets. By selectively disclosing this information to only a subset of parties, the firm is attempting to gain the benefits of increased disclosure (access to more capital or borrowing at a lower rate) while reducing the costs (competitive disadvantage) associated with unrestricted disclosure to all parties. (A useful introduction to the economics literature in this area is in Grossman, 1981).

One important benefit from recognizing the existence of "private" or "selective" disclosure is that the decision/actions of parties receiving such disclosures themselves can be informative. Consider the following:

- A decision by a rating agency to assign a rating higher than the expected rating, given its annual report disclosures
- A decision by a venture capitalist with a long and impressive track record to invest heavily in a new venture.

Eastern Airlines, a major U.S. airline. Table 1.2 presents selected financial statement data over the 19X1–19X10 period. (Salaries, wages, and benefits were only disclosed in the 19X6–19X10 period.) After the net loss of $89 million in 19X2, employees agreed to a voluntary wage freeze that saved the company $32 million in 19X3. In 19X4 Eastern proposed a variable earnings program (VEP). Under this plan, "all employees subject 3.5% of their earnings to the achievement of a corporate profit target equal to two cents on the revenue dollar." The 3.5% of wages withheld would be returned (with a bonus) to employees at year's end if the profit target was achieved through normal operations. VEP was a five-year undertaking, and on July 1, 19X4, with the majority of representatives of organized labor agreeing, it was implemented.

In its 19X4 Annual Report, Eastern reported that "the Company's wage and salary expense was approximately $6.0 million less than it would have been had VEP not been in effect"; no VEP payment was made to employees that year. In its 19X5 Annual Report, Eastern noted

> Employees participating in our innovative VEP and profit-sharing plan shared in (our) good return. The Company not only paid out the 3.5 percent of base salaries placed under VEP toward our minimum profit goal of 2 cents on each sales dollar, but also paid an additional 1.2 percent in VEP incentive payments.

In 19X5 wage and salary costs were $9.8 million more because of VEP. In the 19X6–19X9 period, Eastern did not make any VEP payments. It reported that VEP reduced wage and salary costs by $22.8 million in 19X6, by $37.3 million in 19X7, by $40.6 million in 19X8, and by $37.7 million in 19X9. The 19X9 Annual Report stated that "The Company has reached a tentative agreement with the International Association of Machinists and Aerospace Workers (the IAM) to terminate VEP and to create an alternative program involving the borrowing by Eastern of amounts withheld and repayment thereof with interest at a rate not in excess of 10 percent per annum."

TABLE 1.2 Eastern Airlines: Selected Financial Data ($ Millions)

Financial Item	*19X1*	*19X2*	*19X3*	*19X4*	*19X5*	*19X6*	*19X7*	*19X8*	*19X9*	*19X10*
Operating revenues	$1,530	$1,624	$1,826	$2,036	$2,380	$2,629	$3,152	$3,387	$3,406	$3,608
Salaries, wages, and benefits	N.D.	N.D.	N.D.	N.D.	N.D.	1,131	1,274	1,347	1,386	1,574
Operating profit (loss)	71	2	78	34	97	111	2	(50)	(19)	(100)
Interest expense	66	51	41	40	75	84	110	141	178	236
Income before extraordinary items	9	(54)	34	35	67	58	(42)	(66)	(75)	(184)
Net income (loss)	12	(89)	45	35	67	58	(17)	(66)	(75)	(184)
Total assets	1,407	1,290	1,301	1,244	1,909	2,453	2,816	2,935	3,225	3,758
Shareholders' equity	340	251	299	384	441	441	435	350	255	177
Market capitalization	62	81	166	122	211	193	182	146	192	233
S&P 500 Index	67	89	107	94	95	107	134	122	139	164

N.D. – Not disclosed.

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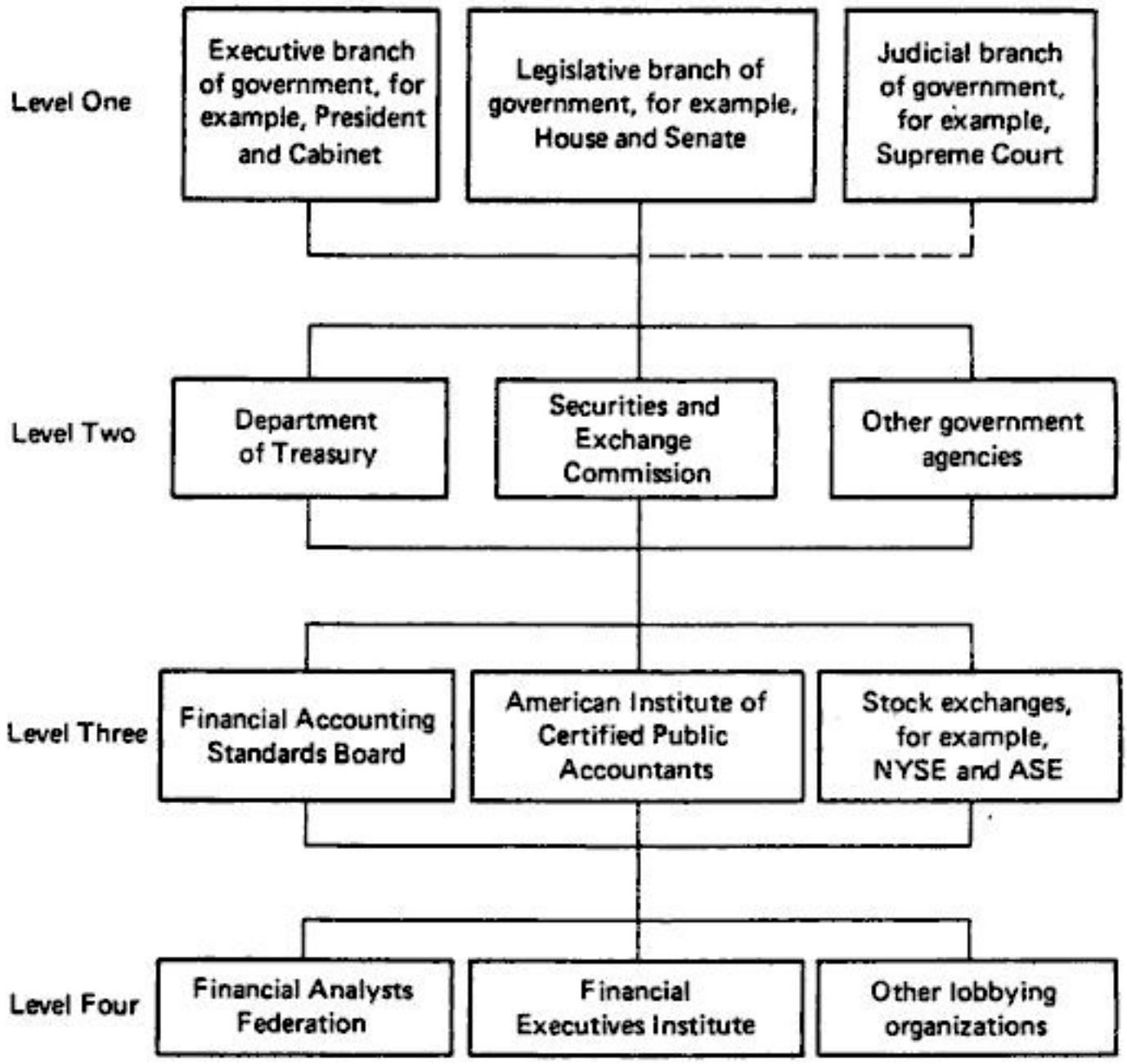

FIGURE 2.2 Institutional Framework Governing Financial Reporting in the United States

have the ability to recentralize this power. The investment tax credit scenario in the 1970s illustrates this observation. Congress instituted the investment tax credit to stimulate investment in capital assets. The two main accounting alternatives for the investment tax credit are the deferral method (the tax benefits affect reported income over the life of the purchased asset) and the flowthrough method (the tax benefits affect reported income in the year the asset is purchased). In October 1971, the Accounting Principles Board (APB)—the private sector body that preceded the FASB—issued an exposure draft supporting the deferral method. Horngren (1972) provides the following details on the chain of events:

> 1. The APB did not issue its exposure draft of October 22, 1971, until receiving two written commitments. The SEC said it would support the APB position, and the Department of the Treasury indicated that it "will remain neutral in the matter."
>
> 2. The Senate Finance Committee issued its version of the 1971 Revenue Act on November 9. In response to lobbying, the Committee clearly indicated that companies should have a free choice in selecting the accounting treatment of the new credit.

state insurance commissioners. These principles—termed statutory principles—differed from GAAP in two main respects:

1. Costs of writing new policies were expensed in the first year of the policy rather than being amortized over the life of the policy.
2. The interest rate assumptions used in computing policy reserves were below the returns insurance companies earned on their investments.

Prior to 1973, various bodies (for example, Standard & Poor's and A. M. Best) adjusted the statutory earnings of life insurance companies for differences (1) and (2) noted above. The resultant earnings numbers—termed adjusted earnings—were provided to subscribers of the investment services of these firms. Since 1973, however, these bodies have stopped reporting their own adjusted earnings estimates. They now report the GAAP numbers provided in the annual reports of insurance companies. Thus, the effect of the 1973 life insurance reporting requirements has been to transfer the source of (and presumably the costs of preparing) GAAP earnings numbers from several information intermediaries to life insurance companies.

2.3 EVIDENCE OF VOLUNTARY OR NONREGULATORY MANDATED DISCLOSURES

There are many pieces of evidence to suggest that factors other than regulatory mandates influence the supply of financial statements. Consider the following:

1. Financial statements were publicly released by firms well before the formation of the major regulatory forces currently influencing financial reporting. The SEC was formed in the 1930s. Private sector bodies associated with the accounting profession are a product of the twentieth century. Yet, financial statements dating back to the eighteenth and nineteenth centuries exist for some U.S. firms. For instance, the Bank of New York issued a "Statement of Condition" as early as 1784. As a second example, the annual reports issued in the nineteenth century by U.S. railroads were especially detailed. The 1874 Annual Report of the Atchison, Topeka, and Santa Fe Railroad Co. was 49 pages in length and included a balance sheet, an annual income statement that reported monthly earnings and operating expenses by activity (passenger, freight, mail, express, and miscellaneous), an auditor's report, and an "estimate of earnings and expenses for fiscal year 1875." More comprehensive evidence on voluntary disclosure prior to regulatory mandates is in Benston (1969) and Morris (1984).

2. Financial statements are voluntarily issued by entities not under the jurisdiction of the SEC. For instance, Days Inns of America, Inc., is a privately held company operating in the lodging industry. Each year since 1976 it has vol-

put into place to monitor their actions may not be hired, or if they are hired, they may be paid a relatively low salary. A manager who perceives that he or she has the ability to increase the market value of the firm significantly may be willing to accept a contract that restricts his or her main sources of discretionary compensation to those items where there is congruence between the manager's interests and those of the shareholders. Labor market forces can arise from both external sources (for example, via changes in the marketability of executives to other firms) and internal sources (for example, via changes in promotion prospects, salary, and perquisites).

The mechanisms available to monitor management include financial statements and third-party certification (for example, by an independent auditor) of those statements. Third-party certification is likely to be viewed by the external labor market as increasing the reliability of inferences drawn from financial statements about the quality of management. Higher-quality management has an incentive to institutionalize mechanisms that facilitate their being distinguished in the labor market from lower-quality management. Where third-party certification is mandated, higher-quality management may have an incentive to add additional monitoring bodies, for example, an audit committee of its board of directors.

C. Corporate Control Market Forces

Managers appear to value very highly their ability to control the financing, investment, and operating decisions of firms. Attempts by external parties to take this control from existing management often encounter stiff opposition. The financial press contains many examples of (1) takeover battles between existing management and an unfriendly suitor or (2) proxy fights between a coalition of the existing management and a subset of shareholders vis-à-vis another subset of shareholders. One tactic that managements can use in such battles (or in an attempt to preempt such battles) is to release financial information that they perceive will increase the likelihood of their retaining control.

Two examples illustrate this factor. One example concerns the release of information pertaining to the market values of individual assets owned by the firm. The following disclosure was made at an annual meeting of South Australian Brewing Holdings:

> Last year I made reference to the existence, at that time, of a certain amount of speculative comment to the effect that "The Brewing Company was about to be taken over." . . . I reported that the directors intended to take steps to determine, as nearly as practicable, the present value of the Group's freehold properties and the plant and equipment used in its modernised and expanded Southwark Brewery.
>
> A detailed examination of the factors relevant to making such an assessment was duly carried out by senior members of the Group's professional staff. . . . This information enabled the directors to present this year's Balance Sheet on a much more informative basis. . . . The Group's shareholders' funds (are now) shown at the much more realistic figure of $91 million, compared with $58.5 million a year earlier.[4]

D. Competitive Disadvantage Costs

A common argument presented against disclosure is the cost incurred when competitors use the disclosures to their own advantage. One sensitive area in this connection is information about research and development and new products. Firms that perceive that they have an advantage over competitors in these areas face difficult decisions when raising new capital. Unless they provide some information pertaining to the R&D or new products, the capital market is less likely to support a new share offering. Yet, if they provide detailed information, they may reduce the lead time with which competitors learn about developments within the company. A second sensitive area is with disclosure of advertising budgets. Schlitz Brewing Company made the following comment at an annual meeting: "As a matter of policy, we do not announce advertising budgets in advance because it's information our competitors would like to have." Competitive disadvantage costs can also arise if labor unions and other suppliers are able to use the financial disclosures to improve their bargaining power and hence to increase the relative cost structure of the firm.

The motivations behind disclosure or nondisclosure are diverse, and in some cases the stated motivations appear less than convincing. This is especially true for many appeals to the competitive disadvantage notion. Consider the use of this notion by A. H. Belo Corporation (owner of *The Dallas Morning News*) against a minority shareholder proposal that it become a publicly listed company. A financial newspaper commented,

> The company maintains that publishing information required of public companies by the SEC would put it at a severe competitive disadvantage, since the data would be available to its main competitor, *The Dallas Times Herald*, which is owned by Times Mirror Co., Los Angeles. Belo maintains that because it is significantly smaller than Times Mirror, financial disclosures required by the SEC would reveal too much of its inner workings. Times Mirror owns several major papers and can group its newspaper financial data for reporting purposes. By contrast, *The Dallas Morning News* is the only major newspaper property of Belo.[7]

On at least the revenue side, the Times Mirror Company already can use competing information sources to learn considerable information about *The Dallas Morning News*. This paper is a member of the Audit Bureau of Circulations that publishes very detailed unit circulation figures on *The Dallas Morning News* every six months. The advertising rates of the paper are readily available to an external party in a booklet titled "Retail Advertising Rates." The list of advertising clients is available at the cost of a subscription to the paper. In short, these competing sources of information are considerably more detailed and cover more facts than does the "sales" figure required in the 10-K of a publicly listed company.

Firms in any industry typically have a rich network of information sources on what their competitors are doing. Given this network, it would be difficult to support an argument that increased disclosure of many items in financial reports would cause a major competitive disadvantage. However, several key items could

TABLE 2.2 Median Reporting Lags in Calendar Days for Selected Industries, 1971–1982

SIC Two-Digit Code	*Industry Title*	*Interim Earnings*	*Annual Earnings*
10	Metal/mining	21	31
20	Food and kindred products	19	34
23	Apparel and other finished products	24	45
26	Paper and allied products	15	26
29	Petroleum refining	19	22
33	Steel (primary metal industries)	17	26
36	Electrical and electronic machinery	18	35
40	Railroad transportation	16	19
45	Air transportation	18	28
49	Electric, gas services	19	23
56	Apparel and accessory stores	25	40
60	Banking	11	12
65	Real estate	28	51
70	Hotels/lodging	22	41
78	Motion pictures	27	59

SOURCE: S. Penman, the University of California at Berkeley, unpublished.

industries to report interim and annual results after the end of the fiscal quarter or year. Another finding related to the timing of earnings reports is that reporting lags are longer for small firms than for large firms. Zeghal (1984) reported the following for a sample of 1,402 firms on the NYSE and ASE in the 1973–1975 period:

	Reporting Lag	
Firm Size (market capitalization)	*Median*	*Mean*
Small (less than $20 million)	39	40
Medium ($20 million to $132 million)	30	32
Large (greater than $132 million)	26	28

One explanation Zeghal (1984) offered for this result was "the advantages that large firms enjoy in producing information and particularly financial and accounting information" (p. 308).

