

Chapter 2

Data Collection and Presentation

Chapter Outline

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Key Terms

Primary data	Pie charts
Secondary data	Balance sheet
Census	Income statement
Sample	Assets
Random error	Liabilities
Systematic error	Net worth
Time-series graph	Liquidity ratios
Line chart	Leverage ratios
Component-parts line chart	Activity ratios
Component-parts line graph	Profitability ratios
Bar charts	Market value ratios

2.1 Introduction

The collection, organization, and presentation of data are basic background material for learning descriptive and inferential statistics and their applications. In this chapter, we first discuss sources of data and methods of collecting them. Then we explore in detail the presentation of data in tables and graphs. Finally, we use both accounting and financial data to show how the statistical techniques discussed in this chapter can be used to analyze the financial condition of a firm and to analyze the recent deterioration of the financial health of the US banking industry. In addition, we use a pie chart to examine how Congress voted on the Gulf Resolution in 1991.

2.2 Data Collection

After identifying a research problem and selecting the appropriate statistical methodology, researchers must collect the data that they will then go on to analyze. There are two sources of data: primary and secondary sources. *Primary data* are data collected specifically for the study in question. Primary data may be collected by methods such as personal investigation or mail questionnaires. In contrast, *secondary data* were not originally collected for the specific purpose of the study at hand but rather for some other purpose. Examples of secondary sources used in finance and accounting include the *Wall Street Journal*, *Barron's*, *Value Line Investment Survey*, *Financial Times*, and company annual reports. Secondary sources used in marketing include sales reports and other publications. Although the data provided in these publications can be used in statistical analysis, they were not specifically collected for that use in any particular study.

Example 2.1 Primary and Secondary Sources of Data. Let us consider the following cases and then characterize each data source as primary or secondary:

1. (Finance) To determine whether airline deregulation has increased the return and risk of stocks issued by firms in the industry, a researcher collects stock data from the *Wall Street Journal* and the Compustat database. (The Compustat database contains accounting and financial information for many firms.)
2. (Production) To determine whether ball bearings meet measurement specifications, a production engineer examines a sample of 100 bearings.
3. (Marketing) Before introducing a hamburger made with a new recipe, a firm gives 25 customers the new hamburger and asks them on a questionnaire to rate the hamburger in various categories.
4. (Political science) A candidate for political office has staff members call 1,000 voters to determine what candidate they prefer in an upcoming election.
5. (Marketing) A marketing firm looks up, in *Consumer Reports*, the demand for different types of cars in the United States.

6. (Economics) An economist collects data on unemployment from a Department of Labor report.
7. (Accounting) An accountant uses sampling techniques to audit a firm's accounts receivable or its inventory account.
8. (Economics) The staff from the Department of Labor uses a survey to estimate the current unemployment rate in the United States.

The cases numbered 1, 5, and 6 illustrate the use of secondary sources; these researchers relied on existing data sets. The remainder involve primary sources because the data involved were generated specifically for that study.

The main advantage of primary data is that the investigator directly controls how the data are collected; therefore, he or she can ensure that the information is relevant to the problem at hand. For example, the investigator can design the questionnaires and surveys to elicit the most relevant information. The disadvantage of this method is that developing appropriate surveys or questionnaires requires considerable time, money, and experience. In addition, mail questionnaires are usually plagued by a low response rate. What response rate is acceptable varies with context and with other factors. A response rate of 50 % is often considered acceptable, but it is rarely achieved with mail questionnaires.

Fortunately, there are many good secondary sources of information in business, economics, and finance. Financial information such as stock prices and accounting data is easy to locate but tedious to organize. As an alternative, databases such as Compustat and CRSP (Center for Research on Securities Prices) tapes can be used. Economic data can be found in many government publications, such as the *Federal Reserve Bulletin*, the *Economic Report of the President*, and the *Statistical Abstract of the United States*. In addition, macroeconomic variables are found in databases such as that of Data Resources. Of course, not all secondary sources are unimpeachable. Possible problems include outdated data, the restrictive definitions used, and unreliability of the source.

A sample or a census may be taken from either primary or secondary data. A *census* contains information on *all* members of the population; a *sample* contains observations from a *subset* of it. A census of primary data results, for example, from the polling of all voters in a city to determine their preference for mayor. If a subset of voters in the city is asked about their preference for mayor, a sample of primary data results. These are both examples of using primary data because the data are collected for purposes of the study that is under way.

If a researcher records the prices of all the securities traded on the New York Stock Exchange for 1 day as they are listed in the *Wall Street Journal*, he or she is taking a census from a secondary source. However, if he or she takes a subset from the population—say, every fifth price—he or she is developing a sample of secondary data. Note that taking stock prices from the newspaper is an example of using secondary data because the data were not collected specifically for the study.

Given that the purpose of taking a sample is to gain information on a population, why do we not take a census every time we need information? The first reason is the high cost of taking a census. It would be extremely expensive for a pollster who

wanted information on the outcome of a presidential election to contact all the registered voters in the country. Of course, the costs of obtaining the names of voters, hiring people to conduct the survey, performing computer analysis, and carrying out research must also be incurred when taking a sample, but because the sample is usually much smaller than the population, these costs are substantially reduced.

For example, to determine Illinois voters' preferences in the 1988 presidential election, the *Chicago Tribune* sampled 766 Illinois residents who said they would vote in the election. Obviously, sampling was cheaper than contacting all Illinois adults. The poll was accurate to within five percentage points, which is an acceptable margin of error. In Chaps. 8 and 20, we will return to the topic of calculating the error in sampling.

The second advantage of sampling is accuracy. Because fewer people are contacted in a sample, the interviewers can allot more time to each respondent. In addition, the need for fewer workers to conduct the study may make it possible to select and train a more highly qualified staff of researchers. This, in turn, may result in a study of higher quality.

Another problem in taking a large census is the time involved. For example, suppose it would take at least 2 months for the *Tribune* to contact all the adults in Illinois. If the election were only 1 month away, the poll would not be of any use. In cases where the population is very large and will take a long time to reach, a sample is the more timely method of obtaining information.

This is not to suggest that a sample is always better than a census. A census is appropriate when the population is fairly small. For example, a census would be feasible if you wanted information on how the members of a small high school class intended to vote for student council president because the cost and time of contacting every member of the class would be relatively low. In contrast, a sample is more cost- and time-effective when the population is a city, state, nation, or other large entity.

There are two types of errors that can arise when we are dealing with primary or secondary data. The first is *random error*, which is the difference between the value derived by taking a random sample and the value that would have been obtained by taking a census. This error arises from the random chance of obtaining the specific units that are included in the sample. Happily, random error can be reduced by increasing the sample size, and it can be reduced to zero by taking a census. Random error can also be estimated. Using statistics, the *Chicago Tribune* was able to determine that this poll was subject to random error of plus or minus 5 %. This issue will be discussed in Part III, on sampling and statistical inference.

Systematic error results when there are problems in measurement. Unlike random error, which can occur only in sampling, systematic error can occur in both samples and census. For example, suppose that a basketball coach measures the heights of his players with an imprecise ruler. The resulting error is "systematic": the ruler distorts all measurements equally. As another example, when a researcher uses an incorrect computer program that calculates an arithmetic mean

by dividing by the number of observations plus 5, a systematic error results because the divisor should have been the number of observations.

Let us use the measurement of basketball players' heights to compare random and systematic errors. Suppose the basketball coach selects a sample of five players, measures their heights with a "good" ruler, and finds (by dividing properly) that the mean of the sample is 6 ft 1 in. If the actual average height of all the players is 6 ft 2 in., the mean random error is -1 in. A random error will result. Now suppose the coach uses a ruler that is 2 in. too short. When measuring all the players' (a census), he comes up with a population mean of 6 ft even. In this case, a systematic error of -2 in. results.

2.3 Data Presentation: Tables

All data tables have four elements: a caption, column labels, row labels, and cells. The caption describes the information that is contained in the table. The column labels identify the information in the columns, such as the gross national product, the inflation rate, or the Dow Jones Industrial Average. Examples of row labels include years, dates, and states. A cell is defined by the intersection of a specific row and a specific column.

Example 2.2 Annual CPI, T-Bill Rate, and Prime Rate. To illustrate, Table 2.1 gives some macroeconomic information from 1950 to 2010. The caption is "CPI, T-bill rate, and prime rate (1950–2010)." The row labels are the years 1950–2010. The column labels are CPI (consumer price index), 3-month T-bill rate, and prime rate. Changes in the consumer price index, the most commonly used indicator of the economy's price level, are a measure of inflation or deflation. (For a more detailed description of the CPI, see Chap. 19.) The 3-month T-bill interest rate is the interest rate that the USA Treasury pays on 91-day debt instruments, and the prime rate is the interest rate that banks charge on loans to their best customers, usually large firms. This table, then, presents macroeconomic information for any year indicated. For example, the CPI for 2010 was 218.1 and the prime rate in 2008 was 5.09 %. The relationship between the CPI and 3-month T-bill rate will be discussed in Chap. 19.

2.4 Data Presentation: Charts and Graphs

It is sometimes said that a picture is worth a thousand words, and nowhere is this statement more true than in the analysis of data. Tables are usually filled with highly specific data that take time to digest. Graphs and charts, though they are often less detailed than tables, have the advantage of presenting data in a more accessible and

Table 2.1 CPI, T-bill rate, and the prime rate (1950–2010)

Year	CPI ^a	3-Month T-bill rate	Prime rate
50	24.1	1.218	2.07
51	26	1.552	2.56
52	26.5	1.766	3
53	26.7	1.931	3.17
54	26.9	0.953	3.05
55	26.8	1.753	3.16
56	27.2	2.658	3.77
57	28.1	3.267	4.2
58	28.9	1.839	3.83
59	29.1	3.405	4.48
60	29.6	2.928	4.82
61	29.9	2.378	4.5
62	30.2	2.778	4.5
63	30.6	3.157	4.5
64	31	3.549	4.5
65	31.5	3.954	4.54
66	32.4	4.881	5.63
67	33.4	4.321	5.61
68	34.8	5.339	6.3
69	36.7	6.677	7.96
70	38.8	6.458	7.91
71	40.5	4.348	5.72
72	41.8	4.071	5.25
73	44.4	7.041	8.03
74	49.3	7.886	10.81
75	53.8	5.838	7.86
76	56.9	4.989	6.84
77	60.6	5.265	6.83
78	65.2	7.221	9.06
79	72.6	10.041	12.67
80	82.4	11.506	15.27
81	90.9	14.029	18.87
82	96.5	10.686	14.86
83	99.6	8.63	10.79
84	103.9	9.58	12.04
85	107.6	7.48	9.93
86	109.6	5.98	8.33
87	113.6	5.82	8.22
88	118.3	6.69	9.32
89	124	8.12	10.87
90	130.7	7.51	10.01
00	172.2	5.85	9.23
01	177.1	3.44	6.91
02	179.9	1.62	4.67
03	184	1.01	4.12
04	188.9	1.38	4.34

(continued)

Table 2.1 (continued)

Year	CPI ^a	3-Month T-bill rate	Prime rate
05	195.3	3.16	6.19
06	201.6	4.73	7.96
07	207.3	4.41	8.05
08	215.3	1.48	5.09
09	214.5	0.16	3.25
10	218.1	0.14	3.25

Source: Economic Report of the President, January 2010

^aCPI base: 1982–1984 = 100

memorable form. In most graphs and charts, the independent variable is plotted on the horizontal axis (the x -axis) and the dependent variable on the vertical axis (the y -axis). Frequently, “time” is plotted along the x -axis. Such a graph is known as a *time-series graph* because on it, changes in a dependent variable (such as GDP, inflation rate, or stock prices) can be traced over time.

Line charts are constructed by graphing data points and drawing lines to connect the points. Figure 2.1 shows how the rate of return on the S&P 500 and the 3-month T-bill rate have varied over time.¹ The independent variable is the year (ranging from 1990 to 2010), so this is a time-series graph. The dependent variables are often in percentages.

Figure 2.2 is a graph of the components of the gross domestic product (GDP)—personal consumption, government expenditures, private investment, and net exports—over time. This is also a time-series graph because the independent variable is time. It is a *component-parts line chart*. These series have been “deflated” by expressing dollar amounts in constant 2005 dollars. (Chap. 19 discusses the deflated series in further detail.)

Figure 2.2 is also called a *component-parts line graph* because the four parts of the GDP are graphed. The sum of the four components equals the GDP. Using this type of graph makes it possible to show the sources of increases or declines in the GDP. (The data used to generate Fig. 2.2 are found in Table 2.2.)

Bar charts can be used to summarize small amounts of information. Figure 2.3 shows the average annual returns for Tri-Continental Corporation for investment periods of seven different durations ending on September 30, 1991. This figure shows that Tri-Continental has provided investors double-digit returns during a 50-year period.

It also shows that the investment performance of this company was better than that of the Dow Jones Industrial Average (DJIA) and the S&P 500.²

¹T-bill rate data can be found in Table 2.1; rates of return on the S&P 500 can be found in Table 2.4 in Appendix 2 of this chapter. Most of the figures in this book are drawn with the Microsoft Excel PC program. The procedure for using the Excel program to draw these graphs can be found in Appendix 1 of this chapter.

²Both the DJIA and the S&P 500 will be discussed in Chap. 19 of this book.

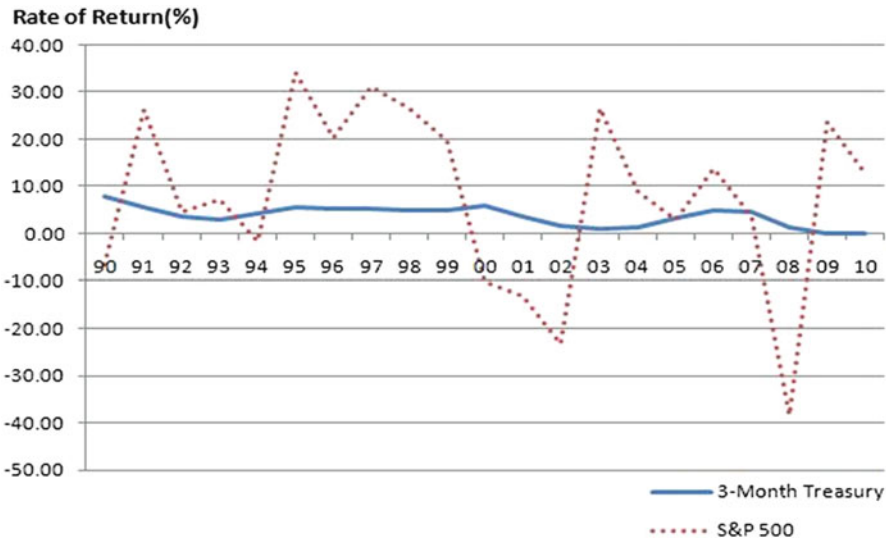


Fig. 2.1 Rates of return on S&P 500 and 3-month T-bills

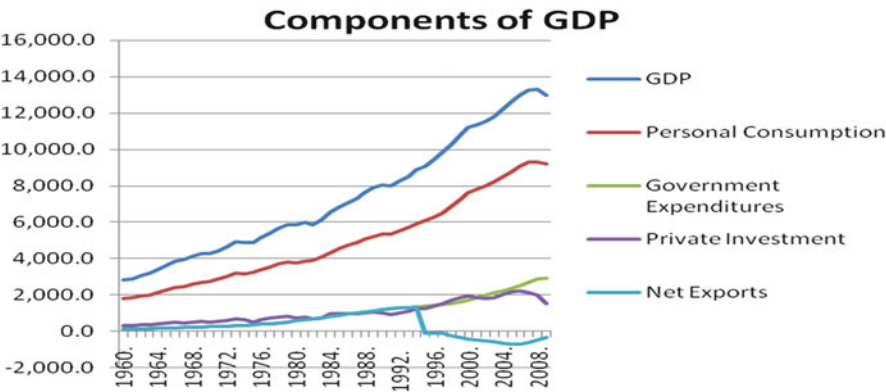


Fig. 2.2 Components of GDP (billions of 2005 dollars)

As this example illustrates, using a bar graph is most appropriate when we are comparing only a few items.

