What Long-Run Returns Can Investors Expect from the Stock Market?

By John E. Golob and David G. Bishop

When investors make financial plans, their strategies depend on the returns they expect from investments in the stock market. The expected returns from stocks affect how much investors save, how long they plan to work, and how they allocate their portfolios among alternative investments. Their strategies are most likely to be successful, of course, when they have realistic expectations about stock returns.

Over the past several years, stock returns have exceeded their long-run historical averages. For example, the 15 percent average annual return on stocks over the last decade is substantially higher than the 10 percent average return over the previous 100 years. Stock returns were particularly high in 1995 and 1996, averaging almost 30 percent for the S&P 500 stock index.

Market observers have reacted to high stock returns in different ways. Many individual investors, for example, interpret recent market strength as the beginning of a new era, with 15 percent returns continuing into the foreseeable future. In contrast, market professionals are generally less optimistic. Indeed, some analysts interpret high stock prices as an indication that future returns will be below their historical average.

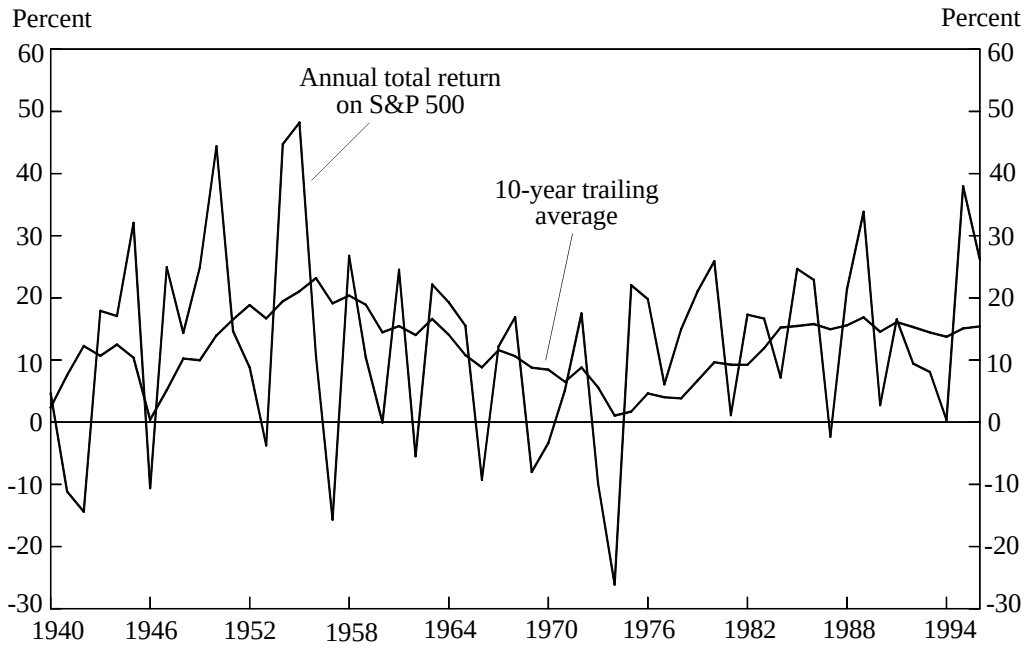
This article analyzes how macroeconomic fundamentals and high price-earnings ratios on stocks will affect long-run returns. The first section reviews the stock market's recent performance and describes how investors and analysts have reacted to this performance. The second section shows how macroeconomic trends imply that long-run returns will remain close to their 10 percent historical average. The third section analyzes the long-run relationship between price-earnings ratios and returns. The section shows that high price-earnings ratios are consistent with lower long-run returns, and argues returns may have declined because the stock market is perceived as less risky.

I. RECENT VERSUS HISTORICAL MARKET PERFORMANCE

The strength of the stock market has led to diverse opinions about future stock returns.