Both Chambers and Penman (1984) and Kross and Schroeder (1984) report that goods news and bad news releases are not symmetrically distributed around their expected announcement date. To illustrate, Kross and Schroeder computed

a. *The unexpected timing of earnings releases*. The reporting dates of each firm were used to develop a predicted announcement date for each earnings release. Using this predicted date and the actual announcement date, individual announcements were ranked from the earliest to the latest, where

to external parties. McCormick & Company, a diversified specialty food company, has for some time included such information in its annual reports. Objectives pertaining to at least nine variables have been reported in one or more of its annual reports in the seven-year period (termed 19X1 to 19X7) covered in this question. In 19X7 McCormick had sales of $743 million ($329 million from the grocery products division, $157 million from food service, $131 million from industrial products, $36 million from packaging, and $90 million from international).

Panel A of Table 2.3 summarizes the financial objectives reported in each year of the 19X1–19X7 period. Panel B presents the actual values of all variables (and several additional items) as reported in the annual report for that year in the 19X1–19X8 period. The 19X1 Annual Report noted that "management regularly reviews these objectives to confirm their validity. As conditions change within our business and the investment and capital markets, management may find it advisable to adjust these objectives. . . . Management monitors performance against these objectives on a rolling five-year basis, as well as for each year."

Disclosure of Capital Expenditure Budgets

Each year over the 19X1–19X7 period, McCormick also provided details in its annual reports about projected capital expenditures. The following (in millions of dollars) was disclosed in the respective annual reports:

Disclosed in 19.X Annual Report	*One-Year-Ahead Projection*	*Two-Year-Ahead Projection (Aggregate)*	*Five-Year-Ahead Projection (Aggregate)*
19X1	$12	$29	$ 76
19X2	9	29	84
19X3	24	51	109
19X4	17	N.D.	105
19X5	19	N.D.	120
19X6	42	N.D.	N.D.
19X7	26	N.D.	N.D.

N.D.–Not disclosed in that year's Annual Report.

The actual capital expenditures reported by the company (in millions of dollars) were

19X2	*19X3*	*19X4*	*19X5*	*19X6*	*19X7*	*19X8*
$14	$18	$25	$26.5	$22.4	$37.2	$31.3

When making the projections in 19X1, McCormick noted that "the largest amount of the expenditures over the next five years will be allocated to the Food Service/Industrial Sector." In 19X2, McCormick broke up the $84 million projected five-year capital expenditures into $27 million to grocery products, $46 million to food

in writing, to have the forecast lowered, but we were unable to have the number reduced in a meaningful manner.

This repeated excess of enthusiasm on the part of the investment community tended to create several problems for Allen's management and for its stockholders. In a rather curious way, our management's refusal to discuss earnings, instead of focusing a concentration on the more fundamental issues, seems to have discouraged it. Embarrassed by their beginning-of-the-year optimism, some analysts have asked management, "Why are you falling short of our estimate of earnings?" instead of focusing their attention on the dramatic progress that has been made in many areas. Unhappily, because forecasts are a convenient yardstick, many stockholders have used the overly optimistic forecasts of others as a measure of the company's progress. We also have found a few instances where individuals refused to acknowledge the source of these forecasts, with the result that management has been questioned anyway, notwithstanding continuing gains in sales, earnings and return on equity.

For the stockholder, the impact has been felt in three ways. First, to the extent that excessive earnings forecasts have interfered with a proper communication of Allen's progress, stockholder values have undoubtedly suffered.

Second, bullish forecasts, in certain instances, have had an effect on short-term stock price movements that has clearly operated to the disadvantage of many Allen stockholders. Following the $2-per-share investment advisory service forecast mentioned earlier, for example, the number of trades and number of shares traded of Allen stock quadrupled, and in a nine-day period, the stock moved from the low $20s to $30—a price change of approximately 40%. Similarly, when the same service reversed its position some months later, our stock trading again increased dramatically and the price dropped sharply. In this rapid up-and-down movement, many stockholders were undoubtedly abused.

Finally, all stockholders have not had access to the same information at the same time because independent forecasts usually reach only a small portion of the total group. A recent study by the Financial Analysts Federation asked whether all investors had access to forecasts on a timely basis. Results of the study showed that 57% of the analysts have access to outside forecast information while only 14% of investors are able to obtain this information.

Table 2.4 presents the EPS forecasts made by The Allen Group over the 19X5–19X15 period. The company has a December 31 fiscal year end. Table 2.4 also presents additional data from the annual report of each year.

With the exception of years 19X7, 19X14, and 19X15, all initial forecasts for each year were released in March. In March 19X7, the company noted:

> The present economic environment, with its great uncertainties as to GNP levels, auto and truck production, inflation, consumer spending and government anti-recession and energy policies, has made accurate forecasting impossible.

The $0.78 forecast for 19X7 was issued on August 4.

In March 19X14, the company included the following in its "Special Report to Stockholders."

> We continue to believe that our forecasts are beneficial to stockholders. . . . However, we recognize there are times, such as those we are currently experiencing, when external conditions are so unsettled and unclear that a meaningful forecast is not

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3.1 INTRODUCTION

Financial statement analysis includes the study of relationships within a set of financial statements at a *point in time* and with trends in these relationships *over time*. This chapter outlines several techniques that have been developed for these tasks. In subsequent chapters, further analysis of these and other techniques is presented. Financial statement and other information relating to G. Heileman Brewing Company and three other U.S. brewing companies will be used to illustrate these techniques.

The U.S. brewing industry, as of 1984, included six companies that accounted for over 90% of U.S. sales—Anheuser-Busch, Miller Brewing, Stroh Brewing, G. Heileman Brewing, Adolph Coors, and Pabst Brewing. Of these six companies, Heileman experienced the most rapid growth rate in the 1964–1983 period. A major part of this growth came from the acquisition of other brewing companies and the acquisition of the brands or plants of other brewing companies. In this chapter the financial statements of Heileman will be compared with Busch, Coors, and Pabst. All four are publicly held companies with at least 80% of their sales from brewing activities. (Miller Brewing is a subsidiary of Philip Morris and accounts for less than 25% of the sales of Philip Morris. Stroh Brewing is a privately held company.)

Many comparative financial statement exercises of the kind presented in this chapter access computerized data bases rather than the actual annual reports of the companies examined. The appendix to this chapter discusses issues that arise when using computerized data bases.

3.2 CROSS-SECTIONAL TECHNIQUES

Two frequently discussed cross-sectional techniques of financial statement analysis are (A) common-size statements and (B) financial ratio analysis. This section illustrates the use of these techniques in the analysis of Heileman vis-à-vis Busch, Coors, and Pabst.

A. Common-Size Statements

One impetus to the development of the common-size statement came from the problems in comparing the financial statements of firms that differ in size. Suppose that Company A (Heileman) has long-term debt of $95.719 million and that Company B (Pabst) has long-term debt of $76.810 million. Due to possible size differences between the two companies, it would be misleading to always infer that A was more highly leveraged than B. One way of controlling for size

TABLE 3.3 Liquidity Ratios, 1983

	Heileman	*Busch*	*Coors*	*Pabst*
$\frac{\text{Quick assets}}{\text{Current liabilities}}$	.43	.69	1.10	.29
$\frac{\text{Current assets}}{\text{Current liabilities}}$	1.30	1.24	2.08	.93

Brewing Industry Ratios. Table 3.3 presents the 1983 quick and current ratios of the four brewing companies. The only change from the inferences drawn previously is that the liquidity rankings of Busch and Heileman are switched when the current ratio is used; this is in part due to the relatively high inventory holdings of Heileman, causing its current ratio to exceed its quick ratio by a sizable amount.

The use of different asset and liability valuation methods across firms means that a less than literal interpretation of the numerical magnitude of each firm's current or quick ratio is appropriate. Consider inventory valuation methods. While all four brewing companies use the "lower of cost or market" method, they differ with regard to the methods used to determine cost:

Heileman: LIFO (last in, first out) 49%, FIFO (first in, first out) 51%
Busch: LIFO for brewing inventories, FIFO for food inventories
Coors: LIFO
Pabst: Moving average basis

The effect of using alternative valuation rules is sometimes reported in the footnotes or supplemental disclosures included in annual reports. For instance, each of the four firms reports the current cost of inventories in its supplemental disclosures (as required by *FASB Statement No. 33*). Using these data, the current ratio can be computed using a consistent inventory valuation method across all four companies:

	Heileman	*Busch*	*Coors*	*Pabst*
Current ratio (historical cost for inventory)	1.30	1.24	2.08	.93
Current ratio (current cost for inventory)	1.35	1.39	2.43	.93

The effect of using current cost for inventories is to change the ranking between Heileman and Busch on the current ratio. Busch now has a higher current ratio than does Heileman; the difference, however, appears minimal.

Working Capital/Cash Flow

Increasing attention is being paid to the cash-generating ability of firms. While most firms do not directly report cash flow information in their annual reports, inferences about cash flow can be gained by adjusting the reported net income figure for the noncash items in its computation. Table 3.4 presents a set

financing transactions so that they do not give rise to liabilities as defined by the FASB's (SEC's, etc.) existing rules.

Brewing Industry Ratios. The two capital structure ratios for the four brewing companies are reported in Table 3.6. Deferred taxes are treated as part of shareholders' equity when computing these ratios. Both Heileman and Busch have capital structures that are between the extremes of Pabst (which relies very heavily on debt financing) and Coors (which relies only on outside financing for current liabilities). The amount of lease financing reported in the annual reports of these four companies is relatively minor.

Debt Service Coverage

Debt service coverage refers to the ability of an entity to service from its operations interest payments that are due to nonequity suppliers of capital. Two ratios useful in making inferences about coverage are

- $\dfrac{\text{Operating income}}{\text{Annual interest payments}}$
- $\dfrac{\text{Cash flow from operations}}{\text{Annual interest payments}}$

Operating income typically is calculated as revenue less cost of goods sold and marketing and general administrative expenses (and, in the case of brewing companies, less excise taxes). Annual interest payments in both financial ratios refer to the interest payments made to the nonequity suppliers of capital (irrespective of whether the borrower expenses or capitalizes those interest payments). The higher these ratios, the greater the ability to service interest payments to external parties. Debt service coverage ratios can be based on interest payments to external loan capital providers, or they can be extended to include payments to other providers of capital, for example, by including payments on leasing contracts in the denominator of the two coverage ratios.

Brewing Industry Ratios. Table 3.7 presents the foregoing two financial ratios for the four brewing companies. Given Coor's corporate policy of minimal long-term debt, computation of coverage ratios for that company provides limited insights. (Chapter 4 discusses computation and interpretation issues arising with

TABLE 3.6 Capital Structure Ratios, 1983

	Heileman	*Busch*	*Coors*	*Pabst*
$\dfrac{\text{Long-term liabilities}}{\text{Shareholders' equity}}$	.32	.36	.01	1.55
$\dfrac{\text{Current and long-term liabilities}}{\text{Shareholders' equity}}$	.78	.64	.19	3.46

mental current cost disclosures (from *FASB Statement No. 33*) can be used:

	Heileman	*Busch*	*Coors*	*Pabst*
	LIFO 49% FIFO 51%	LIFO 75% FIFO 25%	LIFO 100%	Moving average
Historical cost	8.97	13.56	7.27	8.54
Current cost	8.26	10.28	4.88	8.54

The decline in turnover, when inventory is valued at current cost, is most marked for the two companies using LIFO as the primary valuation method (i.e., Busch and Coors). Pabst reports the same inventory figure for both historical cost and current cost, and hence both show the same inventory turnover ratio.

3.3 TIME-SERIES TECHNIQUES

This section illustrates the use of trend statements and financial ratios to gain insight into a firm's performance over time.

A. Trend Statements

Constructing trend statements involves choosing one year as a base and then expressing the statement items of subsequent years relative to their value in the base year. As a convention, the base year is given a value of 100. Consider the sales item in successive income statements of Heileman (in millions of dollars):

1980	*1981*	*1982*	*1983*
$840.784	$931.940	$1,000.567	$1,325.632

Choosing 1980 as the base year, the 1981 sales item in the trend statement becomes 110.8: ($931.940/$840.784) × 100.

Trend statements for selected items in the income statements of Heileman over the 1980–1983 period are presented in Table 3.10. Also presented in trend statement format is the number of barrels of beer sold each year by Heileman. One feature apparent from Table 3.10 is that marketing, general, and administrative expenses have increased at a faster rate than have both sales and cost of goods sold. Total beer sold by all companies in the 1980–1983 period has been relatively constant (flat?); total U.S. consumption in barrels increased less than 4% in this period (see Table 3.13). Increased marketing is one means that Heileman has used to increase its market share. A second feature apparent from Table 3.10 is that dollar value of beer-related sales has increased 62.8% over the 1980–1983 period, whereas the number of barrels of beer sold has increased only 32.2%. By

period. In this period of relatively constant total consumption, Busch has increased from 28.2% to 32.9% share of the market while Heileman has increased from 7.5% to 9.5% share of the market. The other four major brewing companies have each decreased in market share over the 1980–1983 period as has the share held by other companies (e.g., Falstaff Brewing, Genesee Brewing, and Pittsburgh Brewing).

Another use of barrelage information is expressing the operating profits on a per-barrel basis. For companies with nonbrewing activities, operating profit information from line-of-business disclosures in annual reports rather than from the consolidated income statement is appropriate for this computation:

1983 Operating Profit per Barrel

Heileman	*Busch*	*Coors*	*Pabst*
$5.93	$10.74	$10.84	$1.07

These figures document the sizable differences across brewing companies in their relative operating profits. (Further discussion of factors to be considered in using line-of-business information can be found in Chapter 6.)

In other industries, product market information also can be important in the financial analysis of corporations. For example, the room occupancy rate is the key variable in the lodging industry. A similar statistic in the airline industry is the load factor (percentage of available seats occupied). Given the sizable fixed costs in both these industries, increases in occupancy rates/load factors above break-even points can result in large percentage increases in net income.

B. Capital Market Information

Capital markets access a broad set of information. By examining changes over time in market capitalization (market price per equity share × number of common shares outstanding), insight can be gained about changes in the consensus expectation of the relationship between future and current profitability. The price-to-earnings (PE) ratio is a frequently used figure in this analysis:

$$\bullet\ \frac{\text{Market capitalization of equity shares}}{\text{Net income available to common}}$$

Other things being equal, the higher the price-to-earnings ratio, the higher the expected future income relative to the current reported income. Table 3.14 presents price-to-earnings ratios for the four brewing companies over the 1980 to 1983 period; the market price per share as of December 31 for each year is used as the numerator. Chapter 12 discusses two alternative scenarios for companies with high price-to-earnings ratios in a single year (such as Pabst's 1982 ratio of 63.83): (1) current reported income is temporarily depressed, or (2) growth in the future income series over several subsequent years is expected. (PE ratios are

a sample of 141 *Fortune* 500 companies, the ratios cited by each company were noted. Focusing on 11 of these ratios, Williamson found that for eight, the citing and nonciting firms had values that statistically were not significantly different. For the three with significant differences (return on equity, current ratio, and return on sales), firms citing them had higher values than those not citing them in their annual reports. The conclusion was that "selective reporting by *Fortune* 500 companies does occur for some ratios" (p. 298). In a related study of 25 annual reports, Frishkoff (1981) concluded that "if a ratio was 'good' or had 'shown improvement,' reference at least in the CEO letter was far more likely" (p. 46). This evidence about selective reporting by firms is far from overwhelming. However, it underscores the necessity for users of annual reports to be ever alert to the possibility that the "vested self-interest" of management can affect either the content or the timing of financial disclosures made to external parties.