Pie charts are used to show the proportions of component parts that make up a total. Figure 2.4 shows how the US soft drink market was broken down in 1985. The two industry leaders, Coca-Cola and PepsiCo, enjoyed 40 % and 28 % of the market share, respectively. The next four largest firms (Seven-Up, Dr Pepper, Royal

Table 2.2 Annual macroeconomic data 1960–2009 (in 2005 dollars)

Year	GDP ^a	CPI ^b	3-month		Private consumption ^a	Private investment ^a	Net exports ^a	Government expenditures ^a
			T-bill rate	Prime rate				
1960	2,830.9	29.585	2.88	4.82	1,784.4	296.5	111.5	111.5
1961	2,896.9	29.902	2.35	4.50	1,821.2	294.6	119.5	119.5
1962	3,072.4	30.253	2.77	4.50	1,911.2	332.0	130.1	130.1
1963	3,206.7	30.633	3.16	4.50	1,989.9	354.3	136.4	136.4
1964	3,392.3	31.038	3.55	4.50	2,108.4	383.5	143.2	143.2
1965	3,610.1	31.528	3.95	4.54	2,241.8	437.3	151.4	151.4
1966	3,845.3	32.471	4.86	5.63	2,369.0	475.8	171.6	171.6
1967	3,942.5	33.375	4.31	5.63	2,440.0	454.1	192.5	192.5
1968	4,133.4	34.792	5.34	6.31	2,580.7	480.5	209.3	209.3
1969	4,261.8	36.683	6.67	7.95	2,677.4	508.5	221.4	221.4
1970	4,269.9	38.842	6.39	7.91	2,740.2	475.1	233.7	233.7
1971	4,413.3	40.483	4.33	5.72	2,844.6	529.3	246.4	246.4
1972	4,647.7	41.808	4.07	5.25	3,019.5	591.9	263.4	263.4
1973	4,917.0	44.425	7.03	8.02	3,169.1	661.3	281.7	281.7
1974	4,889.9	49.317	7.83	10.80	3,142.8	612.6	317.9	317.9
1975	4,879.5	53.825	5.78	7.86	3,214.1	504.1	357.7	357.7
1976	5,141.3	56.933	4.97	6.84	3,393.1	605.9	383.0	383.0
1977	5,377.7	60.617	5.27	6.82	3,535.9	697.4	414.1	414.1
1978	5,677.6	65.242	7.19	9.06	3,691.8	781.5	453.6	453.6
1979	5,855.0	72.583	10.07	12.67	3,779.5	806.4	500.7	500.7
1980	5,839.0	82.383	11.43	15.27	3,766.2	717.9	566.1	566.1
1981	5,987.2	90.933	14.03	18.87	3,823.3	782.4	627.5	627.5
1982	5,870.9	96.533	10.61	14.86	3,876.7	672.8	680.4	680.4
1983	6,136.2	99.583	8.61	10.79	4,098.3	735.5	733.4	733.4
1984	6,577.1	103.933	9.52	12.04	4,315.6	952.1	796.9	796.9
1985	6,849.3	107.600	7.48	9.93	4,540.4	943.3	878.9	878.9
1986	7,086.5	109.692	5.98	8.33	4,724.5	936.9	949.3	949.3
1987	7,313.3	113.617	5.78	8.20	4,870.3	965.7	999.4	999.4
1988	7,613.9	118.275	6.67	9.32	5,066.6	988.5	1,038.9	1,038.9
1989	7,885.9	123.942	8.11	10.87	5,209.9	1,028.1	1,100.6	1,100.6
1990	8,033.9	130.658	7.49	10.01	5,316.2	993.5	1,181.7	1,181.7
1991	8,015.1	136.167	5.38	8.46	5,324.2	912.7	1,236.1	1,236.1
1992	8,287.1	140.308	3.43	6.25	5,505.7	986.7	1,273.5	1,273.5
1993	8,523.4	144.475	3.00	6.00	5,701.2	1,074.8	1,294.8	1,294.8
1994	8,870.7	148.225	4.25	7.14	5,918.9	1,220.9	1,329.8	1,329.8
1995	9,093.7	152.383	5.49	8.83	6,079.0	1,258.9	−98.8	1,374.0
1996	9,433.9	156.858	5.01	8.27	6,291.2	1,370.3	−110.7	1,421.0
1997	9,854.3	160.525	5.06	8.44	6,523.4	1,540.8	−139.8	1,474.4
1998	10,283.5	163.008	4.78	8.35	6,865.5	1,695.1	−252.6	1,526.1
1999	10,779.8	166.583	4.64	7.99	7,240.9	1,844.3	−356.6	1,631.3
2000	11,226.0	172.192	5.82	9.23	7,608.1	1,970.3	−451.6	1,731.0
2001	11,347.2	177.042	3.39	6.92	7,813.9	1,831.9	−472.1	1,846.4
2002	11,553.0	179.867	1.60	4.68	8,021.9	1,807.0	−548.8	1,983.3
2003	11,840.7	184.000	1.01	4.12	8,247.6	1,871.6	−603.9	2,112.6

(continued)

Table 2.2 (continued)

Year	GDP ^a	CPI ^b	3-month T-bill rate	Prime rate	Private consumption ^a	Private investment ^a	Net exports ^a	Government expenditures ^a
2004	12,263.8	188.908	1.37	4.34	8,532.7	2,058.2	-688.0	2,232.8
2005	12,638.4	195.267	3.15	6.19	8,819.0	2,172.2	-722.7	2,369.9
2006	12,976.2	201.550	4.73	7.96	9,073.5	2,230.4	-729.2	2,518.4
2007	13,254.1	207.335	4.35	8.05	9,313.9	2,146.2	-647.7	2,676.5
2008	13,312.2	215.247	1.37	5.09	9,290.9	1,989.4	-494.3	2,883.2
2009	12,988.7	214.549	0.15	3.25	9,237.3	1,522.8	-353.8	2,933.3

Source: Department of Commerce (Bureau of Economic Analysis), Economic Report of the President, February 2010

^aBillions of 2005 dollars

^bCPI base: 1982–1984 = 100

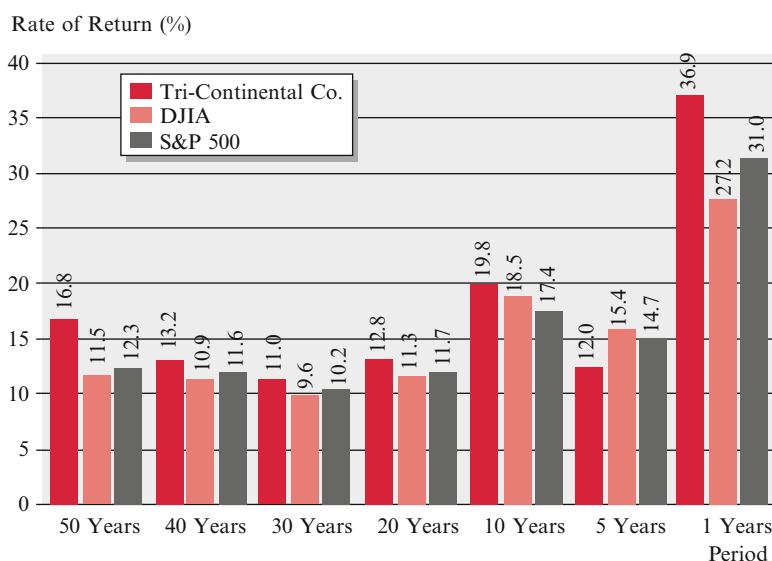


Fig. 2.3 Average annual returns for Tri-Continental Corporation for investment periods of seven different durations ending on September 30, 1991 (Source: *Wall Street Journal*, November 18, 1991, p. C5)

Crown, and Cadbury Schweppes) accounted for 21.8 % of the market, and the remaining 10.2 % of the market was divided among still smaller companies.

2.5 Applications

In the last several sections, we have drawn primarily on macroeconomic data to show how tables and graphs can be used to examine various economic variables. In this section, we will use the same tabular and graphical tools to analyze financial and accounting data that are important in financial analysis and planning. We also will see how Congress voted on the Gulf Resolution.

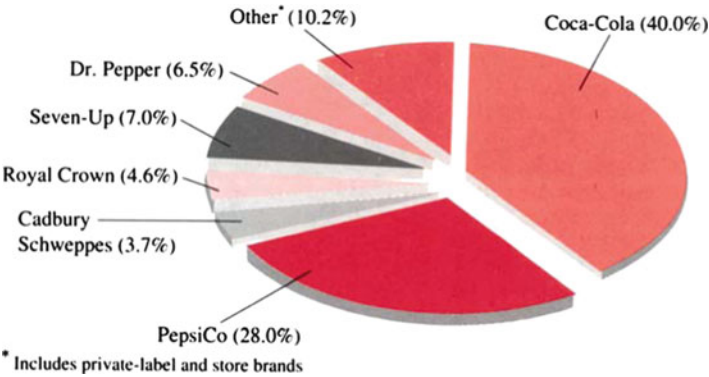


Fig. 2.4 US soft drink market breakdown (1985) (Data: *Beverage Digest*, Montgomery Securities. Source: *Business Week*)

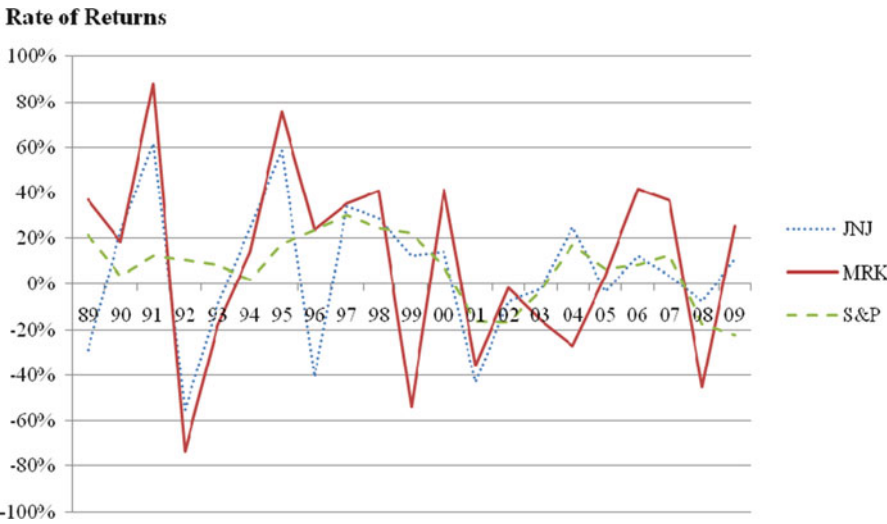


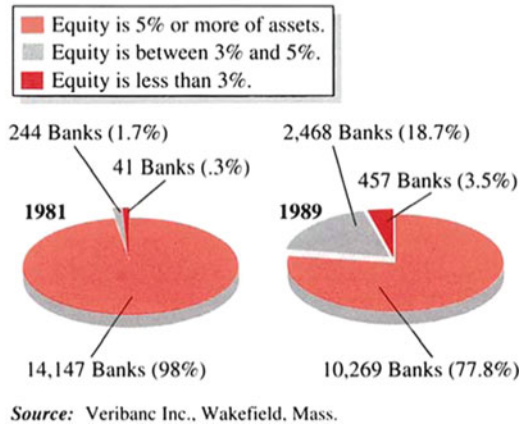
Fig. 2.5 Rates of return for S&P 500, Johnson & Johnson, and Merck

Application 2.1 Analysis of Stock Rates of Return and Market Rates of Return. Stock prices and stock indexes are two familiar measures of stock market performance. In addition to these indicators, percentage rates of return can be calculated to determine how well a particular stock—or the stock market overall—is doing.

Figure 2.5 is a line graph of yearly rates of return for Johnson & Johnson, Merck, and the S&P 500, which, as we have noted, is a market index. The yearly rates of return have been similar for the three. This indicator has fluctuated relatively

Fig. 2.6 How healthy is your bank? (Source: *Home News*, January 6, 1991. Reprinted by permission of The Associated Press)

Federal Reserve Board data for commercial banks, December 1981 and 1989. Banks are classified according to equity.



similar as well for the Merck stock and Johnson & Johnson stock, while the overall market (as gaged by the S&P 500) has varied least of all.³

Application 2.2 Financial Health of the Banking Industry: 1981 Versus 1989.

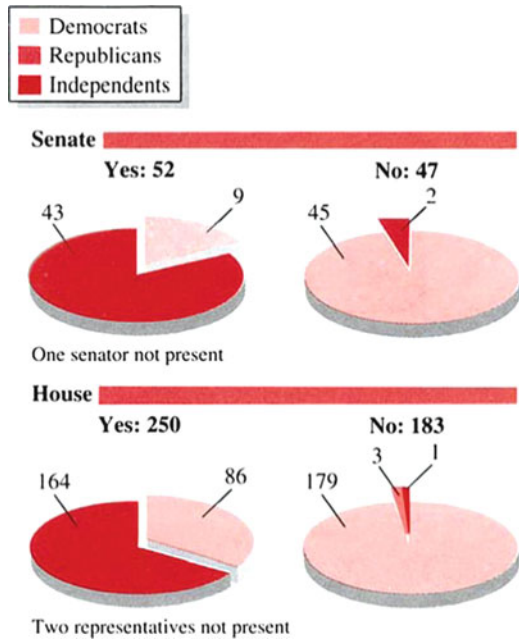
On January 6, 1991, the business section of the *Home News* (a central New Jersey newspaper) printed an Associated Press article that used two pie charts prepared by VERIBANC Inc., a financial rating service. The pie charts, presented in Fig. 2.6, compare the financial condition of the US commercial banks in 1981 to their condition in 1989. These two pie charts show that the percentage of nonproblem banks (those whose equity is 5 % or more of their assets) has fallen from 98 % to 77.8 %, revealing that the probability that depositors are dealing with a problem-plagued bank has increased about 11 times.⁴ In view of this deterioration, the article offers the following five tips to anyone shopping for a new financial institution:

1. Determine whether deposits are protected by federal deposit insurance, which covers deposits of up to \$100,000.
2. Research any state deposit insurance funds.
3. Investigate the institution's history.
4. Check new reports for the health of specific banks and other industry trends.
5. Ask the bank for its yearly financial statement. Or contact federal bank regulators for the institution's quarterly statement of financial condition and its income statement.