John E. Golob is a senior economist at the Federal Reserve Bank of Kansas City. David G. Bishop, formerly a research associate at the bank, is a product specialist with Sprint Corporation. The views expressed herein are solely those of the authors and do not necessarily reflect the views of the Federal Reserve Bank of Kansas City or the Federal Reserve System.

Chart 1
ANNUAL TOTAL RETURN ON S&P 500

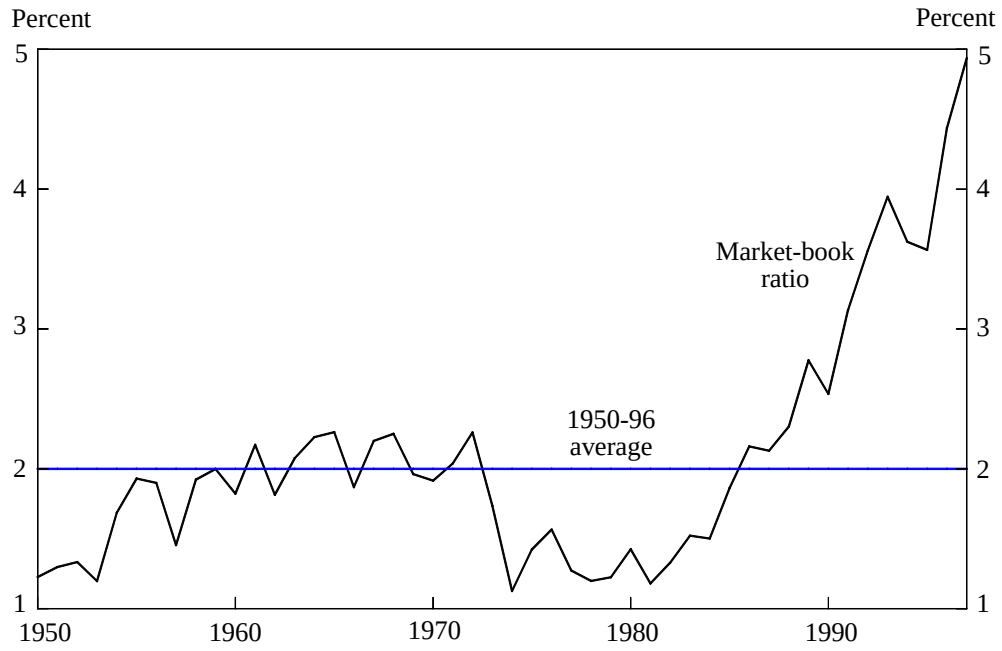


While many individual investors expect the high returns of the past decade to continue, many market professionals are concerned that returns will fall. This section compares the stock market's recent performance with its historical performance, and discusses how market observers have reacted to recent market strength.

Stock investors have received higher returns in recent years than they have received over longer historical periods. Total returns on the S&P 500 index, which include the effects of price increases and dividends, have averaged more than 17 percent per year since the 1982 lows.[1] As a result, this index was recently more than nine times higher than it was during the 1982 recession.[2] The consistency of recent market strength can be illustrated by averaging returns over ten-year intervals to smooth out annual volatility. Average ten-year returns have been in the vicinity of 15 percent since 1984 (Chart 1).[3] These mid-teen returns, of course, are substantially above the 10 percent average returns over longer historical periods (Siegel).[4]

Another measure of stock market performance is the length of time since returns on market indexes have declined significantly over the course of a year (Chart 1). Prior to 1974, stock prices usually declined significantly about every five years. Since 1974, stock returns have been positive in every year except 1987, when the year-over-year return was only slightly negative.[5] With only one small year-over-year decline in 23 years, this