5. Several questionnaire-based studies have examined the relative importance managerial respondents give to individual financial ratios and/or variables. A representative study is Walsh (1984), where "the primary purpose was to learn the preferences of a representative group of chief executive officers and other senior executives concerning the ratios and other financial indicators that they use regularly for various types of decision making" (p. 3). Questionnaires were sent to the CEOs of 500 of the *Fortune* 1000 industrial companies and 50 firms in service industries. A total of 101 usable survey responses was received. Respondents were asked to note the "decision-making activities" in which individual ratios were used. These activities were grouped into the following categories:

- Planning, budgeting, and goal setting (PBGS)
- Evaluating investment proposal (EIP)
- Appraising performance of managers and units (APMU)
- Awarding incentive compensation (AIC)
- Other

Table 3.15 summarizes a subset of the responses. Ratios relating to return on investment were the most frequently mentioned by the respondents. Executives were also asked to rank individual ratios and/or variables in terms of overall importance in their decisions. Walsh (1984) concluded that based on "the number of times that each indicator was ranked first in importance, return on investment and absolute net earnings receive the most such mentions" (p. 11). Gibson (1982a) also used a questionnaire approach when surveying the opinions of the controllers of companies listed in *Fortune*'s 500 largest firms. The conclusion was that "financial officers rated profitability ratios as the most significant" (p. 19).

Due to the many methodological problems associated with questionnaire-based research, considerable care needs to be taken when drawing inferences from these and similar studies. A specific limitation is that neither questionnaire elicited responses about how financial ratios are used in specific management decisions. Both studies, however, do highlight that internal management is an

(2) the inclusion of the data in the summary data base, or (3) its provision to clients. The result is that the data base will not contain the most recent data for each firm. Note that the increasing availability of on-line data bases is reducing delays due to restriction 3.

Data Base May Exclude Items for Firms Included

The available standardized computer data bases typically include only a subset of the information in a firm's annual report, its interim report, or its other disclosures. Items that are more likely to be excluded are those for which there are only a subset of firms disclosing (e.g., earnings forecasts included in an annual report) or for which the presentation of a standardized format is difficult (e.g., details of bond covenant restrictions).

A related problem occurs when data bases have a single coding category that is insufficient to capture the information in the underlying annual or interim report. Consider a coding for the inventory valuation method (e.g., FIFO = 1, LIFO = 2, average cost = 3, etc.) of the following three firms: Firm A (100% LIFO), Firm B (51% LIFO, 49% FIFO), and Firm C (34% LIFO, 33% FIFO, 33% average cost). All three would be coded in the data bases as LIFO inventory firms. The inventory coding in most data bases typically is for only the major inventory method. Inevitably there will be a loss of information when firms with multiple inventory methods are given a single coding.

Data Base May Classify Financial Statement Items Inconsistently Across Firms

This limitation can arise from several sources. One source is that not all firms adopt a consistent set of financial statement categories in their annual or interim reports; for example, Firm A reports cash separately from marketable securities while Firm B reports cash and marketable securities as one item. Individuals constructing data bases typically will have a standard set of rules for treating these problems; for example, they will include Firm B's marketable securities in the cash category with 0 reported for its marketable securities category.

A second source of inconsistency arises from differences across firms in the classification of items. For example, Firm A includes overhead expenses in the "cost of goods sold" category while Firm B includes overhead in its "marketing, general, and administrative expense" category. Often there will be insufficient information for an outside party to place A and B on a uniform treatment of overhead expenses.

Data Base May Contain Recording Errors

Recording errors are inevitable in the construction of any large financial statement data base, for example, due to numbers being entered incorrectly or

REQUIRED

1. The letter from Scurfield refers to the following profitability measures:
   a. Net income to revenues
   b. Net income to average shareholders' equity
   c. Net income to average total assets

   Compute these ratios for Nu-West over the 19X7–19X10 period.
2. In reporting Nu-West's 19X10 net margin on revenues of 3.7%, Scurfield used the $15.1 million figure for the numerator (item 8 in Table 3.16). What arguments could be advanced for using this figure rather than the 19X10 net income figure of $27.1 million?
3. Do you agree with Scurfield that "because of the highly leveraged nature of the development business, more appropriate tests for examining the performance of the development industry are return on assets and margin on operations"? Give reasons.
4. The Greenspan report referred to by *The Calgary Herald* used pretax profits. In his letter, Scurfield used after-tax profits. What are the pros and cons of using either measure when examining profitability?
5. What consequences might ensue if politicians decide that Nu-West and other land developers are earning excessive profits?

QUESTION 3.2: Financial Statement Analysis of General Foods and General Mills

General Foods and General Mills are two large consumer food companies. Table 3.17 summarizes information from their successive annual reports over the 19X1–19X5 period; these data are "as reported" for each year. General Foods classifies its lines of business in 19X5 as packaged grocery products (44% of sales), grocery coffee (27%), processed meats (18%), and food service and other (11%). General Mills classifies its lines of business in 19X5 as consumer foods (49% of sales),

TABLE 3.17 Financial Data of General Foods and General Mills (in millions of dollars)

	General Foods					*General Mills*				
	19X1	*19X2*	*19X3*	*19X4*	*19X5*	*19X1*	*19X2*	*19X3*	*19X4*	*19X5*
Assets										
1. Cash and marketable securities	$ 178	$ 309	$ 163	$ 285	$ 277	$ 39	$ 39	$ 33	$ 58	$ 66
2. Accounts receivable	669	759	900	938	906	374	391	409	468	551
3. Inventories	1,003	904	1,124	1,035	1,097	543	611	661	633	662
4. Prepaid expenses	100	46	67	56	66	30	34	156	199	112
5. Properties, plant, and equipment	931	1,004	1,394	1,546	1,615	747	921	1,054	1,198	1,229
6. Other assets	96	107	213	449	471	279	305	389	388	239
	$2,977	$3,129	$3,861	$4,309	$4,432	$2,012	$2,301	$2,702	$2,944	$2,859

2. How do the results of General Foods and General Mills in the 19X1–19X5 period compare with their published financial goals? Where insufficient information is provided for a specific goal, state this in your answer.
3. Only a small subset of firms publicly discloses specific (numeric) details of their financial goals. What are the pros and cons of voluntarily disclosing this information?
4. Comment on the following argument by Gibson and Boyer (1980, pp. 82–84) for the SEC or FASB to issue authoritative guidelines on the computation and reporting of financial ratios in annual reports:

> Successful financial statement analysis should include the computation and interpretation of financial ratios. . . . There is a need for standard ratios and financial reporting of such ratios. This position is supported by the fact that there are alternative methods of computation, confusion over ratio labels and lack of information for ratio computation. . . . There are clear and misleading inconsistencies in published annual reports in the computing of numerous financial ratios. The lack of uniformity limits the comparability desired in financial statement analysis. . . . The absence of standardization also allows companies to present ratios most favorable to their position.
>
> There should be standard meanings concerning how these ratios were computed. The SEC and the FASB should accept the same role in this area as they do for financial statements in general. Standard meanings of ratios should be determined and selected ratios should be reported as part of the footnotes. An attempt should be made, when feasible, to have all companies report the same ratios. . . . Authoritative guidelines would not restrict statement analysis, but, rather, would enhance this art.

QUESTION 3.3: Financial Magazines, Computerized Data Bases, and Published Financial Statement Information

After several years of service with a well-known financial magazine, you are called into the editor's office. You are to be responsible for the financial surveys regularly included in the magazine. Your predecessor had developed a computerized data base that was updated on a quarterly (or annual) basis. Your name will appear in bold print at the bottom of each of the following surveys:

1. Directory of the Largest 500 U.S. Industrial Companies.
2. Directory of the Largest 500 U.S. Non-Industrial Companies. The current year's issue comprises three 100-company rankings (of the largest diversified financial, diversified service, and commercial banking companies) and four 50-company rankings (of the largest life insurance, retailing, transportation, and utility companies).
3. Directory of the Largest 100 U.S. Private Industrial Companies.
4. Directory of the Largest 100 U.S. Private Non-Industrial Companies.
5. Directory of the Largest 500 Non-U.S. Industrial Companies.
6. Directory of the Largest 500 Non-U.S. Non-Industrial Companies.
7. The 100 Fastest Growing U.S. Companies.

4

FINANCIAL STATEMENT NUMBERS: SOME EMPIRICAL ISSUES AND EVIDENCE

4.3 COMPUTATION ISSUES IN CALCULATING RATIOS

Computation or interpretation problems can arise with financial ratios in a variety of contexts. This section considers problems associated with (A) negative denominators and (B) "extreme" (outlier) observations.

A. Negative Denominators

Assume that an analyst is examining the profitability of firms in an industry and encounters a firm having negative shareholders' equity. The use of this observation as the denominator in the earnings-to-shareholders' equity ratio can result in a ratio that has no obvious interpretation. Various possibilities exist in this context.

1. Delete the observation from the sample. This procedure is frequently adopted. For example, Robert Morris Associates (1983) adopts this procedure when computing the "profit before taxes to tangible net worth" ratio in its *Annual Statement Studies*.
2. Examine reasons for the negative denominator and make subsequent adjustments. For example, if it is due to assets being understated, an asset revaluation can result in the revised estimate of shareholders' equity being positive. (Asset understatement obviously can also exist for firms with positive shareholders' equity. Consistency would argue for revaluation for all firms in the sample.)
3. Use an alternative ratio that captures some aspects of profitability, for example, return on total assets or earnings to sales. Rarely is the denominator in either of these ratios negative.

The advent of computerized financial statement analysis means that analysts typically access the summary ratios rather than the components of those ratios. This situation is not without problems. Consider a computer printout that reports the net income-to-shareholders' equity ratio of Firm X as 16% and Firm Y as 14%. Underlying the 16% and 14% are the following components:

	Firm X	*Firm Y*
Net income	−$4 million	$28 million
Shareholders' equity	−$25 million	$200 million

Clearly, this example illustrates the importance of adding checks in a computer program, where possible, to flag situations such as that for Firm X. (In many data bases, such as Compustat and Value Line, the components are available and these checks can be made.)

whereas the normal distribution will include negative values. A similar example is the total debt-to-total assets ratio, which has both a technical lower limit of zero and a technical upper limit of one. Some financial ratios have economic limits that may result in fewer observations in either the lower or upper end of the distribution than under the normal distribution; for example, firms in the same industry may have fewer observations in the upper end of the distribution of the accounts receivable turnover ratio than under a normal distribution due to common pressure from customers to retain a minimum payment period of at least (say) one month.

What If Normality Is Rejected?

Assume that an analyst decides that a normal distribution is not descriptively valid for the data being examined. The options available include the following:

1. *Impose normality on the data.* This can be achieved by ranking all the observations in the data examined and then converting these ranks to points on a standardized normal distribution. Note that if you use the converted financial ratios to develop a predictive model, data not used in the initial conversion will have to be rescaled according to where they fit on the underlying distribution for the initial sample.
2. *Attempt to transform the data such that a normal distribution assumption is descriptive* (for example, via the use of a logarithmic transformation). Section 4.4 illustrates that use of this transformation does reduce the violations from normality for several financial ratios. When considering this option, it is important to keep in mind the economic meaning of the transformed data. For instance, when the logarithmic transformation is used, the transformed variables give less weight to equal percentage changes in a variable where the values are larger than when they are smaller; that is, there is less difference between a $1 billion- and a $2 billion-size firm than there is between a $1 million- and a $2 million-size firm. An issue that arises with the logarithmic transformation (and several others, such as the square root transformation) is that the distribution is undefined for negative values. One option in this situation is to shift the entire distribution to the right so that all observations are positive. A limitation of this option is that one extreme observation (the most negative) will affect the shape of the distribution imposed on all other observations. A second option when faced with negative observations is to use a transformation for which negative values are defined, for example, the power transformation.
3. *Attempt to impose normality by resetting extreme observations to less extreme values* (this is called winsorizing the data). An example would be to reset all times interest earned ratios below the .02 percentile and above the .98 percentile to the values of the .02 percentile and the .98 percentile, respectively.
4. *Attempt to impose normality by deleting observations that deviate most from normality* (this is called trimming the sample). The Frecka and Hopwood (1983) study described in Section 4.4.D illustrates the use of this

The kurtosis coefficient provides evidence on whether the distribution is more or less *fat-tailed* than would be expected from the normal distribution. For a normal distribution, $Y_4 = 0$. A convenient rule of thumb for suspecting violations from normality is $Y_4 < -1$ or $Y_4 > +1$. A Y_4 of 22.37 is consistent with the debt-to-equity ratio not being well approximated by a normal distribution.

Studentized Range

Another measure of the dispersion is the *studentized range* (S.R.). This statistic is the ratio of the sample range (largest observation minus smallest observation, 51.038 − .065) to the sample standard deviation (7.92):

$$\text{S.R.} = \frac{X_{\max} - X_{\min}}{Y_2} = 6.44 \tag{4.8}$$

This statistic tends to be "large" for fat-tailed distributions. A rule of thumb for suspecting the underlying distribution to have fat tails when using 50 and 100 sample observations is a studentized range greater than 6.0 and 6.5, respectively.

Fractiles of the Distribution

Useful insights into the distribution of a variable can often be obtained from the fractiles of the distribution. Computing such fractiles involves ranking the sample observations from highest to lowest and observing the actual (or implied) values at various percentiles on the distribution. The deciles of the distribution (the .9, .8, . . . , .2, .1 fractiles) of the debt-to-equity ratio are

	Deciles								
	.1	*.2*	*.3*	*.4*	*.5*	*.6*	*.7*	*.8*	*.9*
Debt-to-equity	.17	.34	.50	.74	.98	1.33	2.74	3.70	7.21

The .25 (.44) and .75 (3.14) fractiles are referred to as the lower and upper quartiles of the distribution; the difference between the .75 fractile and the .25 fractile is termed the interquartile range (2.70). As noted previously, the .5 fractile (.98) is the median.

D. Published Evidence on Distributions

A growing number of studies report distribution evidence on financial ratios. Some representative studies are

1. Deakin (1976), who examined the distribution of 11 financial ratios for U.S. manufacturing firms over the 1953–1973 period, for example, current assets-to-sales, working capital-to-total assets, cash flow-to-total debt, net income-to-total assets, and total debt-to-total assets. The conclusion was that "it

Firm Size

24. Total assets, TA
25. Sales, S
26. Market capitalization, MKT. CAP.

The deciles of the distribution for each variable are presented in Table 4.2. Positive/negative skewness is indicated when the difference between the .9 (.8, .7, .6) decile and the .5 decile exceeds/is less than the difference between the .5 decile and the .1 (.2, .3, .4) decile. Several variables exhibit evidence of marked positive skewness, for example, cash position, liquidity, capital structure, debt service coverage, and firm size. The skewness (γ_3), kurtosis (γ_4), and studentized range (S.R.) statistics were also computed for each variable in Table 4.2. For all but 3 (EPS, NI/S, and NI/SE) of the 26 variables in Table 4.2, statistically significant evidence (at the .01 level) of positive skewness was found. For all 26 variables, statistically significant evidence of a fat-tailed distribution was found.