³ Rates of return for Johnson & Johnson and Merck and market rates of return are analyzed in more detail in [Appendix 2](#).

⁴ Eleven times can be calculated as $\frac{1.0-.778}{1.0-.98} = .111$.

Fig. 2.7 How congress voted on the Gulf Resolution
(Source: *Home News*, January 6, 1991. Reprinted by permission of The Associated Press)



Application 2.3 How Congress Voted on the Gulf Resolution. Following a heated debate, Congress voted to grant President Bush the power to go to battle against Iraq if the Iraqis did not withdraw from Kuwait by January 15, 1991.

As indicated in the pie chart in Fig. 2.7, the Senate vote of 52–47 and the House vote of 250–183 authorized President Bush to use military force against Iraq. Among those voting *yes* were 43 Republican senators, 9 Democratic senators, 164 Republicans in the House of Representatives, and 86 Democrats in the House of Representatives; among those voting *no* were 2 Republican senators and 45 Democratic senators. In the House, 3 Republicans, 179 Democrats, and 1 independent voted *no*. In terms of percentages, about 52.53 % of the Senate and 57.74 % of the House voted to support the Gulf Resolution. One senator and two representatives were not present.

Application 2.4 Bar Charts Reveal How Several Economic Indicators Are Related. In *Time* magazine, November 1991, eight bar charts showed how economic conditions fluctuated during 1989–1991.

To stimulate the economy, policy decision makers at the Fed lowered interest rates. Mortgage rates dropped from 10.32 % in 1989 to 8.76 % in 1991, while auto loan rates dropped from 12.27 % to 11.78 %. Despite these lower interest rates, both housing starts and auto sales experienced surprising declines. Figure 2.8a–h gives a clear picture of these relationships.

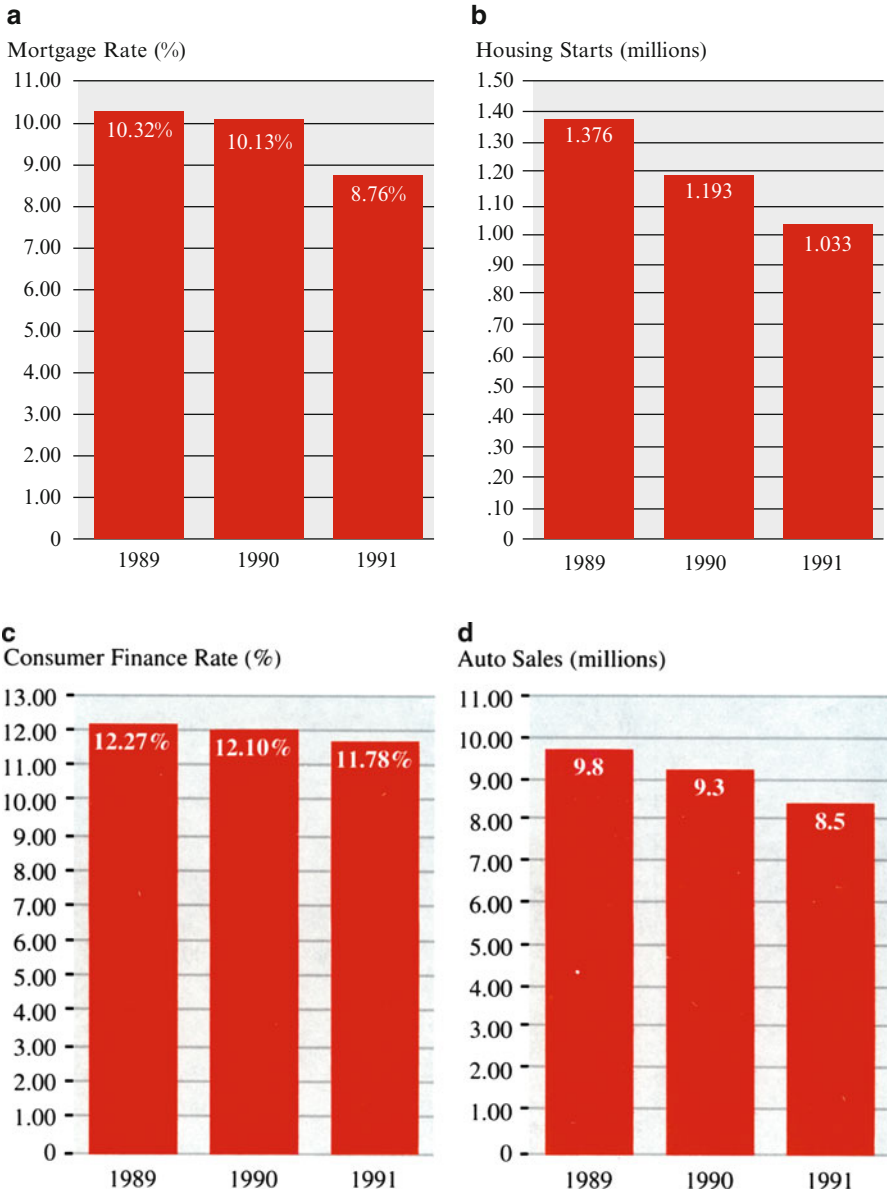


Fig. 2.8 (continued)

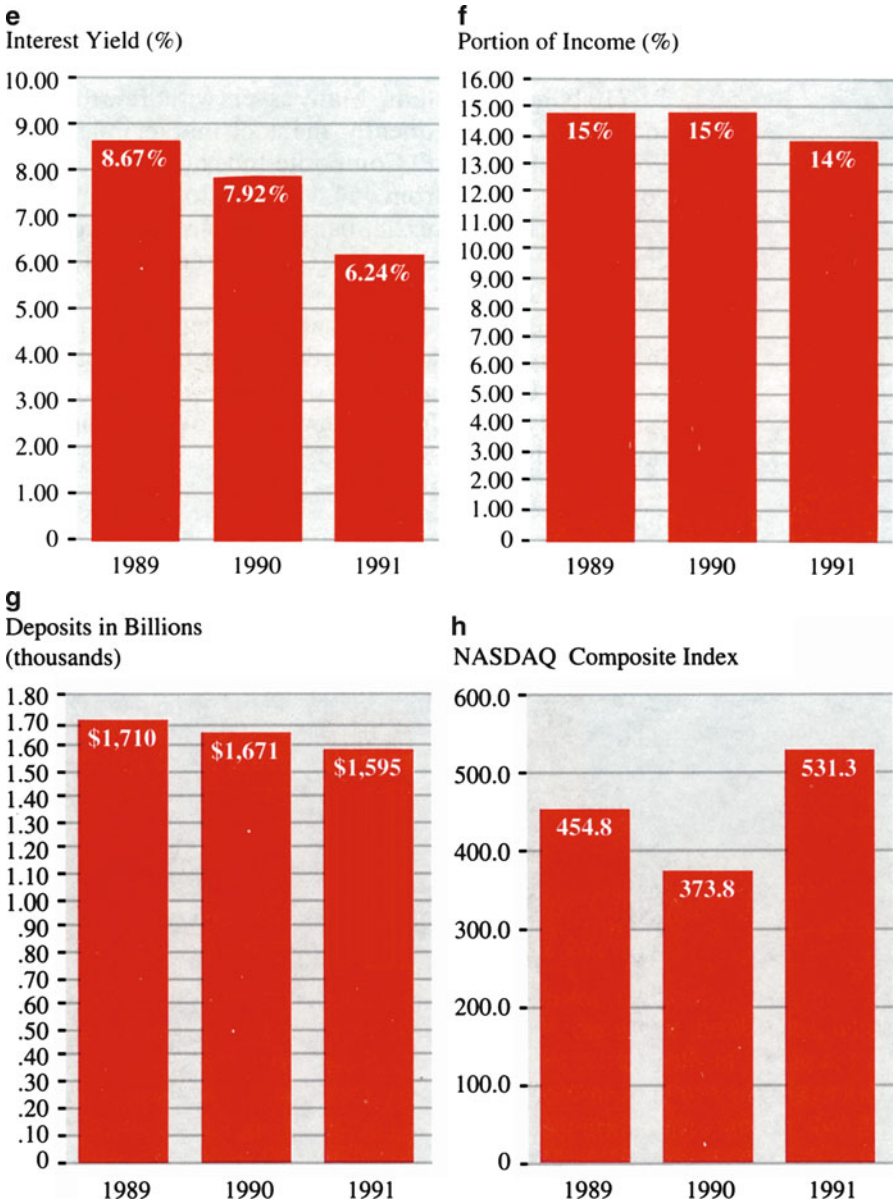


Fig. 2.8 Eight macroeconomic indicators: (a) mortgage rates, (b) housing starts, (c) consumer finance rate for auto loans, (d) domestic auto sales, (e) 1-year CD interest yield, (f) portion of income derived from interest, (g) time and savings account deposits, and (h) NASDAQ Composite Index (Source: Adapted from “Statistics for Business and Economics.” *TIME* Magazine, November 25, 1991. Copyright 1991 the Time, Inc. Magazine Company. Reprinted by permission)

Because interest rates such as that on 1-year CDs declined (specifically, from 8.67 % to 6.24 %) over the 3-year period, the proportion of savers' income derived from interest also went down (from 15 % in 1989 and 1990 to 14 % in 1991).

During these 3 years, time deposits and savings account deposits sank from \$1,710 billion to \$1,595 billion. Many savers withdrew their savings to invest them in the stock market. Consequently, the stock market indexes went up dramatically. For example, the NASDAQ Composite Index (an index compiled from over-the-counter stock) fluctuated from 454.8 in 1989 to 373.8 in 1990 to 531.3 in 1991.

As we can see in Fig. 2.8, bar charts can very effectively and clearly show changes in economic conditions. Common sense is all that the viewer needs to interpret the charts.

We discussed some of the data analysis related to Fig. 2.8a–h in this chapter; in later chapters, we will discuss it further, using more sophisticated statistical methods. These bar charts give us a great deal of information. And other statistical analysis related to this set of information will improve our understanding of macroeconomic analysis.

2.6 Summary

Good data are essential in business and economic decision making. Hence, it is important to be familiar with the sources of business and economic data and to know how these data can be collected.

Data for a census or a sample can be gleaned from both primary and secondary sources. However, we must guard against random error when using a sample and against systematic error in all our data collection.

Because we want to use sample data to make inferences about the population from which they are drawn, it is important for us to be able to present the data effectively. Tables and charts are two simple methods for presenting data. Line charts, bar charts, and pie charts are three basic and important graphical methods for describing data. In the next chapter, we will discuss other tabular and graphical methods for describing data in a more sophisticated and detailed manner.

Questions and Problems

1. What is a primary source of data? Give two examples of primary sources of data.
2. What is a secondary source of data? Give two examples of secondary sources of data.
3. What is a sample? What is a census? What advantages does using a sample have over using a census? Are there any advantages to using a census?
4. What two types of error might we encounter when dealing with primary and secondary sources of data?

5. Explain how the following can be used to present data.

- (a) Line chart
- (b) Component-parts line chart
- (c) Bar chart

6. Frederick Hallock is approaching retirement with a portfolio consisting of cash and money market fund investments worth \$135,000, bonds worth \$165,000, stocks worth \$185,000, and real estate worth \$1,200,000. Present these data in a bar chart.

7. LaPoint Glass Company has the following earnings before interest and taxes (EBIT) and profits (EBIT and profits are in millions of dollars).

Year	1988	1989	1990	1991
EBIT	3.3	3.3	4.1	5.5
Profits	1.6	1.8	2.1	2.8

Present these data in a bar chart by hand and by using Lotus 1-2-3.

8. Of 354 MBA students, the following numbers chose to concentrate their study in these fields: 35 in finance, 63 in accounting, 70 in marketing, 35 in operations management, 52 in management information systems, 56 in economics, and 43 in organizational behavior. Present these data in a pie chart.

9. Use the data in Table 2.1 to draw line charts for the following:

- (a) GNP
- (b) CPI
- (c) GNP and CPI
- (d) 3-month T-bill rate and prime rate

10. Study Fig. 2.2, and comment on the relationship between GNP and private consumption.

11. Using the data in Fig. 2.3, analyze the average rates of return for

- (a) The DJIA
- (b) The S&P 500
- (c) Tri-Continental Corporation

12. Using the graph in Fig. 2.17, answer the following questions:

- (a) Which company has the higher current ratio?
- (b) Which company's current ratio appears to be more stable over time?

13. Using the graph in Fig. 2.19, carefully explain the relationship between Ford's inventory turnover and GM's.

14. You are given the following information about a certain company's current assets over the past 4 years:

	<i>Years</i>			
	1988	1989	1990	1991
Current assets				
Cash and marketable securities	4,215	5,341	6,325	5,842
Receivables	6,327	6,527	7,725	6,750
Inventories	9,254	9,104	10,104	11,100
Other current assets	2,153	3,277	4,331	3,956

Use a component-lines graph to plot this firm's current assets.

15. Explain under what conditions it is best to use a pie chart to present data.
16. Using the data given in question 14, present the components of total current assets for 1990 in two pie charts, one drawn by hand and one by using Microsoft Excel.
17. A statistics teacher has given the following numbers of the traditional grades to her class of 105 students:

Number of students	Grade
10	A
30	B
50	C
10	D
5	E

- (a) Use a bar graph to show the distribution of grades.
 - (b) Use a pie chart to show the distribution of grades.
 - (c) Which of these graphs do you think is best for presenting the distribution of grades? Why?
18. Using the data in Table 2.5, show the distribution of current assets for 1996 in a pie chart and a bar chart. Which of these graphs do you think is best for presenting the data?
19. The following table gives the sales figures for five products manufactured by Trends Clothing Company, your employer.

Item	Sales
Sweaters	\$5 million
Shirts	12 million
Pants	9 million
Blazers	16 million
Overcoats	7 million

The president of the company asks you for a report showing how sales are distributed among the five goods. What type of chart would you use?

20. Explain the benefits of graphs over tables in presenting data.
21. In the course of researching the benefits of diversification, you collect the information given in the table on page 47 (top), which presents rates of return for different portfolios.

- (a) Use a line chart to plot the 20-year return for all five portfolios.
 (b) What information do these plots provide?