Chart 2
MARKET-BOOK RATIO: S&P INDUSTRIALS

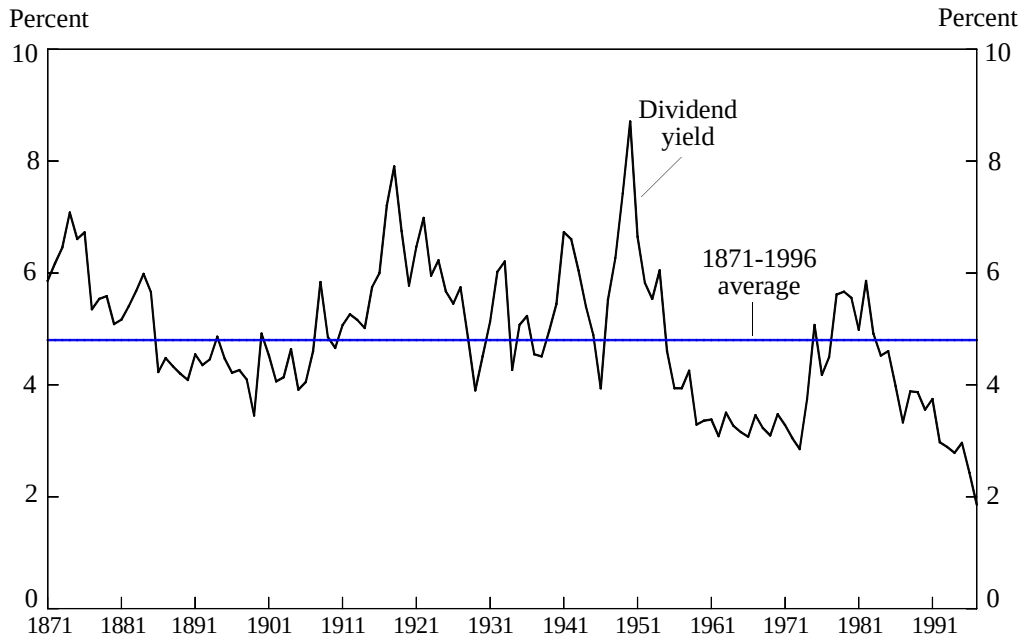


post-1974 period is unprecedented in U.S. stock market history extending back to 1802 (Schwert).

High stock market returns have been driven primarily by rising stock prices. This has led many analysts to conclude that stock prices are now too high. When analysts say stock prices are too high, of course, they are comparing prices to commonly used fundamental measures of stock value, such as book value, dividends, and earnings. Book value is established by accountants and reported on a company's balance sheet as the value of its assets minus the value of its liabilities. The S&P Industrials index, which is the industrial component of the S&P 500, recently rose to five times its book value (Chart 2).[6] The index has averaged only two times book value since 1950, so the index is more than double its average relative to book value.

A second fundamental measure of stock value is the dividend yield, which is the annual dividend divided by the price of the stock. When a stock's price rises faster than its dividend, the dividend yield declines. Some analysts interpret a dividend yield below 3 percent as a sign of market overvaluation. The dividend yield for the S&P 500 index has averaged 4.8 percent since 1871 and has averaged 4 percent since 1950. In November 1996 the dividend yield on the S&P 500 index dropped below 2 percent for the first time ever (Chart 3). Since then, the yield has remained below 2 percent most of the time.