Approaches Available to Reduce Departures From Normality

Section 4.3 discussed several approaches that may reduce the departures from normality. To illustrate these, the effect of using two alternative approaches for the following three financial ratios is presented:

- Current assets/current liabilties
- (Current + long-term liabilities)/shareholders' equity
- Sales/accounts receivable

1. *Trimming the sample*. For illustrative purposes, the top and bottom 1% and 2% of observations were successively trimmed. The results are in Table 4.3. The term "raw ratios" in Table 4.3 refers to the original or nontransformed ratio. Not surprisingly, trimming substantially reduces the observed departures from normality when the full sample is examined.
2. *Transforming the (raw) financial ratios*. Two commonly used transformations for a positively skewed distribution are the natural logarithmic transformation and the square root transformation:

$$T_i^L = \ln(X_i)$$
$$T_i^S = \sqrt{X_i}$$

These results are also in Table 4.3. Both transformations reduce the observed departures from normality when the (raw) financial ratios are examined.

The three ratios presented all have positive observations for each firm in the distribution. For other ratios, firms with negative observations (and zero observations with the logarithmic transformation) would have to be deleted (or recentered) when using the two transformations. For some ratios, a sizable percentage of the distribution falls in this category; for example, approximately 15%

Company	Current Ratio (CR_i)	Quick Ratio (QR_i)	Rank of CR_i	Rank of QR_i	d_i	d_i^2
Genesee	2.285	1.617	1	2	1	1
Falstaff	2.282	1.671	2	1	1	1
Adolph Coors	1.931	1.096	3	3	0	0
G. Heileman	1.298	.429	4	6	2	4
Anheuser-Busch	1.242	.695	5	5	0	0
Pittsburgh	1.040	.757	6	4	2	4
Pabst	.927	.287	7	7	0	0
						10

$$r_s = 1 - \frac{6 \times 10}{7^3 - 7} = .82$$

A Spearman rank correlation of .82 for seven observations is significant at the .05 level.

A high correlation between financial ratios used in a regression model does not necessarily mean that one wants to delete ratios from the model. The regression model might be specified by some theory (for example, of corporate failure), and a model excluding certain specified ratios may not be a test of the descriptive validity of the theoretical model. Note also that techniques have been developed by econometricians to improve the estimation of coefficients when multicollinearity is present; see Johnston (1984, pp. 239–259).

Even if one is concerned with building a parsimonious model, deleting financial ratios from the model is not the only alternative open to an analyst. For instance, a statistical tool such as factor analysis can be used prior to estimating the regression model. This tool aims at capturing the information contained in many variables and representing that information by a smaller number of derived variables; see Green (1978). In some contexts, there need be no requirement that all independent variables be uncorrelated with each other. If the concern is with explaining variations in the dependent variable, then including two correlated ratios may well explain more variation than using either of the ratios as a single independent variable. If the concern is with predicting the dependent variable, including two correlated ratios also can be justified.

B. Time-Series Comovement

Financial ratios are also used to assess changes in the liquidity, profitability, and so on of firms over time. As with cross-sectional tools, the issue arises of how many ratios to examine in such time-series assessments. One approach to gaining evidence on this issue is to examine the extent to which financial ratios move together over time. Consider the current and quick ratios of the seven

The optimal order quantity, when computed by the EOQ model, varies with the square root of periodic demand and not in linear proportion to this demand. The implication of adopting this EOQ model is that the relationship between the numerator and denominator of the inventory turnover ratio is nonlinear.

This EOQ model is but one normative model of inventory choice. It assumes that demand is known with certainty and that management is concerned only with one period ahead. The management science literature is replete with models that vary these and other assumptions. The actual inventory holdings of firms may not appear as predicted by (4.10) for several reasons; for example, (a) management uses a different inventory model in its decisions because the assumptions of the EOQ model are not descriptive, or (b) the assumptions are descriptive but management makes nonoptimal inventory decisions. Using (4.10) to explain differences across firms in their inventory holdings or their inventory turnover ratios would run into some thorny empirical problems. Most firms have numerous products, and data may not be available to an external analyst at the individual product level. The analyst also needs to estimate C_p, C_s, and D for each firm—not a trivial task in itself.

2. Detailed empirical evidence on the descriptive validity of the strict proportionality assumption is limited. McDonald and Morris (1984) probed this assumption for four financial ratios: current assets/sales, current assets/current liabilities, cash flow/total debt, and total debt/total assets. If strict proportionality between the numerator (X) and the denominator (Y) of a ratio exists, the intercept term in the following relation will be zero:

$$X_i = c + p \cdot Y_i + e_i \tag{4.11}$$

where c is the intercept term and p is the responsiveness coefficient. Ordinary least squares was used to estimate (4.11) for both (a) 126 U.S. firms drawn from 126 separate four-digit SIC industries and (b) 113 U.S. firms from one four-digit industry (utilities). The motivation for McDonald and Morris examining both (a) and (b) was "to test the ratio method in its traditional application to intra-industry data and its more general extension to heterogeneous data" (p. 92). For the heterogeneous sample, the intercept was significantly different from zero for three of the four ratios; only for the total debt-to-total assets ratio was the intercept insignificantly different from zero. In addition, the residuals from (4.11) exhibited both skewness and kurtosis. It was concluded that these results were "not surprising, given that traditional analysis has long recognized that ratios do not have similar distributional characteristics across various industries" (p. 94). For the homogeneous industry sample, the intercept term was not significantly different from zero across any of the four ratios. Moreover, the "presence of nonnormalities is substantially reduced using the ratio specification" (p. 95); the "ratio specification" is the simple X/Y form traditionally found in the literature. The conclusion was that the "ratio method proved to be consistently superior to alternative (OLS) specifications for the intraindustry sample. . . . (These) findings provide strong empirical support for simple ratio analysis in its traditional form"

Factor analysis can, if used in an uncritical manner, become brute empiricism in the extreme. However, when used with recognition of its limitations (for example, the potential excessive reliance on factors suggested by data) and of the judgment calls necessary in its application (for example, how many separate factors to identify and what the labels of those factors should be), it can be a useful addition to the tools used in financial statement analysis. A useful discussion of the limitations of brute empiricism, alternatively known as data mining, data grubbing, or fishing, is in Lovell (1983).

4.7 SUMMARY

1. There is a diverse set of motives for examining financial data in a ratio format, including (a) controlling for size differences across firms or over time, (b) facilitating drawing of inferences from statistical analysis, (c) probing a theory in which a financial ratio is a variable of interest, and (d) exploiting observed empirical regularities between financial ratios and the estimation or prediction of variables of interest. Underlying one or more of these motivations are assumptions about the empirical properties of financial ratios, for example, strict proportionality between the numerator and the denominator or normality of the ratio distribution. An analyst should examine whether specific assumptions are descriptive of the financial data of interest.

2. Computational or interpretational problems are frequently encountered when examining data in ratio form. The possible causes of these problems are many, and an analyst should consider them before deciding how to handle them. For instance, the causes of extreme observations include factors such as recording errors, accounting classification, accounting method, and economic and structural change.

3. There is considerable evidence that many financial ratios are not well described by a normal distribution. When faced with nonnormally distributed data, the options available are many, for example, imposing normality on the data, using a transformation to better approximate normality, winsorizing the sample, trimming the sample, or using statistical tools that are more appropriate to the nonnormal distribution.

4. There is considerable evidence that specific financial ratios within many of the various categories (e.g., cash position, capital structure, and profitability) are often highly correlated with each other and have a high degree of comovement over time. This evidence is consistent with a smaller set of ratios being able to capture much of the information contained in the numerous financial ratios that can be calculated.

TABLE 4.7 Distribution Statistics for Financial Ratios of Selected Industries

Industry and SIC Code	*Number of Firms*	*Quick Ratio*			*Sales/Receivables*			*% Profit Before Taxes to Tangible Net Worth*		
		LQ	*M*	*UQ*	*LQ*	*M*	*UQ*	*LQ*	*M*	*UQ*
1. Paint, varnish, and lacquer (2851)	136	.8	1.1	1.7	6.8	8.1	10.7	3.2	11.0	23.6
2. Plastic materials (2821)	126	.6	.9	1.3	7.0	8.3	10.7	6.4	15.4	30.7
3. Bread and bakery products (2051)	108	.5	.8	1.3	13.1	17.0	27.0	8.0	22.1	47.3
4. Dairy products (2021)	124	.5	.8	1.1	12.9	16.9	22.5	6.8	17.3	31.2
5. Meat packing (2011)	134	.6	1.0	1.6	19.0	24.7	29.1	2.9	13.0	29.1
6. Wood furniture (2511)	129	.5	.8	1.4	7.0	8.9	13.9	.1	13.3	28.5
7. Millwork (2431)	142	.5	.8	1.7	7.0	9.3	12.6	−7.1	11.1	22.8
8. Sawmills (2421)	167	.2	.5	1.0	10.6	14.6	23.9	−18.8	3.5	10.7
9. Radio and T.V. transmitting equipment (3662)	166	.7	1.0	1.8	5.0	6.2	8.6	8.8	22.1	46.0
10. Construction equipment (3531)	117	.4	.7	1.7	6.0	8.3	13.6	−13.5	5.1	14.1
11. Electronic computing equipment (3573)	178	.7	1.1	1.9	4.6	5.6	7.2	3.8	21.3	39.7
12. General industrial equipment (3561)	411	.6	1.0	1.6	5.7	7.4	10.2	1.3	13.9	29.1
13. Machine shop repair (3599)	550	.6	.9	1.5	6.7	8.7	11.8	−5.5	12.3	28.1
14. Iron and steel foundries (3321)	147	.6	1.1	1.9	7.4	9.6	13.3	−13.5	4.0	18.3
15. Nonferrous fabricated products (3499)	183	.6	1.0	1.6	6.4	8.2	10.9	−3.6	11.6	27.7

LQ – Lower quartile (.25 percentile).
M – Median (.5 percentile).
UQ – Upper quartile (.75 percentile).
SOURCE: Robert Morris Associates (1983). Copyright 1983. Table 4.6 includes a note by RMA on the "Interpretation of *Statement Studies* Figures," which should be read when using the RMA data.

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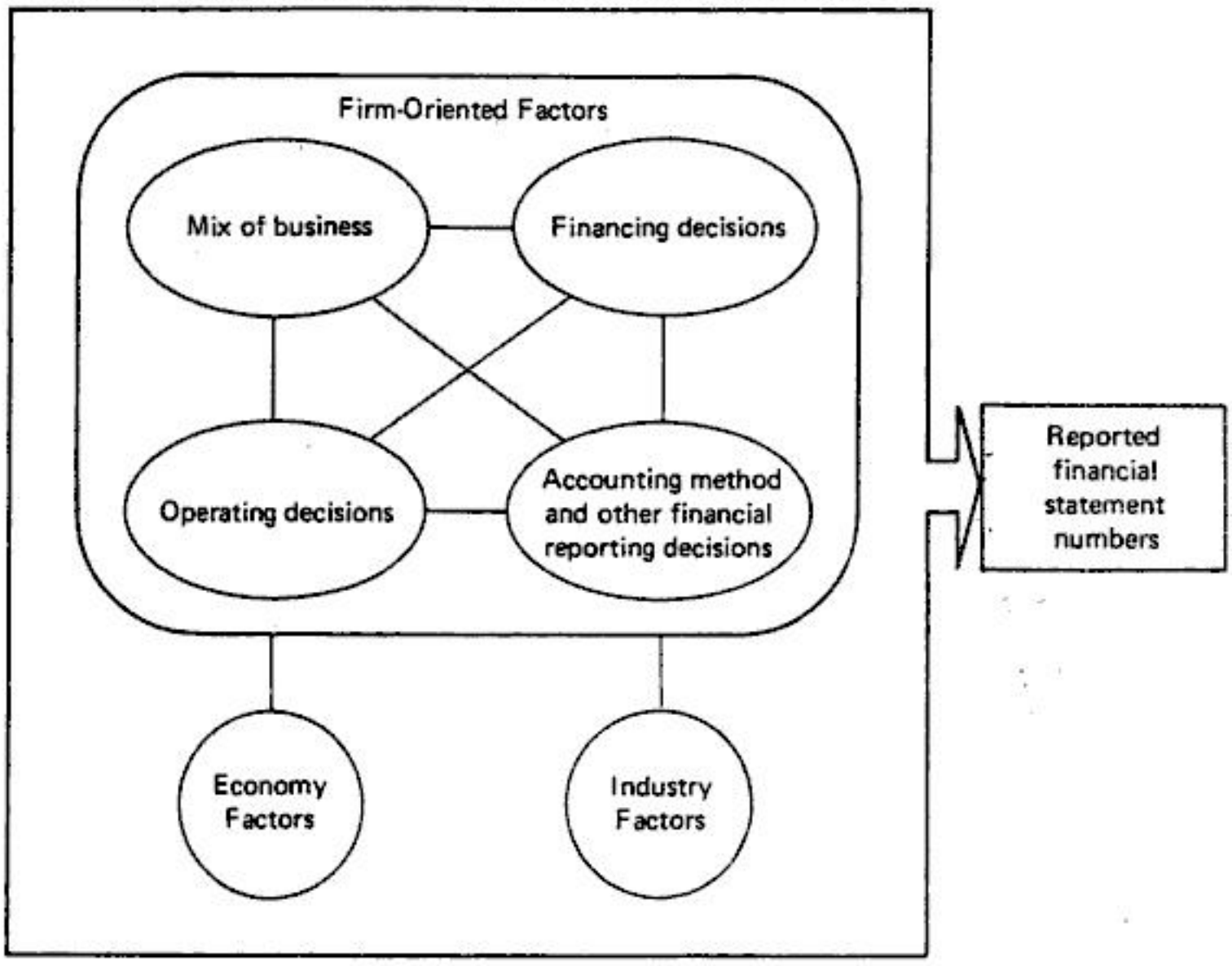
FIGURE 5.1 Interactive Perspective of Accounting Method Choice



4. *Accounting method and other financial reporting decisions*. For example, what asset and liability rules will be adopted from the available options, what rules will be adopted for revenue and expense recognition, and what items will be classified as extraordinary?

The importance of firm-oriented, industry, and economy factors in explaining the numbers reported in financial statements is discussed in this and subsequent chapters. Evidence presented in Chapter 6 indicates that for a sample of 315 U.S. firms, industry and economy factors, on average, jointly explain 43% of the change in annual net income of individual firms.

Why an Interactive Perspective?

Figure 5.1 portrays accounting method choice (and other financial reporting decisions) as affecting and being affected by the other three firm-oriented factors (mix of business, financing decisions, and operating decisions) and by industry and economy factors. There is considerable evidence to support this interactive perspective. Consider FASB decisions in the leasing area. Abdel-khalik (1981) reported results of a study on the economic consequences of *FASB Statement No. 13* (Accounting for Leases). This FASB statement outlined criteria to distin-

> An average annual projected LIFO tax benefit of $1,500,000 plus the existing tax savings of $24,471,000, and
>
> An average after-tax rate of return of 8 percent.
>
> The present tax benefit, combined with the estimated future tax benefit discounted at 8 percent, yields a value to the Corporation in today's dollars of approximately $43,221,000 or $7.22 per share. This represents approximately 32 percent of our current book value. (Dayco Corporation)

Given that many of the factors that influence inventory decisions will be common to all firms in the industry, industry patterns in inventory choice are to be expected. (Section 5.4 provides further discussion.)

Data Collection and Operating Cost Influence

Accounting alternatives can differ in their data collection and operating costs. For instance, reporting land and buildings at historical cost is less costly than is reporting land and buildings at current market values where these market values are updated annually and certified by an external valuer. Similarly, using group depreciation rates for broad categories of plant and equipment is less costly than is using a separate depreciation rate for each individual item of plant and equipment.

Operating cost issues also are an important factor in inventory decisions. One factor in minimizing taxation under LIFO, when faced with increasing purchase prices per unit, is maintaining a constant or increasing (physical) level of inventories. When purchase prices are increasing, a reduction in inventory levels can cause the firm to "dip into" lower-costed inventory layers; this results in higher reported earnings and thus higher taxation payments. One means of avoiding this situation is for a firm to make purchases such that a reduction in inventory does not occur; see Biddle (1980) for evidence consistent with this proposition. This strategy can result in higher operating expenses due to increased storage costs and more money tied up in inventory. Note that in this context, the inventory accounting method choice can involve a trade-off between taxation minimization and higher operating expenses.