Year	Stocks ^a	Bonds ^b	$\frac{1}{3}$ stocks		
			60 % stocks 40 % bonds	$\frac{1}{3}$ bonds $\frac{1}{3}$ cash	BB&K Index ^c
1970	4.01 %	12.10 %	7.52 %	7.98 %	4.7 %
1971	14.31	13.23	14.14	10.83	13.7
1972	18.98	5.68	13.54	9.38	15.1
1973	-14.66	-1.11	-9.11	-3.03	-2.2
1974	-26.47	4.35	-14.88	-5.44	-6.6
1975	37.20	9.19	25.65	17.04	19.6
1976	23.84	16.75	21.18	15.19	11.5
1977	-7.18	-.67	-4.57	-0.94	6.1
1978	6.56	-1.16	3.65	4.40	13.0
1979	18.44	-1.22	10.28	9.14	11.5
1980	32.42	-3.95	17.45	13.17	17.9
1981	-4.91	1.85	-1.99	4.06	6.4
1982	21.41	40.35	28.98	23.97	14.4
1983	22.51	.68	13.43	10.52	15.4
1984	6.27	15.43	10.11	10.75	10.4
1985	32.16	30.97	31.85	23.38	25.4
1986	18.47	24.44	21.11	16.61	23.3
1987	5.23	-2.69	3.59	3.92	8.6
1988	16.81	9.67	13.97	11.01	13.2
1989	31.49	18.11	26.24	19.22	14.3
Compound annual return	11.55	9.00	10.89	9.78	11.54

Source: Bailard, Biehl & Kaiser, Ibbotson Associates, Inc. This figure was printed in the *Wall Street Journal* on January 25, 1990, p. C1

^aStandard & Poor's 500 index

^bLong-term Treasury bonds

^c20 % US stocks, 20 % bonds, 20 % cash, 20 % real estate, 20 % foreign stocks

22. Use the data given in question 21 to construct a bar graph for 1985 through 1989.
23. You are given the following exchange rate information for the number of dollars it takes to buy 1 British pound and the number of dollars it takes to buy 100 Japanese yen:

Month	\$/BP	\$/100 yen
Jan 88	1.7505	.7722
Feb 88	1.7718	.7782
Mar 88	1.8780	.8042
Apr 88	1.8825	.8015
May 88	1.8410	.7995
Jun 88	1.7042	.7475
Jul 88	1.7160	.7533

(continued)

Month	\$/BP	\$/100 yen
Aug 88	1.6808	.7307
Sep 88	1.6930	.7477
Oct 88	1.7670	.7951
Nov 88	1.8505	.8227
Dec 88	1.8075	.8013

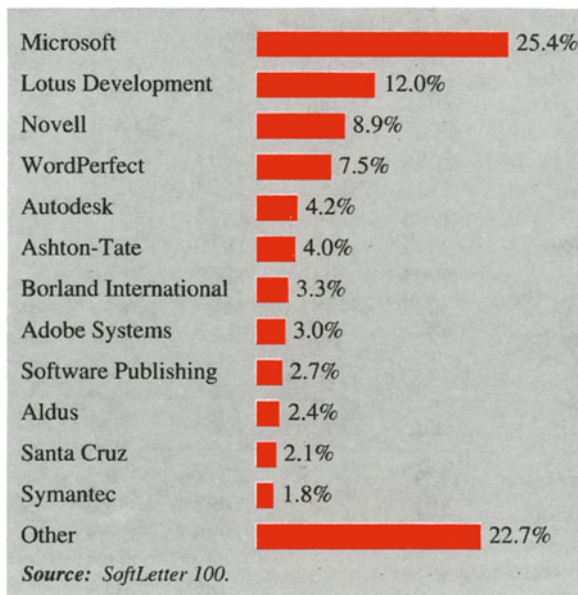
- (a) Draw a line chart showing the exchange rates between British pounds (BP) and US dollars during this period.
- (b) Draw a line chart showing the exchange rates between Japanese yen and US dollars.
- (c) Use Microsoft Excel to draw a line chart containing the exchange rates in *a* and a line chart representing the exchange rates in *b*.
24. You are given the following financial ratios for Johnson & Johnson and for the pharmaceutical industry:

Year	<i>Current ratio</i>		<i>Inventory Turnover</i>	
	Industry	J&J	Industry	J&J
79	2.30	2.73	2.17	2.71
80	2.29	2.55	2.22	2.70
81	2.18	2.50	2.34	2.78
82	2.12	2.50	2.30	2.38
83	2.12	2.66	2.34	2.28
84	2.09	2.41	2.40	2.37
85	2.19	2.47	2.27	2.45
86	1.91	1.40	2.38	2.33
87	1.86	1.86	2.24	2.27
88	1.93	1.88	2.27	2.32

Year	<i>ROA</i>		<i>Price/earnings</i>	
	Industry	J&J	Industry	J&J
79	.11	.12	12.04	13.76
80	.11	.12	15.03	15.35
81	.10	.12	28.02	14.79
82	.11	.12	15.19	17.79
83	.11	.11	14.56	15.90
84	.10	.11	14.88	13.14
85	.10	.12	17.98	15.66
86	.10	.06	23.46	35.47
87	.09	.13	35.09	15.50
88	.12	.14	15.98	14.88

- (a) Draw a line chart showing the current ratio over time for the industry and for J&J, and compare the two.
- (b) Use a bar graph to present the data for the industry and J&J's current ratio.

25. Repeat question 24 for inventory turnover.
26. Repeat question 24 for return on total assets (ROA).
27. Repeat question 24 for the price/earnings ratio.
28. An August 27, 1991, *Wall Street Journal* article reported that increasing numbers of small software firms are being absorbed by that industry's biggest companies. According to WSJ, the result of this dominance by a few giants is that the industry has become much tougher for software entrepreneurs to break into. The newspaper printed the chart given in the accompanying figure to depict the breakdown of market share among software companies. Refer to this chart to answer the following questions:
- (a) List the companies in descending order of market share.
 - (b) What is the combined market share for Lotus Development and WordPerfect?
 - (c) What is the combined market share for Micro soft, Lotus Development, and Novell?



From entrepreneurs to corporate giants: market share among the top 100 software companies, based on total 1990 revenue of \$5.7 billion.

29. The results of the 1991 city council election (voters could vote for more than one person) in Monroe Township, New Jersey, were

Nalitt	4,656
Riggs	4,567
Anderson	4,140
Miller-Paul	4,142
	17,505

Use a pie chart to present the results of the election.

30. Redo question 29 using a bar chart. Which method is better for presenting these election results?

To answer questions 31–37, refer to the table, which gives the rankings for team defense and offense for NFC teams for the first 9 weeks of the 1991 season. Rankings of team defense and offense for NFC teams in the 1991 season (rankings based on averages a game)

	NFC team defense			Avg.
	<i>Yds</i>	<i>Rush</i>	<i>Pass</i>	
Philadelphia	1,955	715	1,240	217.2
New Orleans	2,035	562	1,473	226.1
Washington	2,325	830	1,495	258.3
San Francisco	2,460	851	1,609	273.3
New York	2,551	959	1,592	283.4
Tampa Bay	2,652	1,065	1,587	294.7
Chicago	2,665	950	1,715	296.1
Green Bay	2,684	775	1,909	298.2
Atlanta	2,728	1,202	1,526	303.1
Dallas	2,736	863	1,873	304.0
Minnesota	3,097	1,147	1,950	309.7
Detroit	2,799	932	1,867	311.0
Phoenix	3,277	1,381	1,896	327.7
Los Angeles	2,986	959	2,027	331.8

	NFC team offense			Avg.
	<i>Yds</i>	<i>Rush</i>	<i>Pass</i>	
San Francisco	3,392	1,178	2,214	376.9
Washington	3,019	1,337	1,682	335.4
Dallas	2,969	970	1,999	329.9
New York	2,842	1,254	1,588	315.8
Minnesota	3,095	1,328	1,767	309.5
Atlanta	2,768	998	1,770	307.6
Detroit	2,705	1,070	1,635	300.6
New Orleans	2,665	918	1,747	296.1
Chicago	2,662	1,006	1,656	295.8
Los Angeles	2,515	748	1,767	279.4
Phoenix	2,636	897	1,739	263.6
Philadelphia	2,319	688	1,631	257.7
Green Bay	2,250	650	1,600	250.0
Tampa Bay	2,142	779	1,363	238.0

Source: *USA TODAY*, November 7, 1991, p. 11C

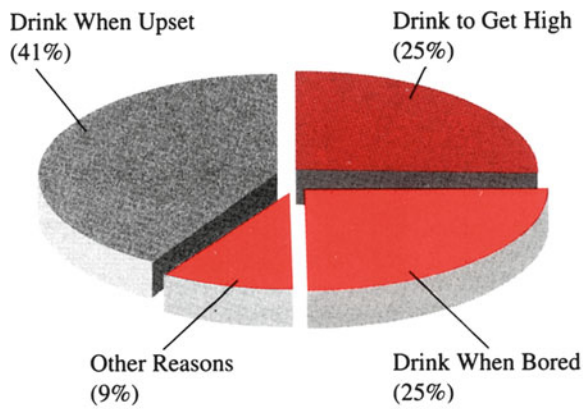
31. Use a pie chart to show how San Francisco's total team offense is divided between rush and pass.
32. Use a pie chart to show how Phoenix's total team defense is divided between rush and pass.
33. Use a bar chart to show the total pass offense for the 14 NFC teams.
34. Repeat question 33 for rush offense.
35. Repeat question 33 for pass defense.
36. Repeat question 33 for rush defense.
37. Use the graphs from questions 33–36 to answer the following questions;
 - (a) Which team has the best pass offense?
 - (b) Which team has the best pass defense?
 - (c) Which team has the best rush offense?
 - (d) Which team has the best rush defense?
38. The following table is a table of salaries for the top NHL forwards and defensemen:
 - (a) Use a bar chart to show the players' salaries.
 - (b) Do you think the bar chart is a better vehicle than a table for comparing players' salaries?

Salary comparisons for top NHL forwards and defensemen

Position	Name	Team	Gross salary (\$ millions)
C	Wayne Gretzky	Los Angeles Kings	\$3
C	Mario Lemieux	Pittsburgh Penguins	\$2.338
RW	Brett Hull	St. Louis Blues	\$1.5
C	Pat LaFontaine	Buffalo Sabres	\$1.4
C	Steve Yzerman	Detroit Red Wings	\$1.4
LW	Kevin Stevens	Pittsburgh Penguins	\$1.4
LW	Luc Robitaille	Los Angeles Kings	\$1.3
C	John Cullen	Hartford Whalers	\$1.2
D	Ray Bourque	Boston Bruins	\$1.2
D	Scott Stevens	New Jersey Devils	\$1.155

Source: *USA TODAY*, October 7, 1991, p. 8C

39. The accompanying pie chart presents data on why teenagers drink. Use information shown in the pie chart to answer the following questions:
 - (a) For what reason do the highest numbers of teenagers drink?
 - (b) What percentage of teenagers drink because they are bored or because they are upset?

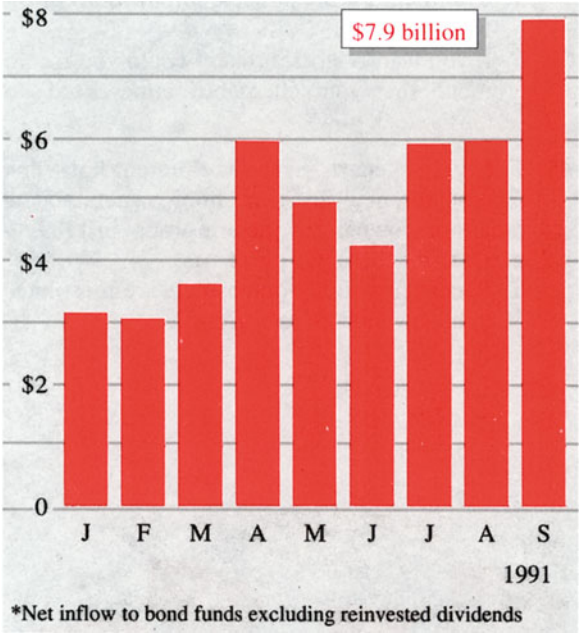


Source: National Council on Alcoholism and Drug Dependence. Surgeon General survey. *USA TODAY*, November 5, 1991. Copyright 1991, *USA TODAY*. Reprinted with permission.

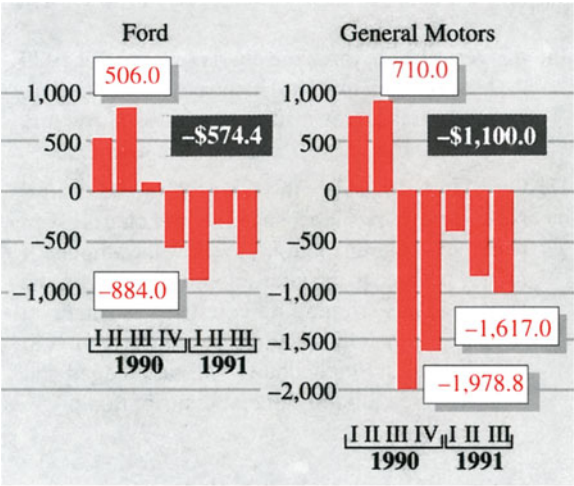
To answer questions 40–42, use the following results of the election to the General Assembly from one New Jersey district in 1991.

Batten	17,026
Lookabaugh	17,703
LoBiondo	27,452
Gibson	24,735

- 40. Use a bar graph to show the distribution of votes.
- 41. Use a pie chart to show the distribution of votes.
- 42. Which type of graph presents these data more effectively?
- 43. The following bar graph shows net purchases of bond mutual funds. Does this graph tell us anything?

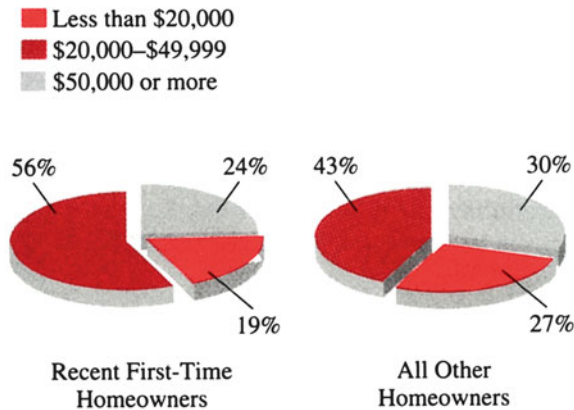


44. On November 9, 1991, the *Home News* of central New Jersey used the bar chart given in the accompanying figure to show quarterly net income or losses for both Ford and GM.



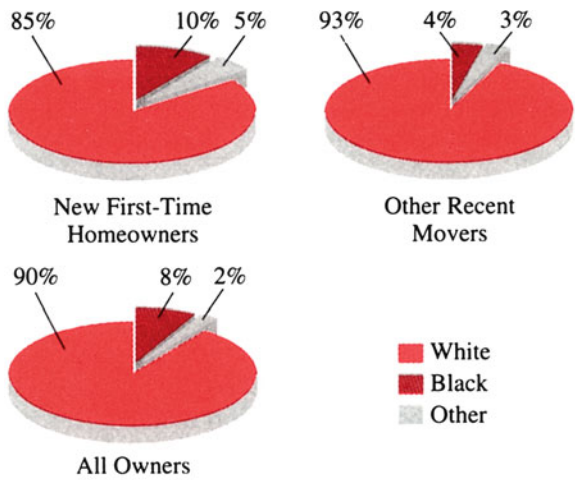
Source: Company reports, news reports. Reprinted by permission of Knight-Ridder Tribune News.