Chart 3
DIVIDEND YIELD: S&P 500

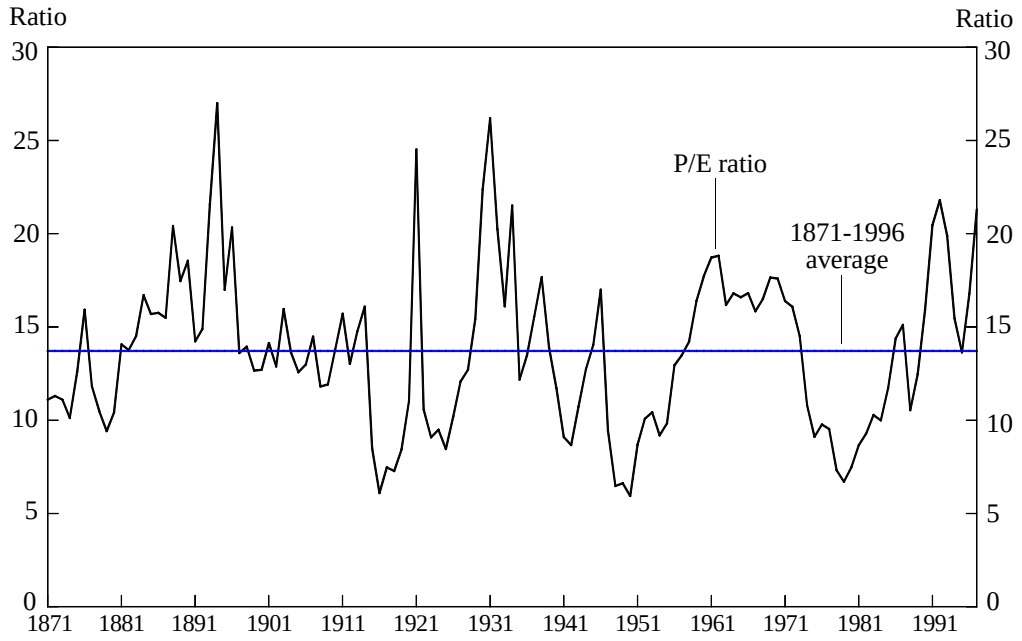


A third fundamental measure of stock value is the price-earnings (P/E) ratio. The P/E ratio for the S&P 500 index has averaged about 14 since 1871 (Chart 4). Recently, the P/E ratio on the index rose above 21, more than 50 percent above its long-run average. Not only is the P/E ratio above average, but some analysts suggest the ratio should be below average because the economy has been expanding for so long. Stock prices reflect expectations for *future* earnings. Because earnings typically grow slower as economic expansions mature, prices tend to fall relative to current earnings.

Recent market strength has led many individual investors to become very optimistic about future stock returns. For example, when Louis Harris and Associates recently polled over 1,000 mutual fund investors, a surprising 75 percent predicted that returns in the next decade will either equal or exceed the returns in the past decade (Easton). But, is this optimism warranted?

Most professional market analysts are skeptical, for two reasons. First, many of them think that stock prices are too high relative to fundamental measures of their value. For example, Larry Smith, the head of asset allocation at J. P. Morgan, recently noted that stocks are as overvalued as at any time since 1987 (Zuckerman). Analysts are concerned because high stock prices in the past have typically been followed by below-average returns (Cochrane and Shiller; Fama and French). Given this evidence, many

Chart 4
PRICE-EARNINGS RATIO: S&P 500



analysts forecast that near-term returns will be less than the 10 percent achieved historically. A few analysts even forecast substantial declines in stock prices over the next year (Welling).