Financing Cost Influence

An example where financing costs can be influenced by accounting method choice is in the bank lending area. Assume that a firm has borrowed from a bank and that, as part of the lending agreement, a covenant is written on the times interest earned ratio. If the lending agreement does not specify the accounting methods under which the covenant is to be interpreted, management may make an accounting change to avoid technical violation of the covenant. The financing cost impact of this decision will be influenced by the actions the bank would have taken had a violation occurred; for example, the bank may have forced a rene-

discussions in annual reports and in the accounting literature focus on I in Figure 5.2; that is, they focus on a single accounting issue at a time and consider its financial statement and other effects for only a single (that is, the current) period. Alternative perspectives, focusing on multiple issues or on multiple periods, are more complex; see Amershi, Demski, and Wolfson (1982) for a discussion. Ultimately, it is an empirical issue as to which perspective in Figure 5.2 is most descriptive of accounting method choice by firms.

5.4 ACCOUNTING METHOD DIFFERENCES: EVIDENCE OF SYSTEMATIC PATTERNS

There is considerable evidence of systematic patterns in the accounting methods chosen by firms. This section presents a subset of this evidence. (A further discussion of the evidence and related topics is in Section 5.7.)

A. Profiles of Firms Using Different Accounting Alternatives

Industry membership is one variable that explains differences across firms in their accounting method choice. Early recognition of this variable is in Gilman (1939). He observed that while cost-based inventory valuation methods were used by companies in most industries, market-based methods were used by both gold-mining companies and meat-packing companies. One rationale offered for this industry difference was the greater difficulty of allocating joint costs to individual products in both these industries. (Joint products were perceived to be more common in these industries than in many other industries.)

Industry patterns have also been noted for the adoption of the LIFO (last-in, first-out) inventory method. Butters and Niland (1949) noted heavy use of LIFO by oil and gas firms. In a more recent study, Biddle (1980) also reports an industry factor in LIFO choice. Biddle examined firms that adopted LIFO vis-à-vis firms in the same four-digit industry that did not adopt LIFO. He reported that "in several industries (for example, chemicals and glass) nearly all the Compustat firms were either already using LIFO to some extent or simultaneously adopted LIFO" (p. 251). Table 5.1 presents data on the 1983 inventory valuation methods used by Compustat firms for a select set of industries. Note, for example, the predominant use of FIFO (first-in, first-out) inventory accounting by computer firms, LIFO by retailers, and average cost by air transportation firms. The data in Table 5.1 reinforce prior findings that differences across firms in accounting method choice are correlated with differences in their industry membership.

A related approach to examining factors associated with different accounting method usage is to present profiles of financial and other characteristics of firms adopting different methods. For example, Foster (1980) examined the profiles of oil and gas firms using full-cost vis-à-vis those using successful-efforts when accounting for exploration costs. The main difference between these two methods

one. We argue that an analyst should consider at least three options when faced with interfirm diversity in accounting methods:

Option 1. Do not make adjustments to the reported financial numbers of firms. There could be several motivations for adopting this option:

- Firms have rationally selected their accounting methods to best represent their underlying economic attributes
- Insufficient information is available to make adjustments that the analyst would view as reliable
- The decision context in which the financial numbers are being used is insensitive to the choice of accounting method by firms.

Option 2. Make adjustments, using information provided by the firm, so that all firms are on a uniform set of accounting methods. This information could be in footnotes, management's discussion of results, and so on; see Section 5.5.A.

Option 3. Make adjustments, using approximating techniques, so that all firms are on a uniform set of accounting methods. Section 5.5.B provides an example of an approximating technique plus a discussion of its accuracy.

A. Adjustments Using Company-Based Estimates

In some cases, sufficient information is provided by the company for an external analyst to use a set of accounting methods other than those adopted in the primary financial statements. Consider the provision of supplemental financial statements using alternative accounting methods. Early instances of such disclosure were voluntary. For example, starting in 1954, Indiana Telephone Corporation voluntarily disclosed general price-level-adjusted financial statements in addition to the mandated historical cost-based statements. More recently, regulatory bodies have mandated such disclosures of companies in countries such as the United Kingdom and the United States. These disclosures permit external analysts to compare companies on an alternative set of accounting methods other than those provided in the primary financial statements. In some cases the supplemental disclosures may reduce the interfirm diversity in accounting methods encountered when using the primary statements. Consider *FASB Statement No. 33*, which mandates that U.S. companies report current cost supplemental information. Companies that use different inventory methods in their primary statements (LIFO, FIFO, average cost, etc.) all use a uniform method (current cost) in their *FASB Statement No. 33* supplemental disclosures. (Note, however, that if firms differ in the methods used to estimate current cost, uniformity in accounting method across firms may be more in form than in substance.)

Another example of disclosure of the numerical effect of alternative accounting method choice is inventory valuation. LIFO firms typically disclose in a footnote the amount by which their inventory valuation would have differed had FIFO been used. In some cases, these amounts can be substantial. Consider

Highest Correlations Between Historical Cost and Constant-Dollar Earnings

Year	*Correlation*	*Inflation Rate*
1962	.999	1.2%
1964	.999	1.2
1965	.999	1.9

Lowest Correlations Between Historical Cost and Constant-Dollar Earnings

Year	*Correlation*	*Inflation Rate*
1974	.439	12.2%
1969	.695	6.1
1980	.738	12.4

Firm-specific factors, such as fixed asset intensity and financial leverage, also are potentially important factors that may affect the correlation between historical cost earnings and current-cost or constant-dollar earnings.

B. Diversity and Financial Variables

The second issue to be discussed arises when a subset of firms uses accounting alternative A (say, straight-line depreciation) and another subset uses alternative B (say, accelerated depreciation). Some argue that diversity in accounting method is a major limitation of conventional accounting. Several factors need to be considered on this diversity issue. The context in which the financial data are used is *one factor*. Suppose that an analyst were only interested in ranking companies in terms of a leverage ratio. If the use of diverse accounting rules did not change the ranking of companies vis-à-vis what they would have been if uniform accounting rules had been used, then the diversity in accounting rules in this context would pose no problem. A *second factor* is the availability of methods to adjust reported numbers to reduce such diversity. Section 5.5 of this chapter illustrates the use of company-based information and approximating techniques to make adjustments for accounting method differences. Where the decision context is highly sensitive to the accounting methods used, strong economic incentives may exist for the decision maker to employ these adjustment techniques. A *third factor* is the availability of competing information sources. For example, estimates of cash flow for a broad cross section of firms are available from several brokerage firms.

In many decisions, accounting information is but one of many information sources used. The existence of "noise" in the accounting inputs used in a decision may cause increased reliance on other sources. (Note that in cases where the interpretation of clauses in contracts is based on *reported* financial statement numbers, the second and third factors noted may not be operative. In this context, parties to the contract can reduce the problems associated with accounting method diversity by specifying the accounting methods on which the financial statement numbers are to be computed.)

Some insight into the accounting method diversity topic is in the Dawson, Neupert, and Stickney (1980) study. The focus was on the correlation between (1) variables based on reported financial statement numbers and (2) variables

TABLE 5.5 Why Companies Reject LIFO? Explanations Given by Chief Financial Officers

Categorization of Responses	*% of Firms Citing Factor*
1. No expected tax benefits • No immediate tax payments to be made (e.g., due to either carryforward tax losses or credits) • Declining prices (e.g., in electronics, meat-packing, steel, and drug industries) • Immaterial inventory • Inventory used in long-term projects or in equipment held for lease	73%
2. Regulatory or other restrictions LIFO deemed inappropriate by most rate-making authorities	12
3. Excessive cost • High administrative costs • Problems of managing cash flow owing to involuntary liquidations	20
4. Other adverse consequences • Lower reported earnings • Trigger disputes with IRS	11

SOURCE: Granof and Short (1984, Table 1, p. 327). Reprinted by permission from the *Journal of Accounting Auditing and Finance*, Summer 1984. Published by Warren, Gorham and Lamont, Inc., 210 South St., Boston, MA. Copyright © 1984. All Rights Reserved.

Archibald (1976) reported:

> One treasurer flatly stated that an influential shareholder demanded the firm not show a relative decrease, and that the accountants were obliged to figure a way out of the problem. The depreciation change was the easiest and the most obvious. (p. 72)

Such anecdotes are difficult to verify. However, they do highlight the difficulties faced by researchers in developing models that explain decisions by management about accounting method choice.

B. Submissions to Accounting Policy Bodies. Accounting policy bodies frequently solicit the opinions of firms potentially affected by their decisions. Typically a small subset of firms make written submissions. Examples of studies examining these submissions are Watts and Zimmerman (1978) on general price-level accounting and Dhaliwal (1982) on the interest cost capitalization issue. The dependent variable in these studies was a support/oppose classification of the submission sent by individual firms in relation to the FASB's Discussion Memorandum on each issue. Independent variables examined included firm size, the existence of a management incentive scheme, and the debt-to-equity ratio. Both papers reported that firm size was a significant factor in classifying firm submissions. For instance, Watts and Zimmerman (1978) reported that "the larger firms are more likely to favor GPLA (if earnings decline). This finding is consistent

find means of structuring transactions that do not give rise to reported expenses or reported liabilities even though, in spirit, expenses or liabilities exist. This is but one of several reasons why the disclosures in annual reports need not represent either a complete or an unbiased representation of the underlying transactions and events affecting the firm.

5.8 SUMMARY

1. Accounting method choice is an important factor affecting reported financial statement numbers. The perspective taken in this chapter is that the accounting method choice interacts with decisions concerning the mix of business, financing, and operating aspects of the firm.

2. Increasing recognition is being given to the economic consequences to the firm and the economic consequences to management factors affecting accounting method choice. At present, security analysts, financial commentators, and academics are better able to list factors such as taxation benefits, political costs, and executive compensation than to develop models that reliably predict how the foregoing (and possibly other) factors interact to produce the set of accounting methods chosen by individual firms.

3. There is considerable evidence of self-selection by firms in their accounting method choices. Industry similarities and firm-size similarities have been documented. In addition, firms making voluntary accounting changes typically have experienced lower profitability and lower stock price performance in the period prior to the change.

4. The existence of differences across firms in their accounting methods does not, in itself, preclude analysts from making interfirm comparisons of financial statement variables. The availability of supplemental information provided by firms and of approximating techniques partially reduces potential problems arising from interfirm diversity in accounting method choice.

QUESTIONS

QUESTION 5.1: Lease Accounting and Leverage Ratios of Airline Companies

Accounting for leases is a topic that has generated much controversy. The issues considered (and reconsidered) by regulatory bodies typically include

management and franchise fees" is based on "the present values of the respective net income streams generated." The current market value of "investments in unconsolidated affiliates is the estimated present value of future income streams minus debt."

As of 19X8, the company (1) operated 13 hotels that were wholly owned or leased, (2) operated 13 hotels that were partially owned and managed, (3) managed 23 hotels, (4) managed three hotel-casinos, and (5) had 194 hotels franchised.

19X1, 19X2, and 19X3 Annual Reports

These annual reports called "attention to the fact that the market value of Hilton's hotel properties was substantially greater than the book value shown on the financial statements." In footnotes, Hilton provided the following information (in millions of dollars):

	Historical Cost			*Current Market Value*		
	19X1	*19X2*	*19X3*	*19X1*	*19X2*	*19X3*
Net property of Hilton subsidiaries	237	253	305	467	496	818
Net property of Hilton proportional share of 20–50% owned companies	134	154	157	251	278	362

The 19X1 Annual Report stated that "current market value was arrived at by calculating the present worth of estimated future income streams accruing to the owner utilizing rates of return ranging from 9 to 12 percent, and various terms of financing, and conditions of sale and profitability factors with respect to individual properties." This method is referred to by some appraisal companies as the "income approach to fair market value." As an example, the value of one Hilton property was based on a ten-year horizon period. The future annual revenues and future expenses for the property were predicted and then used to calculate the "most probable net operating income and pre-tax cash flow to be generated by the property." An estimate of the residual value of the property at the end of the tenth year was also made. The discount rate was that yield "which would attract a prudent investor to a property with comparable degrees of risk, non-liquidity and management burdens." In the two years prior to 19X1, Hilton had noted that the current market value greatly exceeded the book value of property but had not provided estimates of the difference.

19X4 Annual Report

Starting in 19X4, Hilton reported current-cost and constant-dollar supplemental information to comply with *FASB Statement No. 33:*

> The objective (of current cost) is to reflect the effect of changes in the specific prices (also referred to as "current costs") of the resources actually used in the Company's operations. Current costs of property and equipment were based on replacement

best, involving many hypothetical assumptions that inevitably will turn out to be incorrect. Moreover, they are likely to produce earnings numbers that vary significantly from year to year."

4. What factors might explain Hilton's voluntary disclosure of current-value information in 19X1 and its expanded disclosures starting in 19X4? What factors might explain Holiday Inn's voluntary disclosure of current-value information starting in 19X6?
5. What factors might explain the difference between the market capitalization of equity and the value of stockholders' equity (using the current-value accounting method) for Hilton and Holiday Inn?

QUESTION 5.3: Energy Reserves Group: Accounting Method Choice

Energy Reserves Group (ERG) is engaged in the exploration for and the production and sale of oil and natural gas. The primary financial statements are based on the historical cost method. Table 5.9 presents summary financial and operating

TABLE 5.9 Energy Reserves Group, 19X1–19X8

Financial and Operating Data	*19X1*	*19X2*	*19X3*	*19X4*	*19X5*	*19X6*	*19X7*	*19X8*
A. Primary Financial Statement Disclosures ($ millions)								
1. Total revenues	60	71	76	102	149	175	160	142
2. Earnings before extraordinary items/ discontinued operations	3.7	6.6	(.1)	14.4	13.9	(22.6)	9.7	12.6
3. Net earnings	5.6	10.4	.3	15.1	13.9	(22.6)	(14.5)	12.6
4. Reported interest expense	1.0	1.1	2.8	7.0	11.6	23.9	22.5	25.3
5. Capital expenditures	39	46	53	67	86	162	93	28
6. Stockholders' equity	76	85	84	94	112	91	160	173
7. Total assets	113	141	162	204	256	357	502	470
8. Properties, plant, and equipment	94	120	137	158	201	282	431	414
B. Operating Disclosures								
Production (net interest)								
9. Crude oil produced (million barrels)	4.01	3.85	3.55	3.21	3.22	3.41	3.27	3.08
10. Average sale price per barrel	$9.56	$10.95	$11.79	$19.80	$31.76	$35.78	$31.66	$29.25
11. Natural gas produced (billion cubic feet)	26.16	26.10	25.51	24.09	23.35	22.48	21.08	17.38
12. Average sale price (thousand cubic feet)	$0.63	$0.92	$1.12	$1.34	$1.60	$1.87	$2.27	$2.49
Estimated Net Proven Reserves								
13. Oil (million barrels)	25.86	23.17	23.35	23.15	23.78	27.36	25.30	29.23
14. Gas (billion cubic feet)	235.14	242.12	272.08	263.20	228.16	238.49	237.54	239.16
C. Capital Market Data								
15. ERG market capitalization of equity ($ millions)	92	114	167	468	881	491	174	175
16. Standard & Poor's 500 Index	107	94	95	107	134	122	139	164

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6.1 INTRODUCTION

Financial statement data are often used in a comparative mode, such as

- Cross-sectional applications: comparisons of one entity with other entities at the same point in time
- Time-series applications: comparisons of one entity at different points in time.

This chapter examines issues that arise in cross-sectional analysis. Issues that arise in time-series applications are discussed in Chapter 7.