- (a) Comment on the possible implications of this bar chart.
- (b) If you were a stock broker, would you recommend that your client buy either Ford's or GM's stock now?
45. The two pie charts given here present household income for new first-time homeowners and all other homeowners, by income group, in 1989.
- (a) Describe these two pie charts.
- (b) Recent first-time homeowners are most likely to be in which income group?



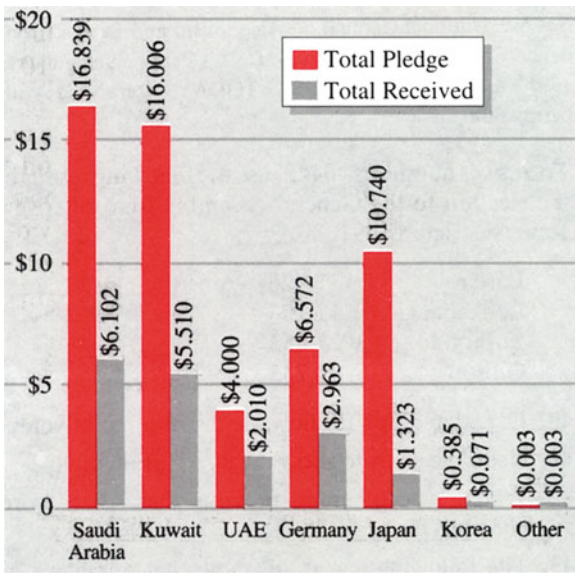
Source: U.S. Census Bureau. AP. *Home News*, October 31, 1991.

46. (a) Describe the three pie charts (in terms of 1989 home ownership data) in the next column (top).
- (b) Do members of minority groups show any gains among new first-time homeowners?
47. On March 20, 1991, the *Home News* (a central New Jersey newspaper) used the bar charts given here (next column, bottom) to show the amount of money pledged to, and the amount received by, the United States from allied countries as financial support for the Gulf War. Use the information in this chart to draw pie charts of total pledged and total received allied financial contribution.
- Analysis. (Hint: Use the pie chart.)



Source: U.S. Census Bureau. *Home News*, October 31, 1991. AP/Ed De Gasero, reprinted by permission of The Associated Press.

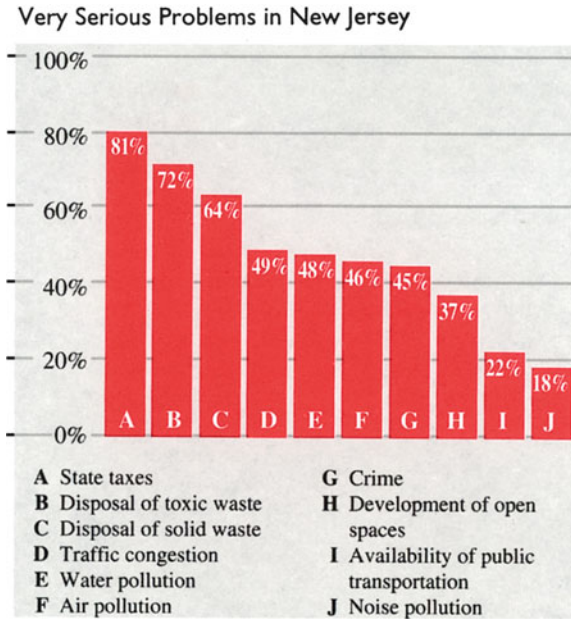
Figures in billions of dollars



Source: Senate Appropriations Committee. *Home News*, March 20, 1991. Reprinted by permission of The Associated Press.

48. On March 14, 1991, the *Home News* (a central New Jersey newspaper) used the bar chart given here to show what problems New Jerseyans considered “very serious.”

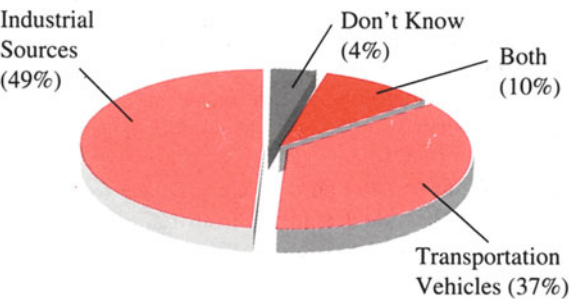
- What do New Jerseyans consider the most serious problem?
- Is traffic congestion regarded as more serious than crime? Explain your answer.



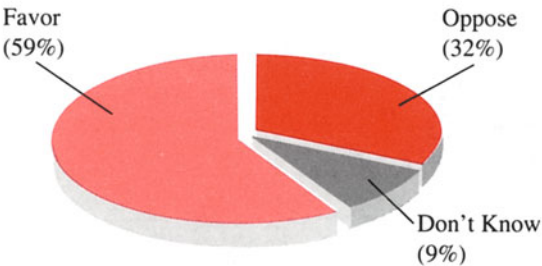
Source: Project: CLEAN AIR/Eagleton Institute of Politics.
Home News, March 14, 1991. Reprinted with permission of the publisher.

49. On March 14, 1991, the *Home News* used two pie charts (next column, top) to show (1) the main causes of air pollution in New Jersey and (2) people’s attitudes toward using increased taxes to reduce air pollution. Discuss the implications of these two pie charts and of the bar chart given in question 48.

Main Cause of Air Pollution in New Jersey

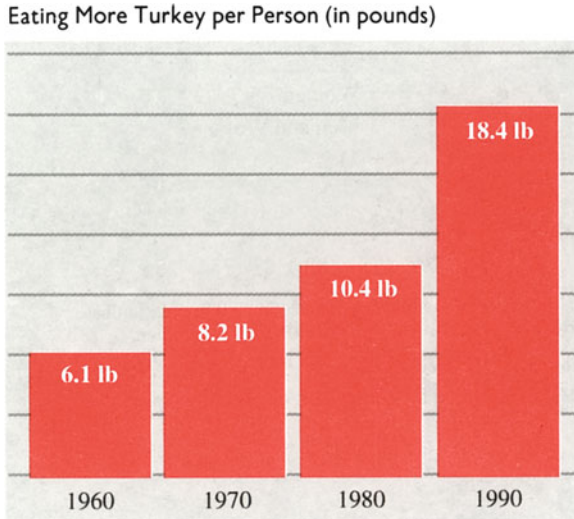


Attitudes Toward Using Increased Taxes to Reduce Air Pollution

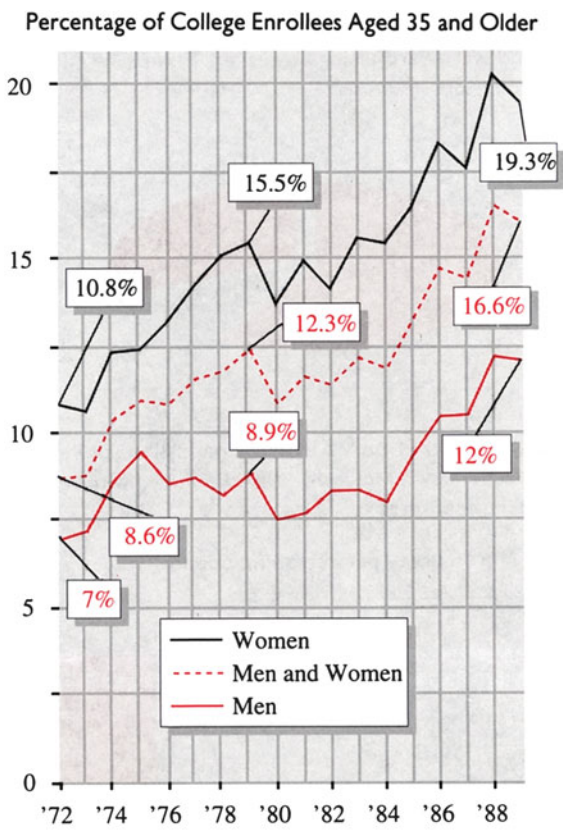


Source: Project: CLEAN AIR/Eagleton Institute of Politics. From *Home News*, March 14, 1991. Reprinted with permission of the publisher.

50. The *Home News* used this bar chart (next column, bottom) on page D1 of its November 20, 1991, issue to depict the increasing popularity of turkey not just at holiday meals but throughout the year.
- (a) How much turkey was consumed per person in 1960–1990, respectively?
 - (b) How much has per person consumption of turkey increased from 1970 to 1990?



51. The following line chart was printed in the *Home News* on page A1 of its November 22, 1991, issue to show the increase in the number of college students over age 35 during the period of 1972–1989.
- (a) Percentage wise, did more men or more women over 35 years old attend college during this 18-year period?
 - (b) What was the percentage increase for older female college students from 1977 to 1989?
 - (c) What was the percentage increase for college students over age 35 from 1972 to 1989?



Note: Several methods used on estimated population base by the U.S. Census Bureau to calculate percentage.

Source: U.S. Census Bureau. *Home News*, November 22, 1991. Reprinted by permission of The Associated Press.

Appendix 1: Using Microsoft Excel to Draw Graphs

This appendix explains how to use Microsoft Excel to draw graphs. Eight steps are involved: entering Microsoft Excel, preparing the data, and drawing the graph(s):

- Stage 1: Start Excel and enter data for Johnson & Johnson and Merck as shown in Fig. 2.9.
- Stage 2: Select the data to be graphed as shown in Fig. 2.10.
- Stage 3: From the Insert Menu, choose Line on charts option as shown in Fig. 2.11 to get the 2-D line chart as shown in Fig. 2.12.
- Stage 4: Choose the Select Data on Chart Tools as shown in Fig. 2.12.

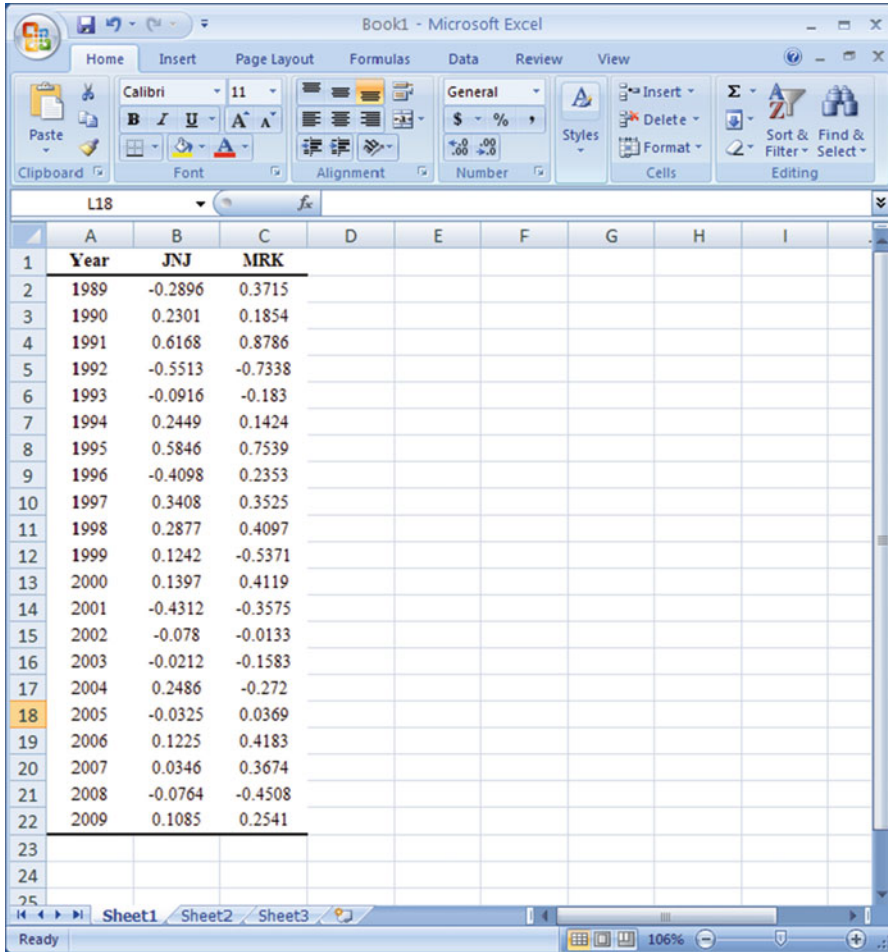


Fig. 2.9 Rates of return for JNJ and MRK

Stage 5: Choose Year and press Remove as shown in Fig. 2.13. Then press Edit to select axis labels as shown in Fig. 2.14.

Stage 6: Select Cell A2 to Cell A22 in Axis label range as shown in Fig. 2.14 and press OK.

Stage 7: Press OK on Select Data Source again, and then we can get the chart as shown in Fig. 2.15. Press Move Chart on Chart Tools, select New sheet, and press OK. The finished chart is shown in Fig. 2.16.

Microsoft Excel has strong charting features. With more work, the chart in Fig. 2.16 can look like the chart in Fig. 2.17.

Book1 - Microsoft Excel																	
Home			Insert		Page Layout		Formulas		Data		Review		View				
Clipboard			Font			Alignment			Number			Styles		Cells		Editing	
A1											Year						
	A	B	C	D	E	F	G	H	I								
1	Year	JNJ	MRK														
2	1989	-0.2896	0.3715														
3	1990	0.2301	0.1854														
4	1991	0.6168	0.8786														
5	1992	-0.5513	-0.7338														
6	1993	-0.0916	-0.183														
7	1994	0.2449	0.1424														
8	1995	0.5846	0.7539														
9	1996	-0.4098	0.2353														
10	1997	0.3408	0.3525														
11	1998	0.2877	0.4097														
12	1999	0.1242	-0.5371														
13	2000	0.1397	0.4119														
14	2001	-0.4312	-0.3575														
15	2002	-0.078	-0.0133														
16	2003	-0.0212	-0.1583														
17	2004	0.2486	-0.272														
18	2005	-0.0325	0.0369														
19	2006	0.1225	0.4183														
20	2007	0.0346	0.3674														
21	2008	-0.0764	-0.4508														
22	2009	0.1085	0.2541														
23																	
24																	
25																	

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Fig. 2.10 Data to be graphed

Appendix 2: Stock Rates of Return and Market Rates of Return

Table 2.3 presents data on earnings per share (EPS), dividends per share (DPS), and price per share (PPS) for Johnson & Johnson, Merck, and the S&P 500 during the period 1988–2009. Table 2.4 shows rates of return for Johnson & Johnson, Merck, and the S&P 500, calculated from the data in Table 2.3.