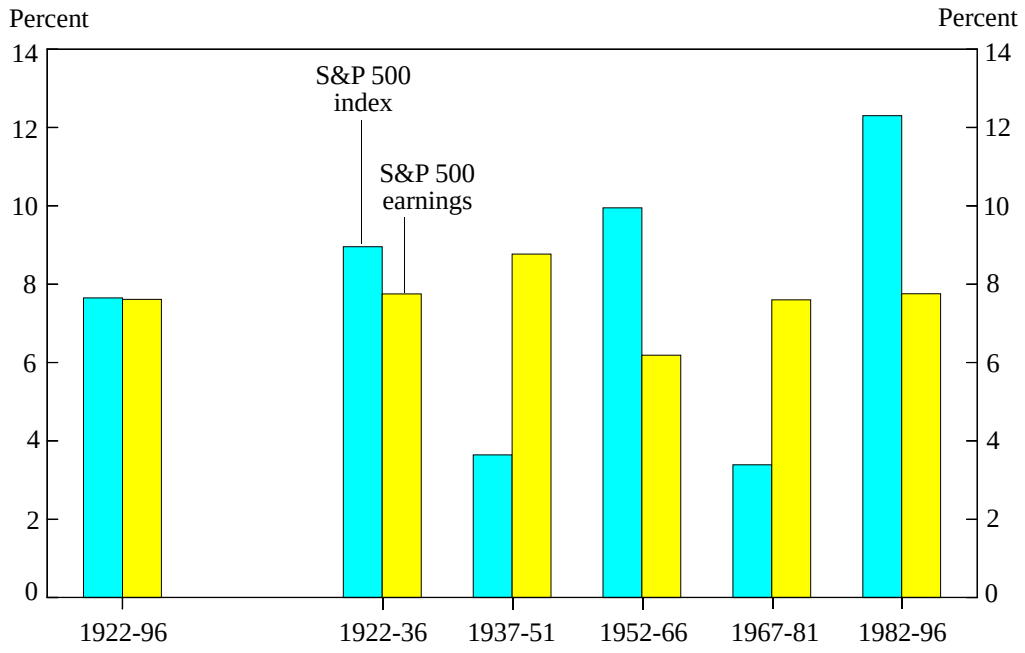
Analysts have a second reason to be skeptical of continued 15 percent stock returns. Decade-long periods of high average returns are not unprecedented, and past episodes did not foretell any permanent rise in long-run returns. Through the 1950s, for example, average ten-year returns were even higher than during the recent decade, peaking at more than 23 percent in 1956 (Chart 1). High stock returns during the 1950s, of course, did not signal the beginning of a new era. Rather, stock returns were low during the 1960s and early 1970s, and the ten-year return almost declined to zero in 1974.

II. STOCK RETURNS AND THE MACROECONOMY

Although the stock market's past performance suggests that 15 percent returns may not be sustained, the future could differ from the past. The factors that determine long-run economic growth, such as productivity, the labor force, and the capital stock, also affect corporate earnings and stock prices. This section shows, however, that recent trends in productivity, the labor force, and the capital stock will not change long-run returns much from their historical average, which has been in the vicinity of 10 percent.

An important constraint on long-run stock returns is the growth of corporate earnings. Stock returns include dividend payments and