Cross-sectional analysis is used in many areas. The following are illustrative:

1. Valuation analysis for mergers or acquisitions where the financial statements of other firms are used to make inferences about the relative under- or overvaluation of a target company or division
2. Management performance evaluation and executive compensation where one input is the profitability of the firm compared to a benchmark set of firms operating in the same competitive environment
3. Prediction of financial distress using models based on firms in the one industry
4. Public policy decisions about excess profits tax legislation where one input is the profitability of firms in one industry compared to that of firms in other industries.

The issues discussed in this chapter are important in these and other cross-sectional uses of financial statement data.

6.2 CRITERIA USED TO SELECT COMPARABLES

Many decision contexts using cross-sectional analysis compare entities that are "similar" in at least one attribute. The following illustrate alternative approaches to defining "similar" entities:

1. *Similarity on supply side*. Firms may be grouped on the basis of having similar raw materials, similar production processes, similar distribution networks, and so on. This supply-side focus is used in the Enterprise Standard Industrial Classification (SIC) scheme for defining industries; the main factors considered are "physical or technological structure" and "homogeneity of production." The Enterprise SIC scheme aims to classify whole enterprises into two-, three-, and four-digit industries. A two-digit classification is the broadest definition of an industry; a four-digit classification is the narrowest definition. Consider the

problems, considerable caution should be employed when making inferences from cross-sectional data.

A. Nonavailability of Data

A frequently encountered problem is that data are not available for the entities of interest. Reasons for nonavailability include

1. The entity is owned by a multiactivity company that provides limited financial disclosures relating to the entity; for example, it is not disclosed as a separate line of business.
2. The entity is privately held and does not publicly release financial statement information. (Indeed, one motivation for remaining private could be to avoid regulatory mandates to publish such information. In some cases, third parties may make estimates of individual financial statement items such as sales and net earnings. However, these estimates will not be certified by the company or its auditors.)
3. The entity is owned by a foreign company (foreign government, etc.) that provides limited financial disclosures.

Consider an analyst who wishes to examine the profitability of firms in the U.S. frozen potato industry. In the early 1980s, there were ten major participants in this industry. Table 6.1 outlines these participants and the problems of obtaining financial statements for them. Not one of the ten participants is a publicly held, single-line-of-business (LOB) enterprise. Five are privately held, none of which

TABLE 6.1 Data Availability in the U.S. Frozen Potato Industry

Parent Company	*Company Name in Frozen Potato Industry*	*Data Availability*
1. Simplot	Simplot	Company is privately held.
2. Amfac	Lamb-Weston	Amfac does not report LOB data for Lamb-Weston.
3. H. J. Heinz	Ore-Ida	Heinz does not report LOB data for Ore-Ida.
4. Carnation	Carnation	Carnation does not report LOB data for frozen potato activities.
5. Chef Ready	Chef Ready	Company is privately held.
6. Rogers Walla Walla	Rogers Walla Walla	Company is privately held.
7. Consolidated Foods	Idaho Frozen Foods	Consolidated does not report LOB data for Idaho.
8. U&I	Gourmet Foods	U&I does not report LOB data for Gourmet.
9. Western Idaho Potato Producers	Western Idaho Potato Producers	Company is privately held.
10. Prosser Pack	Prosser Pack	Company is privately held.

fiscal year will oscillate over time. Some industry patterns are observable for fiscal year ends. For example, January 31 is the predominant date chosen by most U.S. retailing companies.

When all firms in the sample do not have comparable fiscal year ends, problems can arise in making inferences about (say) relative profitability or relative firm size. For instance, Firm X with a December 31 fiscal year may appear more profitable than Firm Y with a September 30 fiscal year, because the most recent three months were in an expanding phase of the economy whereas the comparable three months of the prior year were in a recessionary phase of the economy. In some cases, adjustments can be made to place firms with noncomparable fiscal years onto comparable reporting periods. In the example, given quarterly reporting, the calendar year earnings of Firm Y can be determined by adding the October–December quarter of the current year and subtracting the comparable period of the prior year. An amusing illustration of this problem occurred in 1978. In November 1978, Coopers & Lybrand announced that its revenues for the fiscal year ending September 30 were $595 million. The headline of its press release read "Coopers & Lybrand reports highest CPA revenues"; the firm stated it was "the largest annual volume reported by an accounting firm." *Forbes* magazine subsequently carried an article entitled "The new champion: Coopers & Lybrand." Peat, Marwick & Mitchell fired back a response that its recently reported revenues of $585.9 million were for a June 30 fiscal year and that had it used the same September 30 fiscal year end, it would have reported revenues of "over $603 million."

When making comparisons across companies from different countries, the nonsynchronous data problem can be severe. Countries differ in fiscal year reporting patterns (see Table 6.4) and also differ in the periodicity of interim reporting. Many British Commonwealth countries, for instance, report on a half-yearly (semiannual) rather than a quarterly basis.

C. Nonuniformity in Accounting Methods

In many samples of firms, diversity in accounting method choice is encountered. Chapter 5 discussed factors that may explain these differences across firms. An important conclusion of that chapter is that firms can have substantive reasons for adopting different accounting methods. In this situation, nonuniformity of accounting methods across firms does not necessarily imply noncomparability of financial statement–based ratios. However, if an analyst decides that uniformity of accounting methods is desirable, one of several options can be adopted:

1. Restrict the sample of firms to only those that adopt uniform accounting methods
2. Use company-provided information to adjust the reported numbers to those derived using the alternative method (see Section 5.5.A)

searchers as comprising a single industry ("financial services"). These individual products need not be viewed as close substitutes by the consumer; the focus here is on the range of services that have the common denominator of being "financial" in nature.

B. Sources of Information about Firms in an Industry

Several sources of information can be used in determining the firms to include in an industry:

1. A published coding or classification of firms into individual industries, for example, the SIC codes or the Value Line classifications for U.S. companies, the SEIC codes for U.K. companies, and the STATEX codes for Australian companies.
2. Firms mentioned by security analysts and other sources as competing in the same market. The list of firms could be based on a citation analysis of the research reports of a chosen set of security analysts.
3. Results of a project in which firms are grouped into industries based on their empirical commonalities. Techniques such as factor analysis and cluster analysis could be used to determine the relevant grouping of firms; see Jackson (1983) for a description of these techniques. King (1966) and Meyers (1973) illustrate this approach for commonalities based on similar comovements of security returns. Bourgeois, Haines, and Sommers (1980) discuss this approach for commonalities based on product-demand factors.

Most industry-based applications use published classifications, in part due to their ready availability and their (apparent) objectivity. However, it is important to verify that the basis of the chosen categorization is consistent with the purpose of the data analysis and that the codings reflect recent ownership changes (that is, via acquisitions or divestitures).

C. Evidence of Industry Differences

The most comprehensive data base of U.S. firms is the Compustat tape, which focuses on supply-side similarities in operationalizing the industry notion. Table 6.5 presents evidence on the extent of numerical differences in the median financial ratios/variables of 15 SIC four-digit industries. These industries are those for which there were more than 20 firms available on the 1983 Compustat annual tape. The 12 financial ratios are

1. Cash and marketable securities/total assets, (C + MS)/TA
2. Current assets/current liabilities, CA/CL
3. Cash flow from operations/sales, CFO/S
4. Long-term liabilities/stockholders' equity, LTL/SE
5. Operating income/interest payments, OI/INT
6. Net income/stockholders' equity, NI/SE
7. Sales/total assets, S/TA

(SEIC) system. The SEIC codes were "established by a committee of actuaries, investment managers and stockbrokers. . . . The economic criteria for classification . . . would appear to be predominantly output- or end-product-based" (p. 2). The model used to predict the SEIC industry code of a firm was

$$I_i = f(X_{ij}, \ldots, X_{in}) \tag{6.1}$$

where

I_i = SEIC industry coding of firm i

X_{ij} = financial statement variable j of firm i

The 14 manufacturing industries examined were chosen to represent a "wide spectrum of product characteristics, production technology and maturity," for example, building materials, general food manufacturing, and general chemicals. The final model for (6.1) included six independent variables (X_{ij}'s):

- Accounts receivable payment period
- Accounts receivable/inventory
- Earnings before interest and taxes/sales
- Wages/total assets
- Accounts receivable/accounts payable
- Sales/fixed assets.

These variables were chosen using an empirical search that initially included "18 financial ratios chosen so as to reflect a broad range of important characteristics relating to the economic, financial and trade structure of industries" (p. 6).

Discriminant analysis was used to estimate (6.1). (The appendix to Chapter 14 provides a description of discriminant analysis.) *If* the independent variables in (6.1) reflect industry differences, and *if* there is homogeneity of firms *within* each industry and heterogeneity across the 14 industries, (6.1) will classify a high percentage of the firms into their correct industry codings. By chance, approximately 7% of the firms (that is, 1 out of 14 industries) will be classified into their correct SEIC industry coding. The model in (6.1) was able to classify correctly 30.45% of the firms into their four-digit SEIC industry grouping:

> The more homogeneous groups are Food, Clothing and Chemicals with an average of over 40% of their firms correctly classified. The most heterogeneous are Textiles, Metallurgy and Footwear with 15% or fewer firms correctly classified. The significant overall classification result appears attributable to the substantial homogeneity exhibited by about half of the sample industries, the other half being quite heterogeneous. The SEIC may be said to have achieved partial success in creating groups of firms homogeneous with respect to their substantive economic attributes. (p. 13)

The authors then grouped the 14 industries into four meta industries (processing, engineering, textiles, and food); (6.1) was reestimated with the dependent variable being the meta-industry classification of firm i. The model in (6.1) was able to

eleven of the largest bank holding companies in the country. Among the issues that arise with relative performance plans are (a) choice of the time period of the plan, (b) choice of the comparison set of firms, and (c) choice of the variable used to measure performance. Many of the issues discussed in this chapter are relevant to these choices.

Executive compensation represents one of the most active and vibrant areas of business research; the Winter 1985 issues of the *Midland Corporate Finance Journal* and Volume 7 (1985) of *Journal of Accounting and Economics* are both devoted to this topic. One example of research in this area is Larcker's (1983) analysis of the association between performance plan adoption and corporate capital investment. Two samples of firms were examined. One sample comprised 25 firms that had adopted a performance plan in the 1971–1978 period. The second sample was selected by matching each firm from the first sample with another firm in the same industry and of similar size that had not adopted a formal performance plan. The capital investment patterns of the two samples were examined. It was reported that "firms adopting performance plans (relative to similar nonadopting firms) experience a statistically significant growth in capital investment" (p. 4). Explanations for this finding discussed by Larcker included the incentive effects of performance plans, the tax consequences of these plans, and the effect of confounding events. An overview of research in this area is in Lambert and Larcker (1985).

6.9 SUMMARY

1. Cross-sectional comparisons of the financial statements of firms and other entities require choices about the set of comparables. This choice can be based on a variety of criteria, for example, similarity on supply side, demand side, capital market attributes, or legal ownership.

2. Data availability issues are a frequent problem in many cross-sectional comparisons of financial statement information. The existence of multiactivity firms, privately held firms, and nondomestic firms means that the available data may not be representative of the set of firms of interest to an analyst.

3. Firms have considerable discretion over the reporting of line-of-business information, for example, how individual activities are grouped and how intersegment transfers are priced. The possibility that competitors will use the LOB information to the disadvantage of the disclosing firm serves as a constraint against some firms providing highly disaggregated LOB information.

4. The traditional focus of cross-sectional financial statement analysis is at the industry level. Support for this focus comes from the evidence in Section 6.6 of differences across industries in their financial ratios. At present there are very few reliable theories or models that explain the observed differences in industry financial ratios.

the economy variable is separately included (6.A.2) and when both the industry and economy variables are included (6.A.3).

The industry index in (6.A.1) and (6.A.3) captures movements in the primary activity of each firm. An interesting extension would be to include multiple-industry indexes when examining multiactivity firms. Several commercial services now provide such multiple indexes in their list of commercial products. (See Chapter 10 for description of the BARRA service.)

Industry and economy factors are but two variables that can be included in index models. Consider the following statement in the annual report of Phelps Dodge, a major copper-producing company:

> Economic conditions have been particularly hard on a number of industries that are major markets for our copper and copper products. . . . The result has been clearly reflected in copper prices. Our price for copper began the first quarter (of last year) at $1.06 a pound, and rose briefly to $1.44. From there it has declined steadily to . . . $0.75 today. . . . To place this decline in the perspective of our earnings, at current production rates, each one-cent change in the price of copper, annualized, affects our net earnings by $3 to $4 million.

Variables representing commodity price changes for oil, gold, silver, copper, and so on, can explain sizable percentages in the variation of the earnings of natural resource companies. The index models in (6.A.1) to (6.A.3) potentially could be expanded to include such variables.

QUESTIONS

QUESTION 6.1: Cross-Sectional Comparison of the Profitability of Japanese and U.S. Motor Vehicle Companies

The president of a Japanese motor vehicle company reads a research paper that concludes that "Japanese companies generally appear less efficient or profitable than their U.S. counterparts." He finds this conclusion counterintuitive. As his research assistant, you are requested to examine the summary data published in the most recent edition of *Fortune*'s listing of the 500 largest U.S. industrial companies and the 500 largest non-U.S. industrial companies. The data are presented in Table 6.8.

REQUIRED

1. Your first task is to compute industry measures for the net income-to-stockholders' equity ratio. You are requested to compute the following for both Japan and the United States:
   a. Equal-weighted average
   b. Value-weighted average (weighted by stockholders' equity)

4. What factors might ARCO, Shell, and Exxon consider when deciding the specific amount and format of information disclosed about their individual business segments and about their geographic segments?

QUESTION 6.3: Industry Inventory Turnover Ratios and Industry Characteristics

Differences across industries in their median or mean inventory turnover ratios appear to be both sizable and systematic. Gupta and Huefner (1972) examined inventory turnover "ratios at a macro level for broad industry classes, seeking a correspondence between the accounting numbers and basic attributes" (p. 77). They examined the 1967 inventory turnover ratios of 20 manufacturing industries, defined according to the two-digit SIC code. They classified the industries into the following four groups, based on similarities in their inventory turnover ratios:

Group	*Industry*	*Inventory Turnover*	*Group Mean*
I	Petroleum	12.35	11.55
	Printing	11.62	
	Food	10.67	
II	Paper	7.93	6.77
	Motor vehicles	7.68	
	Stone, clay, and glass	7.06	
	Chemicals	6.72	
	Lumber and wood	6.49	
	Furniture and fixtures	6.35	
	Apparel	6.32	
	Leather	6.30	
	Fabricated metal	6.09	
III	Primary metal	5.61	4.98
	Textile	5.58	
	Rubber and plastic	5.57	
	Electrical equipment	4.95	
	Scientific instruments	4.83	
	Machinery	4.39	
	Transportation equipment	3.94	
IV	Tobacco	2.18	2.18

The industries in each group were then examined to see if they exhibited common characteristics. They noted the following:

(1) Product life. Industries producing a product with a very short life may be expected to have low inventories and a high turnover. Short life may be due to rapid obsolescence (as in the case of newspapers) or perishability (as in the case of some food products).

(2) Holding costs. High costs of holding inventories are a second factor that would be expected to result in low inventories and a high turnover. The short-product-life situation is one factor that would contribute toward high holding costs. In some

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7.1 INTRODUCTION

This chapter examines issues associated with describing and explaining the behavior over time of financial series such as earnings, sales, and return on equity. This topic is important for several reasons. One reason is the key role that forecasts play in many decision contexts, for example, in equity valuation models used in investment decisions and in valuation approaches used in acquisition or divestiture decisions. Forecasts based on time-series analysis are an important source of data in such decisions. Time-series analysis exploits any systematic patterns in the behavior of a series over time when forecasting subsequent values of that series. Time-series analysis can also be important in the subsequent evaluation of forecasts and in the revision of existing models used in forecasting. For instance, such analysis may indicate that a macroeconomic variable is an important determinant of periodic changes in earnings but is not built into the model currently used for forecasting. A detailed discussion of forecasting issues may be found in Chapter 8.