The formula for calculating the rate of return, R_{jt} , on the j th individual stock in period t is

$$R_{jt} = \frac{P_{jt} - P_{jt-1} + d_{jt}}{P_{jt-1}} \quad (2.1)$$

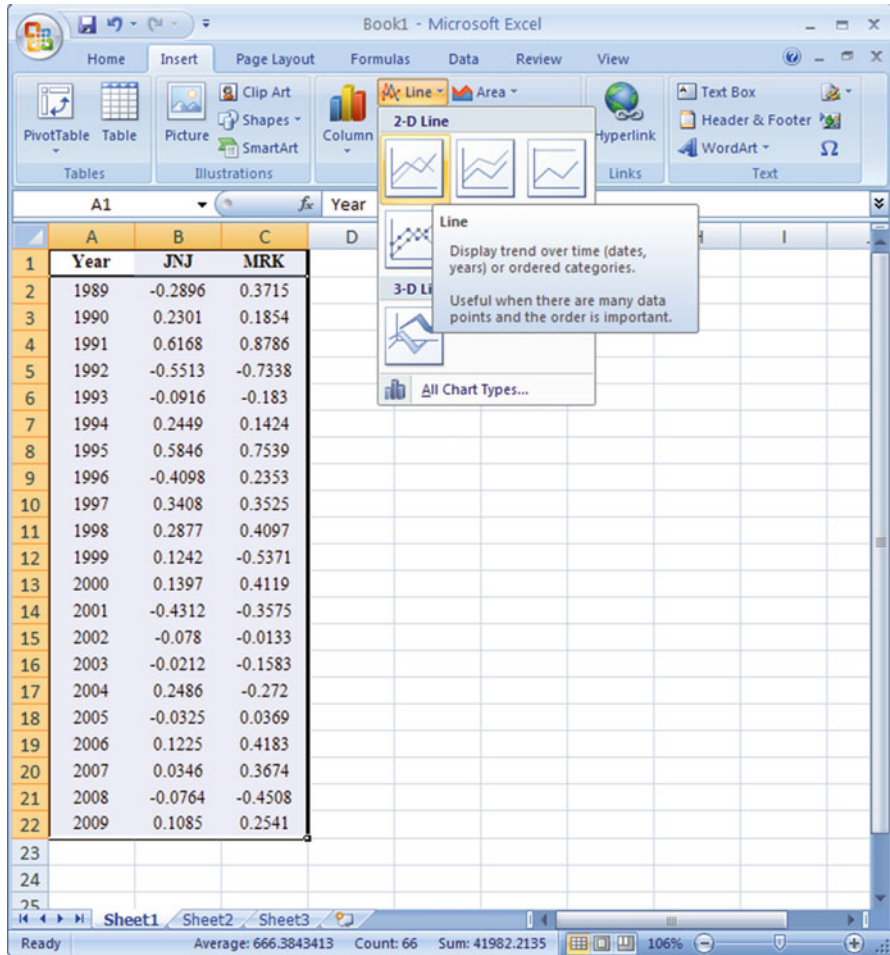


Fig. 2.11 Select graph option

where P_{jt} represents price per share for the j th stock in period t and d_{jt} represents dividends per share for the j th stock. The market rate of return, R_{mt} , in period t is

$$\frac{SP_t - SP_{t-1}}{SP_{t-1}} \quad (2.2)$$

where SP_t represents the S&P 500 in period t .

The rate of return on an individual stock can be rewritten as

$$R_{jt} = \frac{(P_{jt} - P_{j,t-1})}{P_{j,t-1}} + \frac{d_{jt}}{P_{j,t-1}} = \text{Capital gain yield} + \text{dividend yield} \quad (2.3)$$

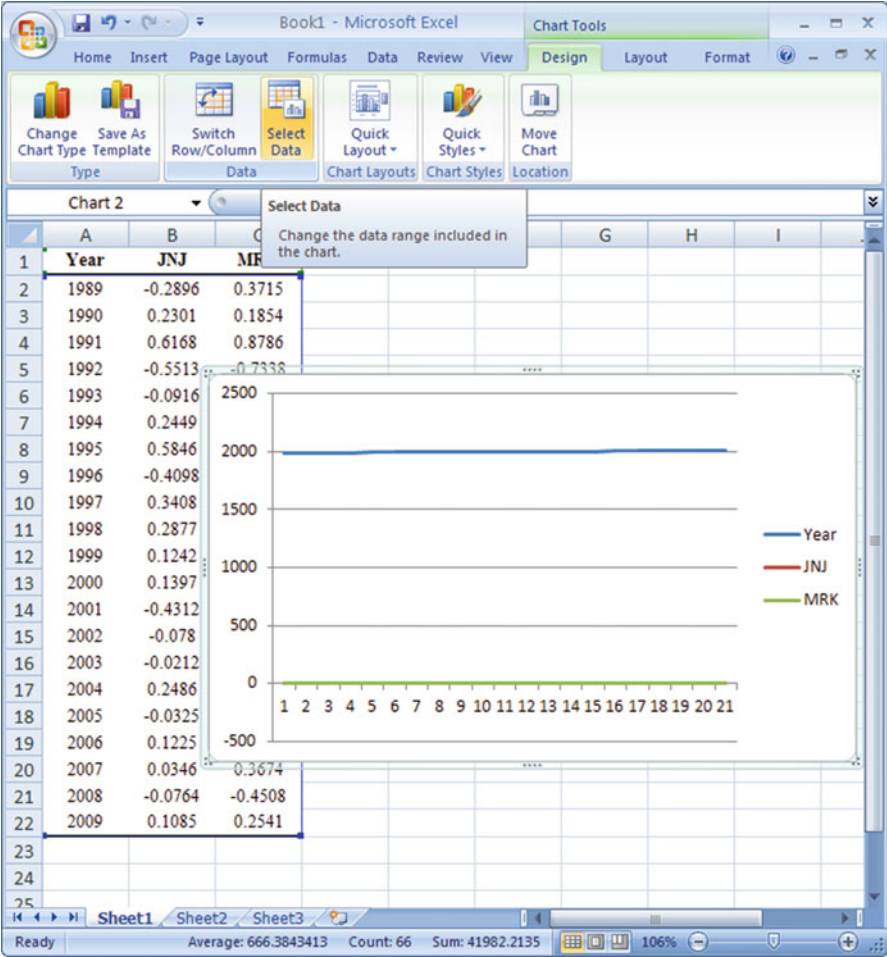


Fig. 2.12 Step 1 of Chart Tools

The first term of the rewritten equation is the capital gain yield (in percent); the second is the dividend yield (also in percent). As an example, let us calculate the rate of return for Johnson & Johnson in 2009. From Table 2.3, we know that $PPS_{08} = \$59.83$, $PPS_{09} = \$64.41$, and $DPS_{09} = \$1.91$. Thus, the rate of return for Johnson & Johnson in 2009 equals

$$R_{JNJ09} = \frac{64.41 - 59.83 + 1.91}{59.83} = .1085.$$

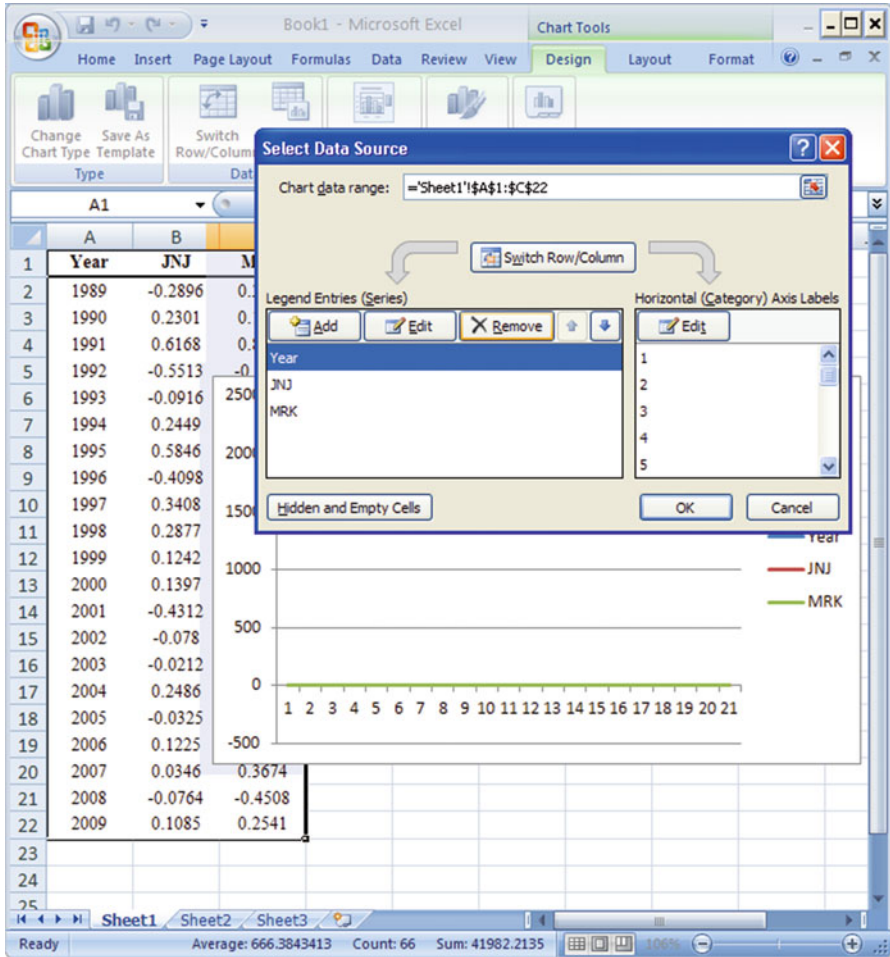


Fig. 2.13 Step 2 of Chart Tools

As another example, from Table 2.3, we know that the S&P 500 was 1220.04 and 948.05 in 2008 and 2009, respectively. Thus, the market rate of return in 2008 equaled

$$R_{M08} = \frac{948.05 - 1220.04}{1220.04} = -0.2229$$

Figure 2.5 in the text compares the rates of return for Johnson & Johnson, Merck, and the S&P 500 over time, as discussed in Sect. 2.5 of this chapter.

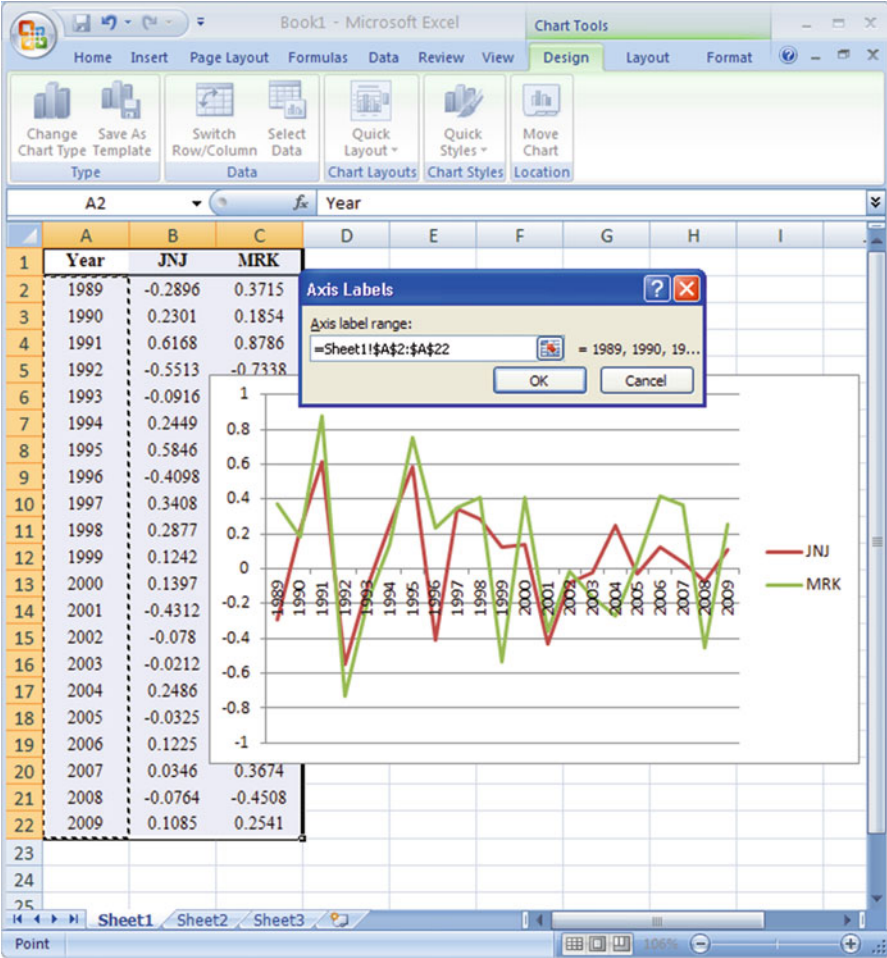


Fig. 2.14 Step 3 of Chart Tools

Appendix 3: Financial Statements and Financial Ratio Analysis

Review of Balance Sheets and Income Statements

Accounting concepts are used to understand a firm’s financial condition. We will discuss two basic sources of accounting information: the *balance sheet*, which reveals the assets, liabilities, and owners’ (stockholders’) equity of a firm *at a point in time*, and the income statement, which shows the firm’s profit or loss *over a given period of time*. *Assets*, which are things that the firm owns, can be classified as current, fixed, or “other” assets. Current assets consist of cash and

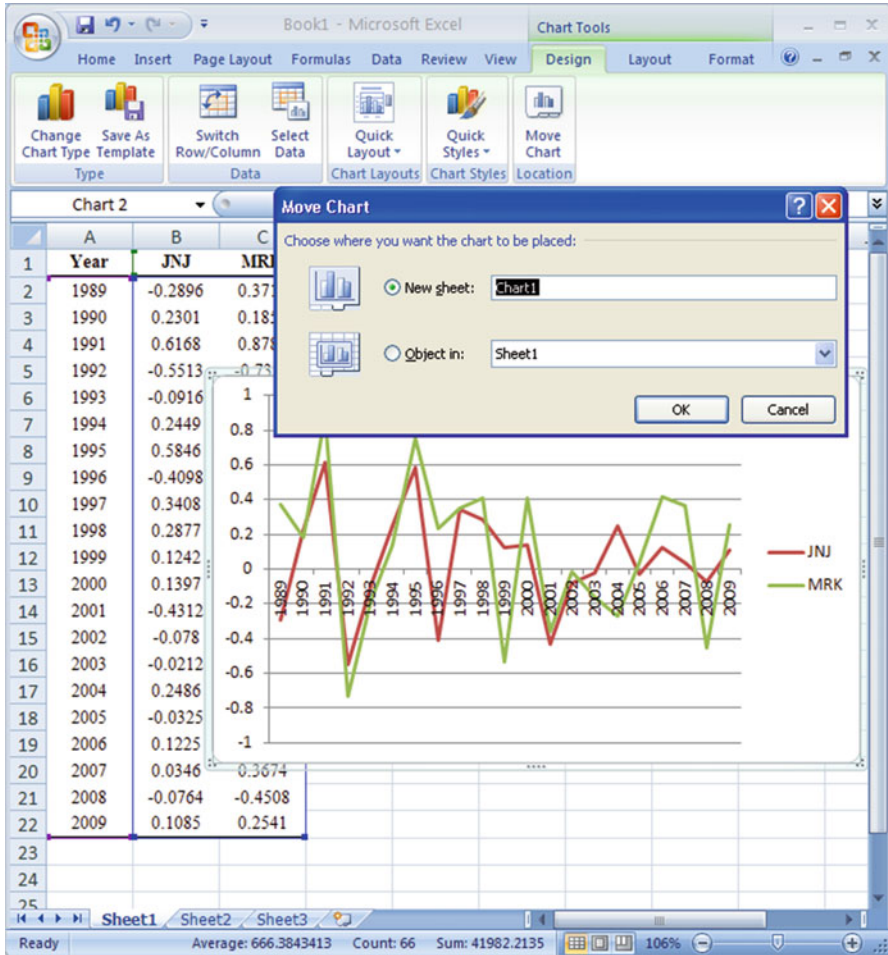


Fig. 2.15 Step 4 of Chart Tools

of property that can be turned into cash quickly. Examples of current assets include cash, stocks, bonds, inventory, and accounts receivable (cash that customers owe the firm). Fixed assets are not easily convertible into cash; they include land, machinery, and buildings. Fixed assets are generally valued at their historical value (purchase price) minus depreciation, not at their current market value. Other assets include intangibles such as goodwill, trademarks, patents, copyrights, and leases.