Chart 5
ANNUALIZED GROWTH IN S&P 500 INDEX AND EARNINGS

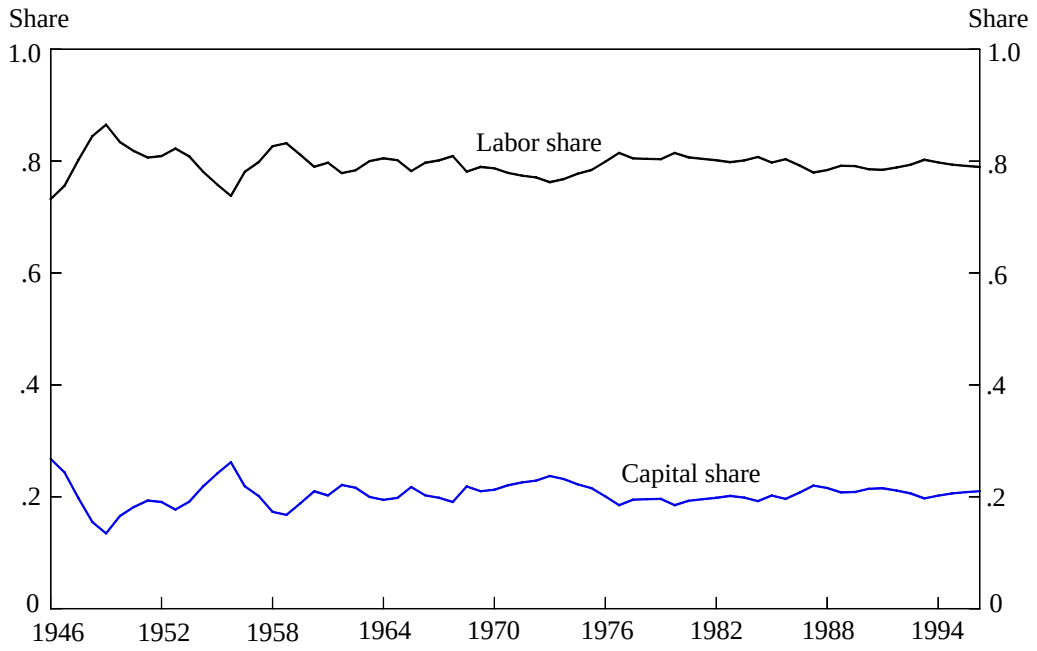


changes in stock prices, and prices grow over the long run at approximately the same rate as earnings. For example, the S&P 500 index has grown 7.7 percent per year on average since 1922, while earnings have grown 7.6 percent per year on average (Chart 5). If dividend yields remain in the vicinity of 2 percent, stock prices would have to grow 13 percent per year to generate 15 percent returns. As a result, earnings would also have to grow 13 percent per year, which is much faster than earnings have grown historically.

Thus far, corporate earnings do not appear to be accelerating. From 1982 to 1996 corporate earnings grew 7.8 percent per year on average, which is about the same as the 7.6 percent average rate over the past 75 years (Chart 5). Earnings have risen more rapidly since 1991, but the gains are comparable to those in previous business expansions. Returns have been high, of course, but primarily because stock prices have risen faster than earnings.

A traditional economic growth model is useful for analyzing whether corporate earnings can grow faster. In the context of a growth model, the question becomes, will the return to capital rise? In growth models, capital refers to real physical assets, such as factories, business equipment, office buildings, land, and residential housing. The return to capital is the income paid to those who own the capital, expressed as a percentage of the initial capital. Much of the physical capital in the economy, of course, is owned through

Chart 6
LABOR AND CAPITAL SHARE OF INCOME

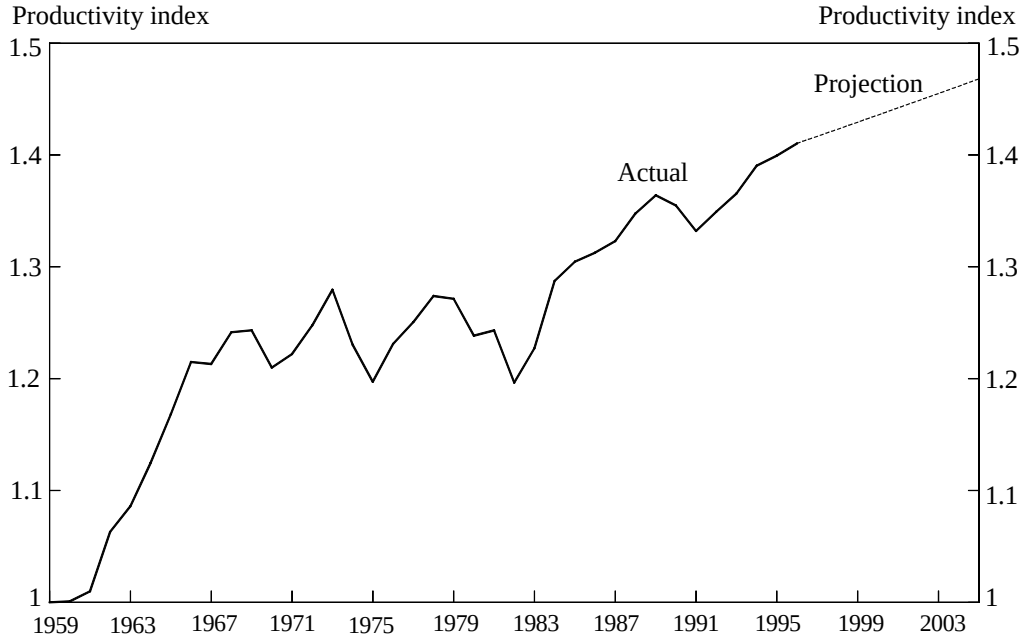


corporations. Thus, a rise in the return to capital implies higher corporate earnings.[7]