Time-series analysis is also important in many nonforecasting contexts such as

- Performance evaluation of management where a key concern is what percentage of the earnings change is due to nonfirm-oriented factors
- Examining allegations that management is "manipulating" earnings to (say) avoid violating restrictive convenants in a bank loan agreement
- Designing a "profit-sharing" component of an executive compensation plan where a central concern is risk sharing between management and other parties associated with the firm
- Management decisions on alternative accounting methods where an important factor is the time-series variability in the reported earnings series
- Litigation where allegations of excess profits have been made and the concern is to explain the sources of a reported earnings series
- Litigation where business operations have been disrupted by a fire or a strike and estimation must be made of the earnings that would "normally" have occurred.

Many of the issues discussed in this chapter arise in the foregoing and similar contexts.

7.2 ISSUES IN ANALYZING FINANCIAL TIME-SERIES DATA

This section outlines several data quality issues that are important in time-series analysis of financial data.

example, via the use of footnote information or approximation techniques based on external data.

Option Three. Examine only those observations in the time series that are derived from the same set of accounting methods. This option could well result in only one year's observations if there are frequent changes mandated by regulatory bodies or voluntarily made by management.

C. Accounting Classification Issues

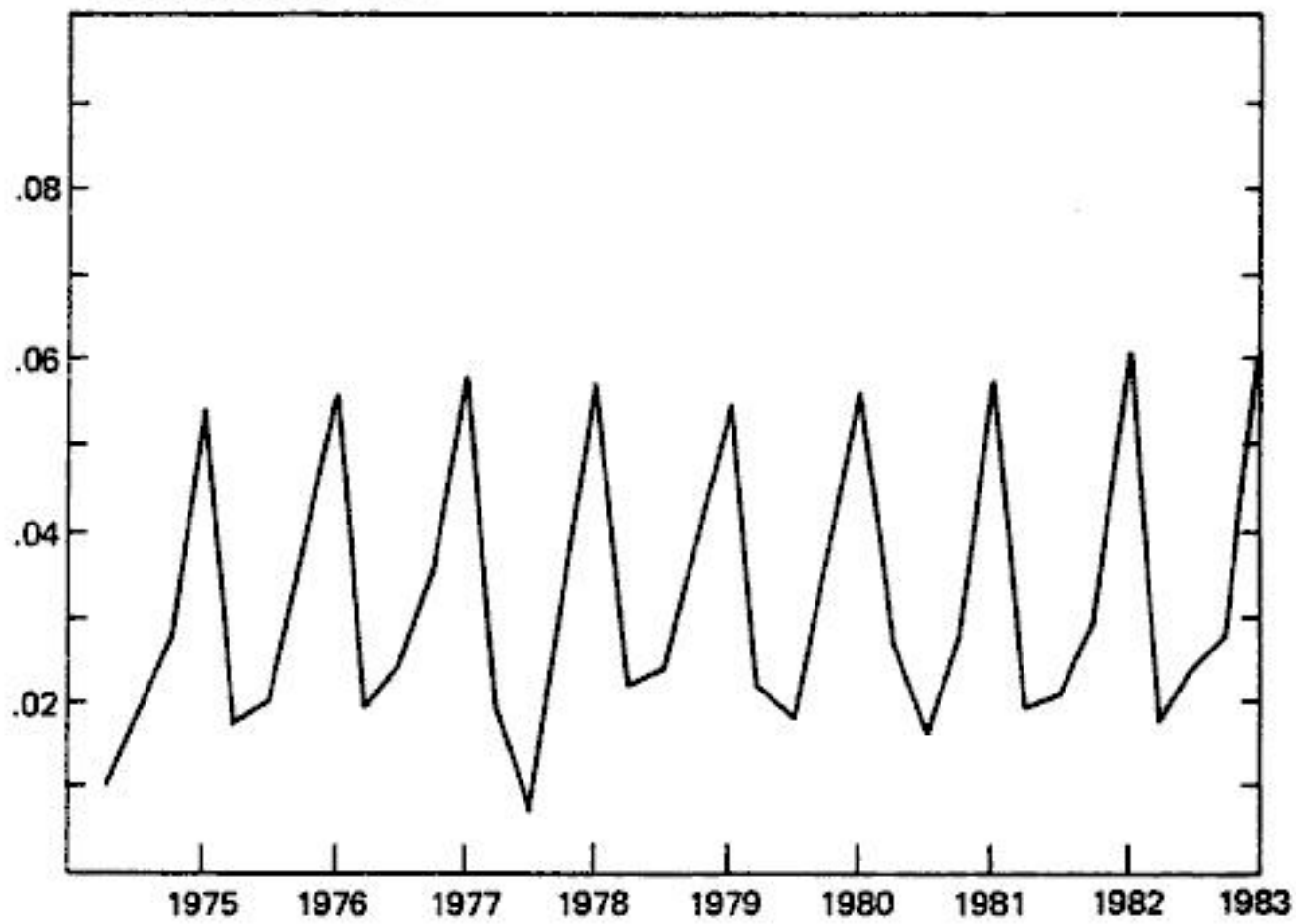
Firms have considerable flexibility over the timing of many events and in the classification used to represent those events in the financial statements. An analyst may wish to adopt a different pattern of timing or classification of events than is represented in the financial statements. Given access to disaggregated data, the analyst can go behind the reported figures and classifications used.

Consider the accounts of F & M Schaefer Corporation, an eastern regional U.S. brewing company. When it went public in 1968, Schaefer operated three breweries—two in New York State (Albany and Brooklyn) and one in Maryland (Baltimore).

- In 1972 a new plant in Pennsylvania (Lehigh Valley) began operations. The 1972 Annual Report noted that "our manufacturing costs were out-of-line with competition, as our capacity, with Lehigh Valley coming on-stream, far exceeded our requirements. To correct this situation, we closed our Albany brewery." The 1972 income statement included an extraordinary charge of $5.4 million related to the "closing of the Albany brewery and brewery operations."
- In 1975 the company closed its Brooklyn brewing plant. The annual report stated that it was "economically obsolete and inefficient compared with larger, automated, high-speed plants that have been erected by brewers over the last few years." The 1975 income statement included a separate line item of $26.1 million related to closing of the Brooklyn plant. The item was *not* treated as an extraordinary income item.
- In 1978 the Baltimore brewery was closed. The 1978 income statement included a separate line item of $7.7 million called "provision for plant closing." This item was *not* treated as an extraordinary income one. The 1978 income statement also included a separate line item of $50.7 million for "write-off of goodwill." The goodwill first appeared in the accounts in 1968 when Schaefer went public.

Assume that an analyst wished to build a time-series model for Schaefer's net income-before-extraordinary-items series. Summary "as reported" data for Schaefer over the 1968–1980 period are presented in Table 7.2. (In 1981, Schaefer was acquired by the Stroh Brewery Company.) There is no necessary reason why the definition of extraordinary items used in the financial statements has to be adopted by an analyst. For instance, the line items associated with the brewery closings in 1972, 1975, and 1978 could be classified consistently rather than 1972

FIGURE 7.1 Quarterly Net Earnings-to-Revenue Series of Dayton-Hudson Corporation, 1975–1983



covered, there has been over a 400% increase in both the revenue and net earnings series. This increase is due to several factors: (1) an increase in the scale of operations via new store expansion and increase in the sizes of existing stores, (2) acquisition of other retailing chains, and (3) inflation causing an increase in nominal revenues and nominal net earnings.

A sizable segment of the literature aims to identify systematic statistical patterns in time-series financial data. These systematic patterns are then modeled and can be exploited for forecasting purposes. As yet, little attempt has been made to provide an economic rationale for the statistical models examined. Appendix A of this chapter discusses several key notions (stationarity, differencing, random walk model, and autocorrelation) that are central to a discussion of this literature. Appendix B presents a step-by-step example of statistical modeling using the Box-Jenkins univariate time-series methodology. Appendix C highlights the major findings of statistical research on the time-series properties of financial statement data.

7.4 ECONOMIC ANALYSIS OF TIME-SERIES DATA

Economy, industry, and firm-oriented factors can affect reported financial statement numbers. This section discusses firm-oriented factors. Economy and industry factors were discussed in Chapter 6.

A. Areas of Potential Management Intervention

There are many areas where management can deliberately misrepresent the timing, amount, or intent of transactions or events in the financial statements. For example,

1. Sales related
   a. Timing of invoices (for example, moving a sale made in the next period to the current period by backdating the invoice)
   b. Phony orders (for example, reporting a sale to a nonexistent customer this period and reversing it the next period)
   c. Downgrading products (for example, classifying nondamaged goods as damaged to make sales to a customer at a lower than normal price)
2. Expense related
   a. Splitting invoices (for example, having a supplier split a single purchase order into several orders with invoice dates in more than one accounting period)
   b. Recording prepayments as expenses (for example, recording advertising prepayments as expenses of the period in which the payment is made).

In many other instances, management can use the large amount of discretion it has to time expense recognition, even though no fraud, falsification of the records, or circumvention of the internal control system is involved. For example,

- Banks have considerable discretion as to the timing and amount of losses on loan portfolios (that is, when a bad loan is classified as bad)
- Oil and gas companies have considerable discretion as to the timing and amount of exploration costs to be expensed in any one year (that is, when a dry hole is classified as dry).

Management can also engage in substantive transactions to affect the reported financial statement numbers. For example, research and development or exploration budgets can be cut in the second half of a fiscal year when it appears that reported annual earnings will fall below internal or external expectations.

B. Legal and Regulatory Decisions

There is a gray area between the extremes of earnings management (via business practices that are beyond reproach) and earnings manipulation (via cooking the books/paper entrepreneurialism). An analysis of judicial and regulatory decisions is one way to gain insight into the practices that some parties view as being beyond the gray and into the "cooking the books" area.

One example of questionable accounting and management practices is McCormick and Company, a diversified specialty U.S. food company with products sold in over 80 countries. This case focused on the "inflation" of the current earnings of McCormick's Grocery Products Division (GPD). The Audit Board of McCormick conducted an investigation of alleged "earnings inflation." The fol-

Executives rarely have to violate the law to put a gloss on dreary earnings. Accepted accounting principles leave ample room for those who want to fudge the numbers." In a related vein, a former member of the FASB commented: "[Executives have developed a] two-platoon system—an offensive unit to penetrate holes in GAAP for a bottom-line score, and a defensive unit to plug the holes and hold the line."

(b) Individual case studies that examine the financial accounts of a firm over an extended time period. Examples are in audit board reports from companies (for example, H. J. Heinz, 1980, and McCormick and Company, 1982) and in the proceedings of legal cases brought by the SEC against individual companies.

(c) Empirical research studies examining large samples of firms that probe the hypothesis that management attempts to smooth the reported earnings series. Ronen and Sadan (1981) summarize over 30 such studies. The main development in this research has been increasing recognition of the many ways management can affect the reported earnings series, for example, via transactions with suppliers and creditors, via decisions regarding discretionary expenditure items like R&D and exploration budgets, via the accounting methods adopted, and via the classification of expenditures as ordinary or extraordinary. There has not been a similar development in analytical models or research designs to handle this increasing recognition of the very complex environment empirical researchers face in this area.

The academic research literature has not been able to provide strong evidence that income smoothing behavior is widespread. However, the problems of research in this area, rather than the limited nature of such behavior, could well explain the limited evidence documenting its existence. Note also that management may attempt to "smooth earnings" but be unsuccessful. For instance, an attempt to transfer income from subsequent "good years" to what management perceives to be a current "bad year" assumes the existence of subsequent "good years." For a subset of firms this assumption is doubtful at best. (See Chapter 15 on "Financial Distress Analysis.") In this case, transferring income to the current year could well increase rather than decrease the variability in the reported earnings series.

2. A diverse set of motives for earnings manipulation/income smoothing behavior has been posited. For example,

- To promote an external perception that the company is low risk (where reported earnings variability is believed to be a critical factor in risk assessment)
- To convey information relevant to the prediction of future earnings
- To maintain satisfactory industrial relations
- To minimize taxation
- To promote an external perception of competent management
- To increase the compensation paid to management.

The first-differenced series shows more evidence of stationarity than does the levels series; that is, the first-differenced series shows more affinity for its mean value of 40 than the levels series does for its mean value of 365.

Seasonal differencing is often used in time-series contexts. This involves choosing a differencing interval that corresponds to the frequency of the seasonal cycle. For example, if seasonality is calendar-year related, fourth differencing would be used with quarterly data and twelfth differencing with monthly data. Appendix 7.B illustrates the use of seasonal differencing when modeling the quarterly net income-to-sales ratio series of Marshall Field and Company.

Submartingales, Martingales, and Random Walks

A submartingale time-series model can be described by

$$X_t = \phi X_{t-1} + \delta + e_t \qquad \textbf{(7.A.1)}$$

where $\phi = 1$ and $\delta \geq 0$. A martingale model can be described by (7.A.1) with $\phi = 1$ and $\delta = 0$. If additionally the $(e_t, e_{t+1}, \ldots, e_{t+n})$ series is independently and identically distributed, (7.A.1) is a random walk model. The model in (7.A.1) portrays the time series as a stochastic process. This means that the sequence of observations evolves through time according to some probability law, in marked contrast to a sequence evolving through time in a deterministic pattern.

Autocorrelation Function

This function displays the autocorrelation structure of a time series up to a specified lag. The jth-order autocorrelation coefficient measures the extent to which the X_t and X_{t+j} observations move together. If a higher (lower) than average observation tends to be followed by another higher (lower) than average observation j periods later, the X_t and X_{t+j} observations are said to be positively autocorrelated. If a higher (lower) than average observation tends to be followed by a lower (higher) than average observation j periods later, the X_t and X_{t+j} observations are negatively autocorrelated. The jth order autocorrelation coefficient is estimated as

$$r_j = \frac{\dfrac{1}{T-j}\displaystyle\sum_{t=1}^{T-j}(X_t - \overline{X})(X_{t+j} - \overline{X})}{\gamma^2} \qquad \textbf{(7.A.2)}$$

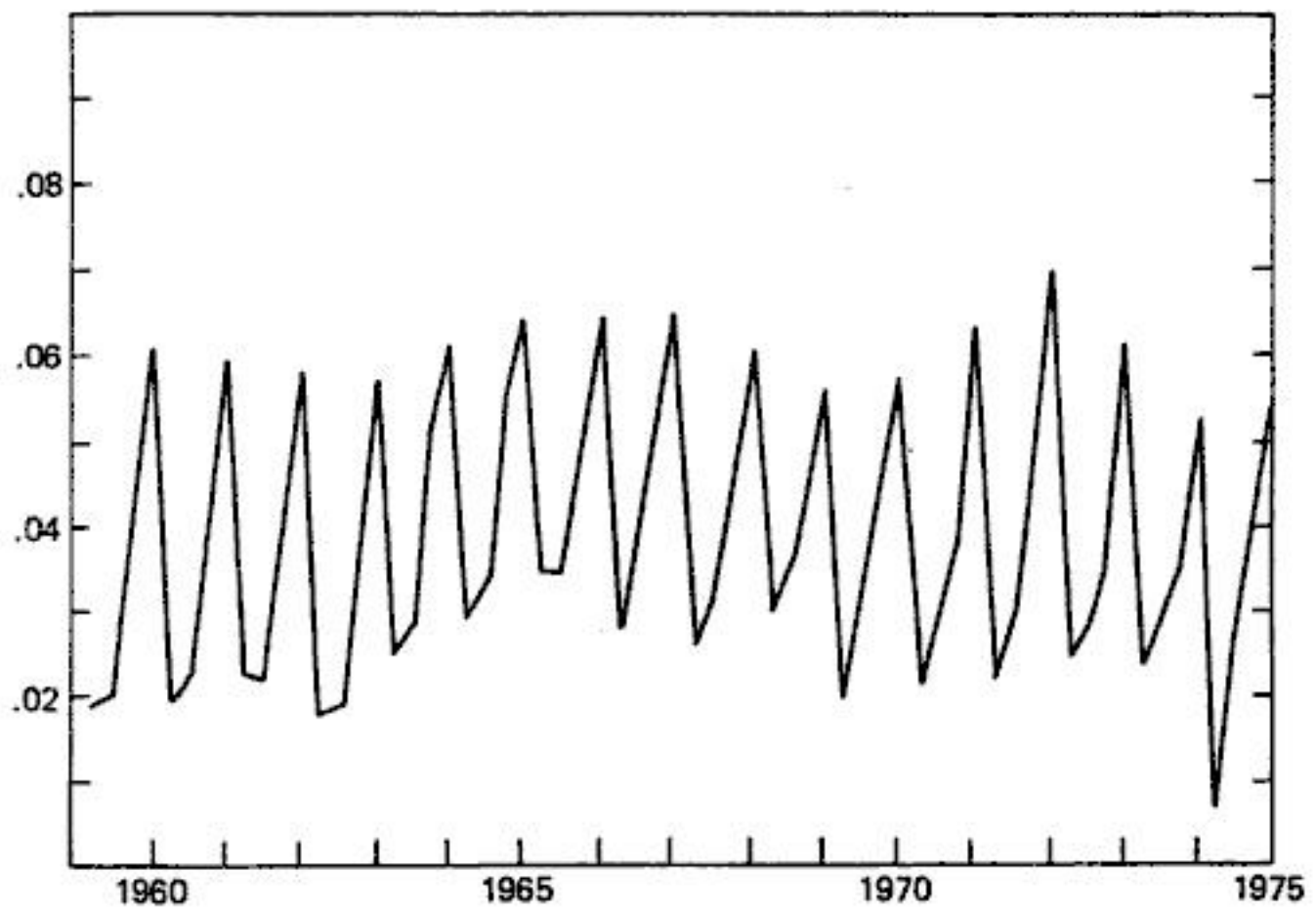
where $\overline{X}$ is the mean of the stationary series, γ^2 is the variance of the stationary series, and T is the number of observations. The range of r_j is from -1 to $+1$.