Liabilities, which are debts of the firm, are divided into current and long-term debts. Current debts come due within 1 year, whereas long-term debts are due in more than 1 year. Current debts include accounts payable (unpaid bills), notes payable, debts on agreements, accrued expenses, expenses incurred but not yet

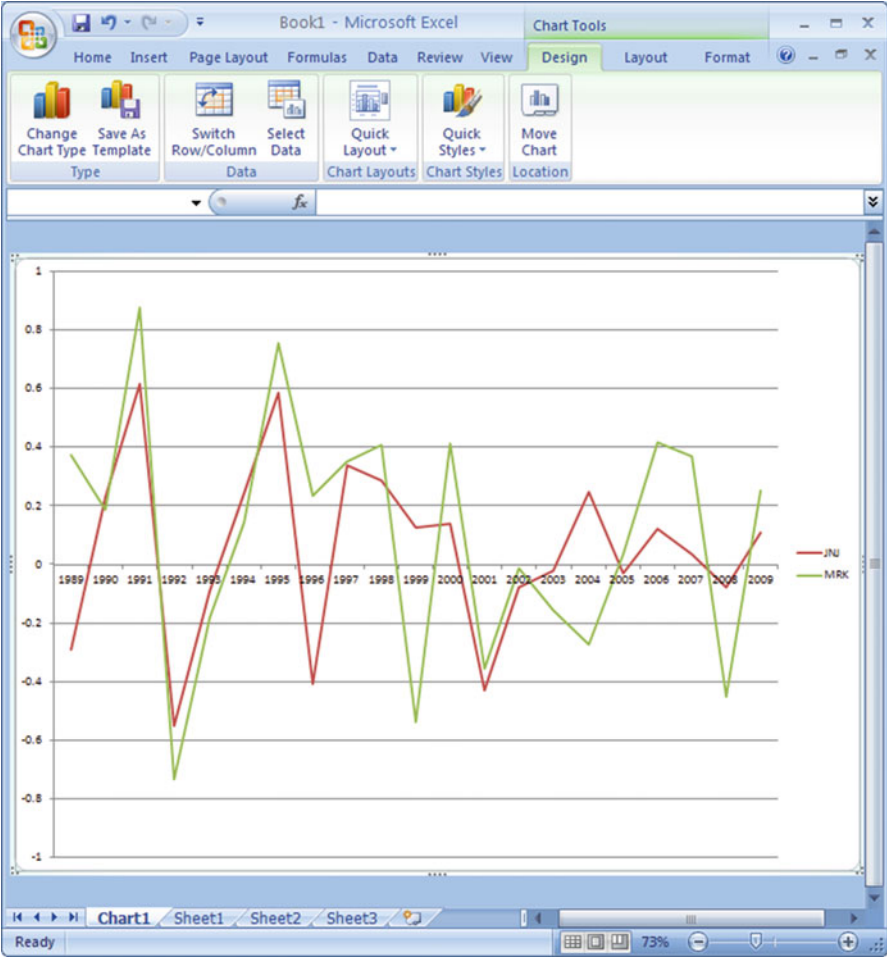


Fig. 2.16 Line Charts of rates of return for JNJ and MRK

paid, and taxes payable. Examples of long-term liabilities include mortgages, payable corporate bonds, and capitalized leases.

Stockholders' equity makes up the second part of the liabilities section of a balance sheet. It consists of funds invested by shareholders plus retained earnings. The *net worth* of the firm is calculated by subtracting total liabilities from total assets.

Whereas a balance sheet looks at the firm at a point in time, the income statement, as we noted earlier, evaluates the firm over a period of time. The end product of the income statement is the profit or loss, which is calculated by taking the sales for a period and subtracting the cost of goods sold and such expenses as

Table 2.3 EPS, DPS, and PPS for Johnson & Johnson, Merck, and the S&P 500

Year	Johnson & Johnson			Merck			S&P500
	DPS	EPS	PPS	DPS	EPS	PPS	
1988	1.89	5.63	85.13	1.37	3.02	57.75	265.79
1989	1.10	3.19	59.38	1.70	3.74	77.50	322.84
1990	1.29	3.38	71.75	2.00	4.51	89.88	334.59
1991	1.51	4.30	114.50	2.34	5.39	166.50	376.18
1992	0.88	1.54	50.50	0.95	1.70	43.38	415.74
1993	1.00	2.71	44.88	1.06	1.86	34.38	451.41
1994	1.12	3.08	54.75	1.15	2.35	38.13	460.42
1995	1.25	3.65	85.50	1.24	2.63	65.63	541.72
1996	0.72	2.12	49.75	1.44	3.12	79.63	670.5
1997	0.83	2.41	65.88	1.70	3.74	106.00	873.43
1998	0.95	2.23	83.88	1.93	4.30	147.50	1,085.5
1999	1.04	2.94	93.25	1.09	2.45	67.19	1,327.33
2000	1.22	3.39	105.06	1.23	2.90	93.63	1,427.22
2001	0.66	1.83	59.10	1.36	3.14	58.80	1,194.18
2002	0.78	2.16	53.71	1.41	3.14	56.61	993.94
2003	0.91	2.39	51.66	1.45	3.03	46.20	965.23
2004	1.08	2.83	63.42	1.50	2.61	32.14	1,130.65
2005	1.26	3.46	60.10	1.52	2.10	31.81	1,207.23
2006	1.44	3.73	66.02	1.52	2.03	43.60	1,310.46
2007	1.60	3.63	66.70	1.51	1.49	58.11	1,477.19
2008	1.77	4.57	59.83	1.52	3.64	30.40	1,220.04
2009	1.91	4.40	64.41	1.58	5.68	36.54	948.05

Source: EPS, DPS, and PPS for Johnson & Johnson and Merck are from Standard & Poor's Compustat, Wharton Research Data Services (WRDS)

Table 2.4 Rates of return for Johnson & Johnson and Merck stock and the S&P 500

Year	JNJ	MRK	S&P500
1989	-0.2896	0.3715	0.2146
1990	0.2301	0.1854	0.0364
1991	0.6168	0.8786	0.1243
1992	-0.5513	-0.7338	0.1052
1993	-0.0916	-0.1830	0.0858
1994	0.2449	0.1424	0.0200
1995	0.5846	0.7539	0.1766
1996	-0.4098	0.2353	0.2377
1997	0.3408	0.3525	0.3027
1998	0.2877	0.4097	0.2428
1999	0.1242	-0.5371	0.2228
2000	0.1397	0.4119	0.0753
2001	-0.4312	-0.3575	-0.1633
2002	-0.0780	-0.0133	-0.1677
2003	-0.0212	-0.1583	-0.0289
2004	0.2486	-0.2720	0.1714
2005	-0.0325	0.0369	0.0677
2006	0.1225	0.4183	0.0855
2007	0.0346	0.3674	0.1272
2008	-0.0764	-0.4508	-0.1741
2009	0.1085	0.2541	-0.2229

Table 2.5 Johnson & Johnson corporation balance sheet (\$ million)

Assets	2004	2005	2006	2007	2008	2009
<i>Current assets</i>						
Cash and cash equivalent	\$9,203	\$16,055	\$4,083	\$7,770	\$10,768	\$15,810
Marketable securities	3,681	83	1	1,545	2,041	3,615
Account receivable	6,831	7,010	8,712	9,444	9,719	9,646
Inventory	3,744	3,959	4,889	5,110	5,052	5,180
Deferred taxes on income	1,737	1,845	2,094	2,609	3,430	2,793
Prepaid expenses and other receivable	2,124	2,442	3,196	3,467	3,367	2,497
<i>Total current assets</i>	<i>27,320</i>	<i>31,394</i>	<i>22,975</i>	<i>29,945</i>	<i>34,377</i>	<i>39,541</i>
Marketable securities—noncurrent	46	20	16	2	—	—
Property, plant and equipment, net	10,436	10,830	13,044	14,185	14,365	14,759
Intangible assets, net	11,842	12,175	28,688	28,763	27,695	31,185
Deferred taxes on income	551	385	3,210	4,889	5,841	5,507
Other assets	3,122	3,221	2,623	3,170	2,634	3,690
<i>Total assets</i>	<i>53,317</i>	<i>58,025</i>	<i>70,556</i>	<i>80,954</i>	<i>84,912</i>	<i>94,682</i>
<i>Liabilities and shareholder's equity</i>						
<i>Current liabilities</i>						
Loans and notes payable	280	668	4,579	2,463	3,732	6,318
Account payable	5,227	4,315	5,691	6,909	7,503	5,541
Accrued liabilities	3,523	3,529	4,587	6,412	5,531	5,796
Accrued rebates, returns, and promotion	2,297	2,017	2,189	2,318	2,237	2,028
Accrued salaries, wages, and commissions	1,094	1,166	1,391	1,512	1,432	1,606
Taxes on income	1,506	940	724	223	417	442
<i>Total current liabilities</i>	<i>13,927</i>	<i>12,635</i>	<i>19,161</i>	<i>19,837</i>	<i>20,852</i>	<i>21,731</i>
Long-term debt	2,565	2,017	2,014	7,074	8,120	8,223
Deferred tax liability	403	211	1,319	1,493	1,432	1,424
Employee-related obligations	2,631	3,065	5,584	5,402	7,791	6,769
Other liabilities	1,978	2,226	3,160	3,829	4,206	5,947
<i>Shareowners' equity</i>						
Preferred stock—without par value	—	—	—	—	—	—
Common stock—par value \$1.00	3,120	3,120	3,120	3,120	3,120	3,120
Net receivable from employee stock plan	—11	—	—	—	—	—
Accumulated other comprehensive income	—515	—755	—2,118	—693	—4,955	—3,058
Retained earnings	35,223	41,471	49,290	55,280	63,379	70,306
Less: common stock held in treasury	6,004	5,965	10,974	14,388	19,033	19,780
<i>Total shareowners equity</i>	<i>31,813</i>	<i>37,871</i>	<i>39,318</i>	<i>43,319</i>	<i>42,511</i>	<i>50,588</i>
<i>Total liabilities and shareholders' equity</i>	<i>53,317</i>	<i>58,025</i>	<i>70,556</i>	<i>80,954</i>	<i>84,912</i>	<i>94,682</i>

research and development, interest, and selling, general, and administrative expenses.

Table 2.5 presents JNJ's balance sheet for 2004–2009. Total assets are divided into current and fixed assets. Again, the current assets are those assets that can be converted into cash in a year or less; fixed assets such as land cannot be turned quickly into cash. The liabilities section is separated into liabilities and

Table 2.6 Income statement for Johnson & Johnson corporation (\$ million)

(Dollars in millions except per share figures)	2004	2005	2006	2007	2008	2009
<i>Sales to customers</i>	\$47,348	\$50,514	\$53,324	\$61,095	\$63,747	\$61,897
Cost of products sold	13,422	13,954	15,057	17,751	18,511	18,447
Gross profit	33,926	36,560	38,267	43,344	45,236	43,450
Selling, marketing, and administrative expenses	15,860	16,877	17,433	20,451	21,490	19,801
Research expense	5,203	6,312	7,125	7,680	7,577	6,986
Purchased in-process research and development	18	362	559	807	181	—
Interest income	−195	−487	−829	−452	−361	−90
Interest expense, net of portion capitalized	187	54	63	296	435	451
Other (income) expense, net	15	−214	−671	1,279	−1,015	547
	21,088	22,904	23,680	30,061	26,307	27,695
Earnings before provision for taxes on income	12,838	13,656	14,587	13,283	16,929	15,755
Provision for taxes on income	4,329	3,245	3,534	2,707	3,980	3,489
<i>Net earnings</i>	8,509	10,411	11,053	10,576	12,949	12,266
<i>Basic net earnings per share</i>	\$2.87	\$3.50	\$3.76	\$3.67	\$4.62	\$4.45
<i>Diluted net earnings per share</i>	\$2.84	\$3.46	\$3.73	\$3.63	\$4.57	\$4.40

stockholders' equity. GM's liabilities include long-term debt, current liabilities such as accounts payable, and deferred taxes. Stockholders' equity consists of common stock and paid-in surplus, preferred stock, retained earnings, and other adjustments. Note that *total assets equal the sum of total liabilities and equity*.

Table 2.6 displays JNJ's income statement for both 2004–2009, showing the firm's profit after expenses are subtracted from revenues. To determine gross profits, the costs of goods sold are subtracted from net sales. Operating income is then calculated by deducting selling and administrative expenses, debt amortization, and depreciation. Earnings before interest and taxes (EBIT) are next obtained by adding other income to operating income, and interest is subtracted to get earnings before taxes (EBT). Finally, net income is obtained by subtracting the provision for income taxes and adding earnings in unconsolidated subsidiaries and associates. Both earnings per share and dividends per share also are reported.

Financial Ratio Analysis

To help them analyze balance sheets and income statements, financial managers construct various financial ratios. There are five basic types of these ratios: leverage ratios, activity ratios, liquidity ratios, profitability ratios, and market value ratios.

Table 2.7 Financial and market ratio calculations for JNJ, 2009 (dollars amounts in millions)

1.	Current ratio = $\frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{\$39,451}{\$21,731} = 1.82$ (liquidity ratio)
2.	Inventory turnover = $\frac{\text{Cost of Goods sold}}{\text{inventories}} = \frac{\$18,447}{\$5,180} = 3.561$ (activity ratio) ^a
3.	Total debt to total asset ratio = $\frac{\text{Total debt}}{\text{Total assets}} = \frac{\$42,670}{\$94,682} = 0.451$ (leverage ratio)
4.	Net profit margin = $\frac{\text{Net income}}{\text{Net sales}} = \frac{\$12,266}{\$61,897} = 0.198$ (profitability ratio)
5.	Return of total asset = $\frac{\text{Net income}}{\text{Total assets}} = \frac{\$12,266}{\$94,682} = 0.129$ (profitability ratio)
6.	Price / earnings ratio = $\frac{\text{Price per share}}{\text{earnings per share}} = \frac{\$64.41}{\$4.45} = 14.474$ (market value ratio)
7.	Payout ratio = $\frac{\text{dividend per share}}{\text{earnings per share}} = \frac{\$1.93}{\$4.45} = 0.434$ (market value ratio)

^aFrom 10 K

From Compustat

Let us use Merck (MRK) and Johnson & Johnson data to calculate a number of these ratios and discuss their significance.

Table 2.7 shows how financial ratios are derived from the 2009 balance sheet and income statement. The information for the current ratio comes from the assets side of the balance sheet. The ratio for JNJ is 1.82, which means that 1 dollar in current liabilities is matched by 1.82 dollars in current assets. To calculate the inventory turnover ratio, we use cost of goods sold from the income statement and inventories from the current assets in the balance sheet. The resulting ratio (3.561) reveals how often the average value of goods in inventory was sold in 2009.

The total debt to total assets ratio is derived from the balance sheet; it indicates that about 45.1 % of JNJ's assets are financed by debt. Data to calculate the net profit margin come from the income statement. JNJ's profit margin is .198, that is, about 20 cents out of every dollar of sales is profit (net income). ROI (return on investment) is more accurately described as return on total assets; it is calculated from information in both the income statement and the balance sheet. The resulting figure for JNJ is 12.9 %.

The price/earnings (P/E) ratio is calculated by taking the price per share divided by the earnings per share (EPS). Although the price per share does not appear in the balance sheet or the income statement, it can be found in stock reports in newspapers. The EPS is then found by dividing net income by the number of common shares. (The ratio cannot be calculated if the firm experienced losses.) The P/E ratio for JNJ is 14.474.

Finally, the payout ratio is calculated by dividing the price of the stock by the dividends per share (DPS). DPS is the value of dividends paid out divided by the number of shares of common stock. This ratio reveals that JNJ paid out about 0.434 % of its earnings in dividends.

The seven ratios discussed in Table 2.7 for both Johnson & Johnson and Merck during 2004–2009 are presented in Table 2.8 following the method discussed in Appendix 2. Line charts in terms of data presented in Table 2.8 are presented in Figs. 2.17, 2.18, 2.19, 2.20, 2.21, 2.22 and 2.23. By using these seven graphs, we now compare the financial ratios of JNJ to those of Merck.

Table 2.8 Seven key financial ratios for JNJ and Merck

Year	Current ratio		Total debt to total assets ratio		Inventory turnover ratio		Return on total assets		Net profit margin		Payout ratio		Price earnings ratio	
	JNJ	MRK	JNJ	MRK	JNJ	MRK	JNJ	MRK	JNJ	MRK	JNJ	MRK	JNJ	MRK
1990	1.778	1.332	.485	.422	2.438	1.850	0.120	0.222	.102	.232	.381	.442	20.918	19.709
1991	1.835	1.532	.465	.389	2.321	1.796	0.138	0.223	.117	.247	.351	.434	26.082	30.328
1992	1.582	1.216	.557	.484	2.427	1.661	0.086	0.179	.075	.205	.570	.558	32.372	25.218
1993	1.624	.973	.535	.421	2.450	1.522	0.145	0.109	.126	.206	.369	.572	16.378	18.382
1994	1.566	1.270	.537	.378	2.359	3.323	0.128	0.137	.127	.200	.362	.488	17.548	16.019
1995	1.809	1.515	.485	.353	2.424	3.958	0.134	0.140	.128	.200	.344	.473	22.984	24.306
1996	1.807	1.600	.450	.355	2.517	4.375	0.144	0.160	.134	.196	.337	.462	22.926	24.883
1997	1.999	1.475	.416	.407	2.427	5.211	0.153	0.179	.146	.195	.344	.454	26.670	27.676
1998	1.364	1.685	.459	.426	2.306	5.546	0.116	0.165	.129	.195	.427	.448	36.949	33.447
1999	1.771	1.285	.434	.494	2.353	6.128	0.142	0.165	.152	.180	.355	.446	31.083	26.768
2000	2.164	1.375	.391	.471	2.475	7.340	0.153	0.171	.165	.169	.359	.426	30.453	31.630
2001	2.296	1.123	.358	.491	2.719	8.446	0.147	0.165	.172	.153	.361	.433	31.604	18.491
2002	1.683	1.199	.424	.474	2.791	9.113	0.162	0.150	.182	.138	.361	.448	24.414	17.858
2003	1.710	1.205	.427	.492	2.991	1.053	0.149	0.168	.172	.304	.382	.478	21.347	15.148
2004	1.962	1.147	.396	.510	3.082	1.534	0.159	0.137	.180	.248	.382	.573	22.098	12.267
2005	2.485	1.582	.344	.518	3.080	1.873	0.179	0.103	.206	.210	.364	.721	17.171	15.076
2006	1.199	1.197	.424	.533	2.911	2.194	0.156	0.099	.208	.196	.386	.749	17.559	21.373
2007	1.510	1.227	.446	.566	2.995	2.263	0.130	0.068	.173	.135	.442	1.011	18.174	38.483
2008	1.649	1.348	.482	.545	3.086	1.881	0.152	0.165	.203	.327	.388	.416	12.950	8.306
2009	1.820	1.805	.451	.373	3.041	.714	0.129	0.115	.198	.470	.434	.279	14.474	6.444

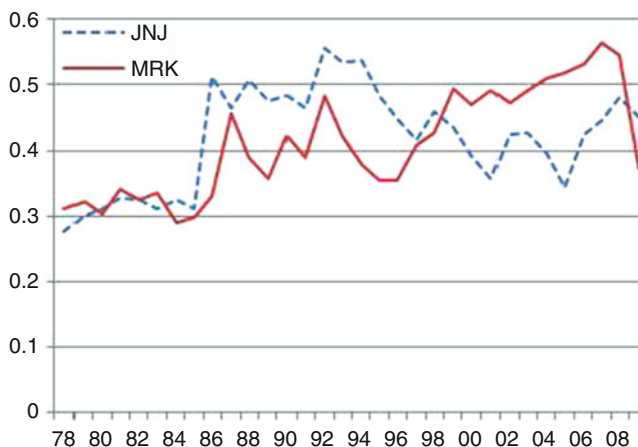


Fig. 2.17 Current ratio for JNJ and MRK

As mentioned above, there are five basic types of financial ratios. *Liquidity ratios* measure how quickly or effectively the firm can obtain cash. If the bulk of a firm's assets are fixed (such as land), the firm may not be able to obtain enough cash to finance its operations. The *current ratio*, defined as current assets divided by current liabilities, is used to gage the firm's ability to meet current obligations. If the firm's current assets do not significantly exceed current liabilities, the firm may not be able to pay current bills, because although current assets are expected to generate cash within 1 year, current liabilities are expected to use cash within that same 1-year period. In Fig. 2.17, this ratio is graphed for both Johnson & Johnson and Merck for the years 1990–2009. As the figure reveals, JNJ had a higher current ratio almost the entire time with the exception of 1998 when its current ratio was 1.364, while Merck's was 1.685.

Leverage ratios measure how much of the firm's operation is financed by debt. Although some debt is expected, too much debt can be a sign of trouble. One indicator of how much debt the firm has incurred is the ratio of total debt to total assets, which measures the percentage of total assets financed by debt. Figure 2.18 shows that Johnson & Johnson had a greater share of its assets financed by debt than did Merck over most of the 1977–2009 periods. This fact is not necessarily a reason for concern unless Johnson & Johnson's leverage ratio was too high in absolute terms. The general trend shows that both firms increased their debt during the period, particularly from 1985 to 1998, and that a sharp increase occurred from 1987 to 1992.

Activity ratios measure how efficiently the firm is using its assets. Figure 2.19 graphs the *inventory turnover* ratio for each firm; it is found by dividing cost of goods sold by average inventory. This ratio measures how quickly a firm is turning over its inventories. A high ratio usually implies efficiency because the firm is selling inventories quickly. This ratio varies greatly with the line of business, however. A supermarket must have a high turnover ratio because it is dealing



Fig. 2.18 Total debt to total assets ratio for JNJ and MRK

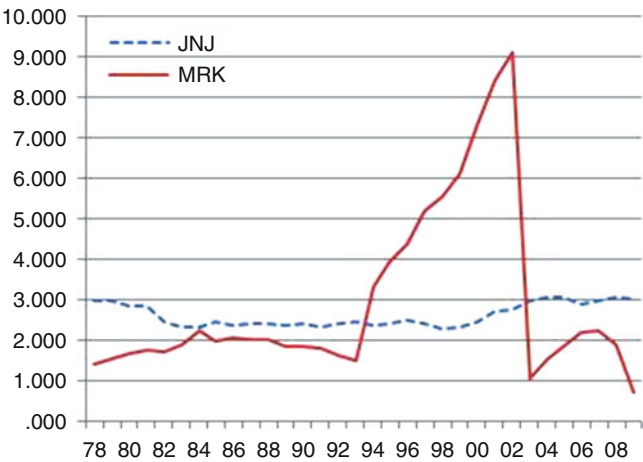


Fig. 2.19 Inventory turnover for JNJ and MRK

with perishable goods; in contrast, a jewelry store selling diamonds has a much lower turnover ratio. The seasonality of the product must also be considered. Auto dealers have high inventories in the fall, when the new autos arrive, and lower inventories in other seasons. On the other hand, Christmas tree dealers have rather low inventories in August!

Profitability ratios measure the profitability of the firm's operations. One of these ratios is the *return on total assets*, defined as net income divided by total assets. This ratio, often abbreviated ROA, measures how much the company has earned on its total investment of financial resources. Looked at in another way, it measures how well the firm used funds, regardless of how the firm's assets are

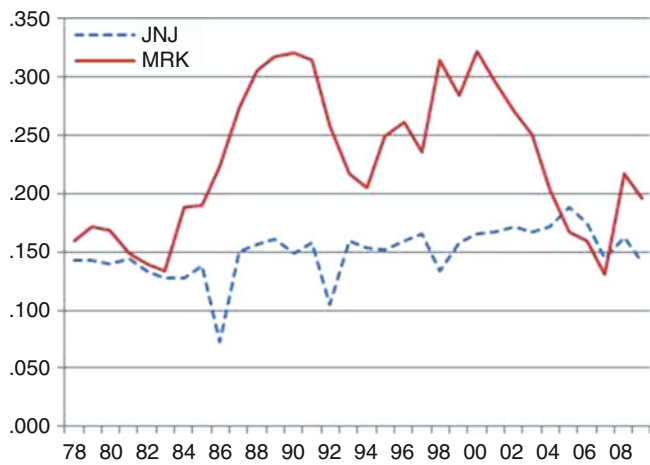


Fig. 2.20 Return on total assets for JNJ and MRK

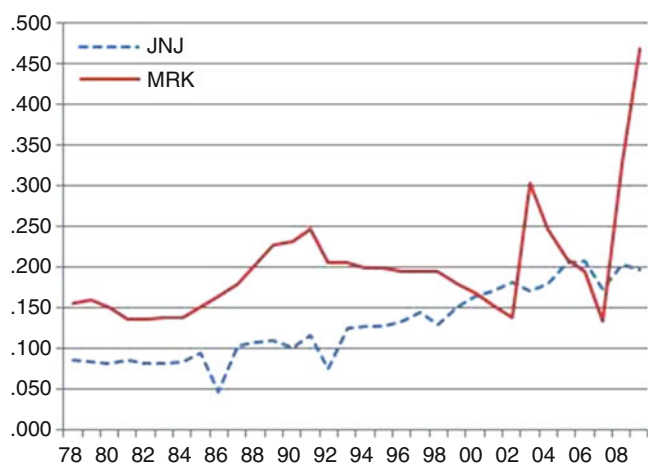


Fig. 2.21 Net profit margin for JNJ and MRK

divided into fixed and current assets. As Fig. 2.20 suggests, Merck had a higher ROA than Johnson & Johnson until 2004–2007.

The *net profit margin*, defined as net income divided by net sales, is another measure of profitability. This ratio gages the percentage of sales revenue that consists of profit. This ratio varies for different industries; a successful supermarket might have a ratio of 20 %, whereas most manufacturing firms tend to have ratios around 8 %. Although many Americans believe that corporations make a profit of 25 cents or more on each dollar of sales, the average net profit ratio for the *Fortune* 500 industrial firms in 1981 was 4.6 %. The net profit margins for Merck and Johnson & Johnson are presented in Fig. 2.21.

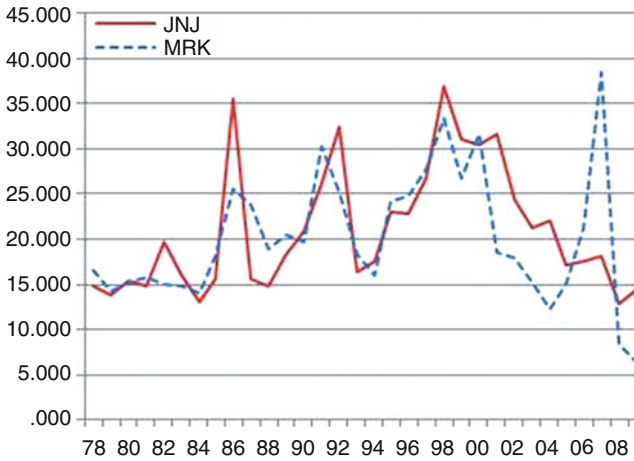


Fig. 2.22 Payout ratio for JNJ and MRK

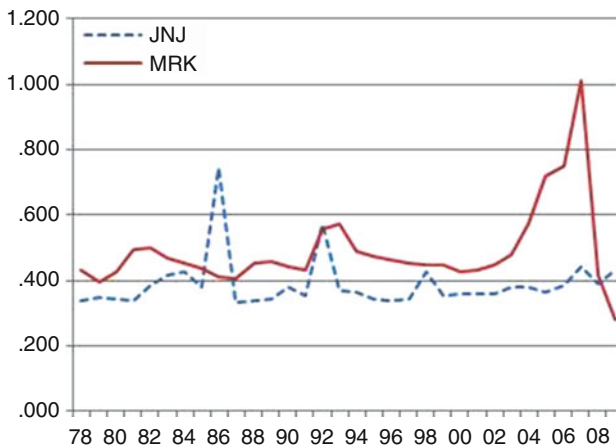


Fig. 2.23 Price/earnings ratio for JNJ and MRK

An indirect profitability indicator is the *payout ratio*, which measures the proportion of current earnings paid out in dividends. This ratio, which is expressed as dividends per share divided by earnings per share, can fluctuate widely because of the variability in earnings per share. . The reason, for example, why the payout ratio was so high for Merck in 1981 is that earnings per share were low. The payout ratios for Merck and Johnson & Johnson are illustrated in Fig. 2.22.

Market value ratios measure how stock price per share is related to either earnings per share or book value per share. The *price/earnings ratio*, or P/E, is shown in Fig. 2.23. This ratio, defined as the price per share of a stock divided by the earnings per share, is usually reported in stock quotations in newspapers such as

the *Wall Street Journal* every day. However, you should be careful in looking at P/E ratios because a high ratio can be the result of low earnings. This seems to have been the case for Merck in 2007. Moreover, firms calculate earnings per share differently, making comparisons of P/E ratios between firms difficult or even misleading.

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