A theoretical property of the first-differenced series of a stationary random walk model is

$$r_j = 0 \text{ for all } j = 1 \text{ to } n \qquad \textbf{(7.A.3)}$$

where n is the number of autocorrelations that can be computed with the series. Testing whether a series behaves as a random walk involves estimating the r_j's

FIGURE 7.2 Quarterly Net Income-to-Sales Series of Marshall Field and Company, 1960–1975



among other things, a comparison of the sample autocorrelations with the theoretical autocorrelation pattern of particular autoregressive moving average models. The pattern of autocorrelations reported suggests an autoregressive model of order 1—termed AR(1)—in the seasonally differenced series

$$X_t = \phi_1 X_{t-1} + \delta + e_t \qquad \textbf{(7.B.1)}$$

where $X_t = Z_t - Z_{t-4}$. The theoretical autocorrelation function of this model, assuming that the sample r_1 of .52 is the population value, is

r_1	r_2	r_3	r_4	...	r_8	...	r_{12}	...	r_{16}
.52	.27	.14	.07	...	.01	...	.00	...	.00

As noted in Appendix 7.A, one does not expect an exact correspondence between the sample autocorrelation function and any theoretical autocorrelation function. In this example, the correspondence between the theoretical autocorrelation function and the sample function is quite high, given the sample size of 52 observations.

Step Four: Model estimation. For the preliminary model identified in Step Three, estimates of its parameters are next obtained. Using a commercially available Box-Jenkins package for estimation, the following model resulted:

$$X_t = .555X_{t-1} + e_t \qquad \textbf{(7.B.2)}$$

This model was estimated with the constant (δ) term in (7.B.1) suppressed to

Compare this finding with the mean autocorrelations Ball and Watts (1972) report for Compustat firms over the 1947–1966 period:

r_1	r_2	r_3	r_4
−.030	−.040	.006	−.007

Both sets of autocorrelations are not significantly different from the theoretical autocorrelations implied by a random walk model. (The random walk model implies that $r_j = 0$ for all j for the first-differenced series.) There is small evidence of negative autocorrelation for the EPS change series in both the Table 7.9 results (mean $r_1 = -.135$) and the Ball and Watts (1972) results (mean $r_1 = -.200$). However, an autocorrelation of −.200 implies only 4 percent explanatory power for an autoregressive predictive model. Note that the .1 and .9 decile values for r_1 to r_4 in Table 7.9 all seem different from zero. This does not necessarily mean that the time series implied by the mean/median results does not adequately describe these .1 and .9 decile firms. With 19 observations (successive earnings changes) for each firm, some dispersion across firms' *sample* autocorrelations is to be expected even if a random walk model describes the underlying time series of net income or EPS for each firm.

The result that, on average, annual reported earnings or EPS can be well described by a random walk model is one of the most robust empirical findings in the financial statement literature. In addition to the U.K. and U.S. evidence noted, similar results have been reported for other countries. For example, Whittred (1978) reports that "successive changes in the reported earnings of Australian corporations are essentially independent and well approximated by a random walk" (p. 198). Caird and Emanuel (1981) report a similar finding for a sample of New Zealand companies.

Annual Earnings: Individual Firm Analysis

Much of financial statement analysis is concerned with evaluating individual firms. A natural question is whether the mean/median results reported in the prior subsection also apply to individual firms. Two approaches have been adopted to address this question: (a) individual-firm-model versus single-model analysis and (b) sample partitioning or stratification analysis.

Individual-Firm-Model versus Single-Model Analysis

This approach identifies and estimates time-series models for each individual firm and then compares their forecasts with those from a single ("premier") model. The single model typically used is the random walk model suggested by the mean-median results. Two major conclusions emerge from this approach. First, a sizable number of firms reject a random walk model as being descriptive of their past time series. For instance, Watts and Leftwich (1977) report that for

with the annual figures. This phenomenon evidently induces a random shock or noise component in the quarterly EPS time-series which may impede the modeling process" (p. 168).

Interim Earnings: Individual Firm Analysis

Similar to annual earnings, research has examined whether the mean/median results reported in the prior subsection also apply to individual firms.

Individual-Firm-Model versus Single-Model Analysis

This approach has compared individual firm-identified models for interim earnings with those of a single ("premier") model. The premier models analyzed have included those discussed in Watts (1975), Foster (1977), Griffin (1977), and Brown-Rozeff (1979). The results are remarkably similar to those for annual earnings. First, a sizable number of firms reject the chosen mean/median model as being descriptive for the past reported quarterly earnings time series. Second, attempts to exploit these departures from the mean/median model for forecasting purposes have met with limited success. For instance, Collins and Hopwood (1980) reported that for a sample of 50 firms, "the best performing model was the premier model suggested by Brown and Rozeff, followed by the model individually identified by each firm" (pp. 397–398). Hopwood and McKeown (1981) report a similar finding for a sample of 267 Compustat firms.

TABLE 7.11 Median Autocorrelation Coefficients for Levels and First Differences of Selected Financial Statement Ratios or Variables, 1964–1983

Financial Ratio or Variable	*Autocorrelation Coefficients*								*No. of Firms*
	Levels				*First Differences*				
	r_1	r_2	r_3	r_4	r_1	r_2	r_3	r_4	
(C + MS)/TA	.422	.159	.031	−.015	−.172	−.082	−.060	−.026	1,148
CA/CL	.462	.236	.090	.035	−.207	−.090	−.053	−.003	1,172
CFO/S	.012	−.045	−.061	−.051	−.369	−.048	−.010	−.022	1,250
LTL/SE	.609	.340	.152	.024	−.049	−.070	−.047	−.041	1,074
OI/INT	.556	.252	.079	−.003	.013	−.096	−.057	−.022	981
NI/SE	.480	.141	−.001	−.049	−.093	−.119	−.081	−.052	1,075
S/TA	.652	.371	.172	.065	.043	−.087	−.083	−.064	1,201
S/AR	.592	.292	.130	−.003	−.019	−.094	−.038	−.057	954
COGS/INV	.603	.331	.170	.068	−.022	−.126	−.061	−.019	912
PE	.433	.226	.167	.087	−.217	−.117	.004	.028	1,135
DIV. PAY	.295	.087	.019	−.007	−.289	−.003	−.021	−.008	1,184
TA	.780	.610	.441	.296	.250	.085	.009	−.008	1,295

SOURCE: Computed from 1983 Compustat annual industrial file.

One set of restatements was due to prior "improper recognition of advertising and market research expenses. These practices generally resulted in an overstatement of expenses in the year in which the item was expensed and a comparable understatement of expenses in a succeeding year when the previously expensed amount was recovered." The percentage of total advertising and market research expenses improperly recognized ranged from 10.8% in 19X3 to 0.2% in 19X5. Examples included

- In 19X3, Heinz USA (HUSA) solicited $2 million of invoices from an advertising agency for services that would be rendered in 19X4. Such invoices were recorded as expenses in 19X3.
- Questionable invoices were recorded as expense in the current fiscal year with an intent that the amounts thereof would be recovered in the form of cash refunds or services in subsequent years. During the 19X1–19X9 period, ten vendors furnished questionable invoices to HUSA.

Another set of restatements was due to "improper recognition of sales. Certain affiliates recorded sales in a fiscal period other than the period in which such sales should have been recorded." The percentage of total sales improperly recognized ranged from 0.0% in 19X1 to 1.3% in 19X2 (and 1.1% in 19X9). Examples included

- In 19X2 to 19X5, the report stated that HUSA's books "may have been kept open for a period of time after year end, or documents may have been misdated to include additional sales in those years."
- In 19X6 and 19X7, HUSA made attempts to "shut off sales by halting shipments in order to limit income in such years. Instructions were given to distribution centers not to make shipments in the last few days of those fiscal years. As a practical matter, however, this was difficult to accomplish and, in some cases, the customers' orders were actually shipped prior to the end of the fiscal year and the paperwork was altered or misdated to record the sales in the succeeding fiscal year."
- In 19X6 and 19X7, HUSA deferred processing vendor credits through its accounting system in the year in which they were received and recorded them in the succeeding fiscal year.

The largest item in the "Other practices" column of Table 7.12 related to transactions with a bean wholesaler:

- In 19X2, HUSA entered into forward contracts to purchase navy beans. When the price of navy beans increased in 19X3, HUSA "entered into a four-stage purchase/sale/repurchase/resale agreement with a bean wholesaler pursuant to which the profit to be realized by HUSA as a result of the arrangement ($1.364 million) was to be paid to HUSA in three equal installments in 19X4. HUSA recorded $1.364 million as income for 19X4. The net effect was to transfer the $1.364 million from 19X3 to 19X4. One motivation cited for this transaction was that Wage and Price Controls (existing in 19X3) were to be dropped in 19X4.

TABLE 7.13 Caterpillar Tractor and Inland Steel: Annual Financial Data, 1928–1983

Year	*Caterpillar Tractor*			*Inland Steel*			*Inflation CPI (1983 = 1.000)*
	Net Income ($ millions)	*Sales ($ millions)*	*Net Income / Sales*	*Net Income ($ millions)*	*Sales ($ millions)*	*Net Income / Sales*	
1928	$ 8.7	$ 35	.249	$ 9.3	$ 64	.145	.184
1929	12.4	52	.238	11.7	69	.170	.182
1930	9.1	45	.202	6.5	52	.125	.182
1931	1.6	24	.067	1.3	32	.041	.169
1932	(1.6)	13	−.123	(3.3)	15	−.220	.152
1933	.4	14	.029	0.2	28	.007	.137
1934	3.8	24	.158	3.7	40	.093	.141
1935	6.2	36	.172	9.4	63	.149	.145
1936	10.2	54	.189	12.8	99	.129	.147
1937	10.6	63	.168	12.7	111	.114	.150
1938	3.2	48	.067	4.9	74	.066	.152
1939	6.0	58	.103	10.9	115	.095	.149
1940	7.8	73	.107	14.5	142	.102	.149
1941	7.7	102	.075	14.8	203	.073	.150
1942	7.0	142	.049	10.7	190	.056	.167
1943	7.6	171	.044	10.8	204	.053	.180
1944	7.3	242	.030	10.2	221	.046	.185
1945	6.5	231	.028	9.9	217	.046	.190
1946	6.1	128	.048	15.6	218	.072	.194
1947	13.5	189	.071	29.9	315	.095	.229
1948	17.5	218	.080	38.6	393	.098	.253
1949	17.2	255	.067	25.0	346	.072	.256
1950	29.2	337	.087	38.0	403	.094	.251
1951	15.8	394	.040	34.4	519	.066	.271
1952	22.7	481	.047	23.8	458	.052	.282

QUESTION 7.4: Accounting Alternatives and the Time Series of Interim Earnings

Grace Bond is a retail chain that has over 50 stores, primarily located in upscale suburban malls. As part of a diversification program, Grace Bond took a 30% interest in Discount Unlimited (DU); the other 70% was publicly held. Discount was a rapidly growing retail chain that sold items to a low- to middle-income clientele. For the first ten years of its investment in Discount Unlimited, Grace Bond included in its reported earnings only dividends paid by Discount Unlimited. Excluded from Grace Bond's reported earnings over this period were capital gains or losses on its investment as reflected in year-to-year changes in Discount Unlimited's market capitalization. (Also excluded was Grace Bond's equity in the reported earnings of Discount Unlimited.)

The financial vice-president of Grace Bond hears that an accounting regulatory body is considering mandating that all companies include gains and losses on marketable equity securities as a component of their reported earnings. The financial vice-president collects the following interim data from the past ten years:

1. Quarterly EPS as reported by Grace Bond
2. Adjustment that would be made to Grace Bond's reported EPS if quarterly

TABLE 7.15 Grace Bond: Alternative Quarterly Per Share Series

	(1)	(2)	(3)		(1)	(2)	(3)
Year & Quarter	*As Reported EPS*	*DU's Capital Gains*	*(1) + (2) Combined*	*Year & Quarter*	*As Reported EPS*	*DU's Capital Gains*	*(1) + (2) Combined*
19X1: Q1	.21	.32	.53	19X6: Q1	.35	−.08	.27
Q2	.30	−1.13	−.83	Q2	.46	1.86	2.32
Q3	.40	−1.51	−1.11	Q3	.74	−.61	.13
Q4	1.21	.89	2.10	Q4	1.97	−1.27	.70
19X2: Q1	.18	.05	.23	19X7: Q1	.41	1.16	1.57
Q2	.31	−3.30	−2.99	Q2	.47	−.91	−.44
Q3	.37	3.26	3.63	Q3	.56	2.63	3.19
Q4	1.20	−.98	.22	Q4	1.49	−1.27	.22
19X3: Q1	.26	.00	.26	19X8: Q1	.37	.23	.60
Q2	.35	.04	.39	Q2	.43	1.33	1.76
Q3	.41	−.13	.28	Q3	.50	−.45	.05
Q4	1.16	.74	1.90	Q4	1.80	−.43	1.37
19X4: Q1	.30	.35	.65	19X9: Q1	.53	.47	1.00
Q2	.35	−.19	.16	Q2	.57	−.31	.26
Q3	.44	−.48	−.04	Q3	.73	−.17	.56
Q4	1.67	−.80	.87	Q4	2.24	.69	2.93
19X5: Q1	.44	.54	.98	19X10: Q1	.39	.30	.69
Q2	.41	−.25	.16	Q2	.55	−2.41	−1.86
Q3	.57	.26	.83	Q3	.52	1.07	1.59
Q4	1.96	2.98	4.94	Q4	2.22	−.92	1.30

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