In models of economic growth, the return to capital depends on how much the economy produces and on how this economic output is shared between those who work and those who own the capital. Economic output depends on three factors: capital, labor, and total factor productivity, which is a measure of how efficiently the economy converts capital and labor inputs into economic output.[8] Economists estimate that 70 percent of national income is paid to workers, and the remaining 30 percent is paid to those who own the capital (Abel and Bernanke).[9] Although these shares vary a little over the business cycle, the shares have remained surprisingly stable when averaged over entire business cycles. Economists first observed the constant labor and capital shares in manufacturing income between 1889 and 1922 (Humphrey). The shares have remained stable through the post-World War II era (Chart 6).[10]

Assuming the labor and capital shares of income remain constant, it is possible to calculate how trends in productivity, the labor force, and the capital stock affect the return to capital. Two of these factors, productivity and the labor force, have a similar effect on the return to capital.[11] As these two factors grow, economic output, capital income, and the return to capital all rise. Growth in the capital stock, however, has the opposite effect on the return to capital.

Chart 7
TOTAL FACTOR PRODUCTIVITY



Note: Index = 1 in 1959.

If the capital stock rises faster than the labor force, capital will be less productive, which will tend to reduce the return to capital. The Bureau of Labor Statistics estimates that the labor force will grow 1.05 percent per year over the next decade (Fullerton). Assuming trends of the last decade continue, capital will grow 2.8 percent per year and total factor productivity will grow 0.72 percent per year (Chart 7).[12] These trends, coupled with a 30 percent capital share, imply that capital currently returning 10 percent annually will return 9.5 percent annually after ten years.[13] That is, contrary to the expectations of many individual investors, the model predicts the return to capital will decline slightly.

Forecasts of changes in the return to capital are potentially sensitive to forecasts of macroeconomic trends. Fortunately, the forecasts do not vary enough to affect the general conclusion of this section. Consider productivity growth as an example. Many economists contend that official estimates of productivity growth are understated because the consumer price index overstates inflation (Boskin and others). Higher productivity growth would raise the return to capital. If total factor productivity is growing 1 percent per year faster than assumed above, capital currently returning 10 percent annually would return 10.5 percent annually after ten years.[14] Thus, even with higher productivity growth, the model does not predict that stock returns will rise to the vicinity of 15 percent. In

fact, productivity growth would have to rise to about 6 percent for returns to rise from 10 to 15 percent over the course of a decade.

III. COULD HIGH STOCK PRICES BE A SIGN OF LOWER LONG-RUN RETURNS?

Based on recent macroeconomic trends, individual investors appear excessively optimistic about future stock returns. In contrast, many market professionals interpret high stock prices as a signal that future long-run returns will be below average. This section shows that recent stock prices are consistent with a modest reduction in future long-run returns, and suggests investors may have become willing to accept these lower returns because they are less concerned about stock market risk.

What is the relationship between stock prices and long-run returns?

Some analysts contend that stock prices are high because investors are willing to accept lower *future* long-run returns on stocks. This relationship is true of assets in general. For example, bond prices rise as bond yields decline. This relationship may also explain high stock prices. The plausibility of this explanation, however, depends on whether the decline in long-run returns implied by recent price-earnings ratios is reasonable. This section calculates how much long-run returns would have to decline from their historical average to justify the recent high stock prices.

When analysts say that stock prices are high, they are typically comparing stock prices to some fundamental measure of stock value. Most analysts believe the price-earnings ratio is better than either book value or dividends for measuring stock market fundamentals. Many analysts think that book value has become less meaningful because accounting statements do not adequately report all of a corporation's assets, including software, research, and the intangible value of a corporation's franchise. In addition, new accounting procedures for retiree health benefits have reduced book value since 1992 (Cole, Helwege, and Laster).[15] A recent trend has also made it difficult for analysts to compare dividend yields with historical levels. Many companies are distributing less of their earnings as dividends and instead distributing more cash to shareholders by buying back stock.[16] Given the limitations of book value and dividends, the following analysis uses the price-earnings ratio to measure stock prices.

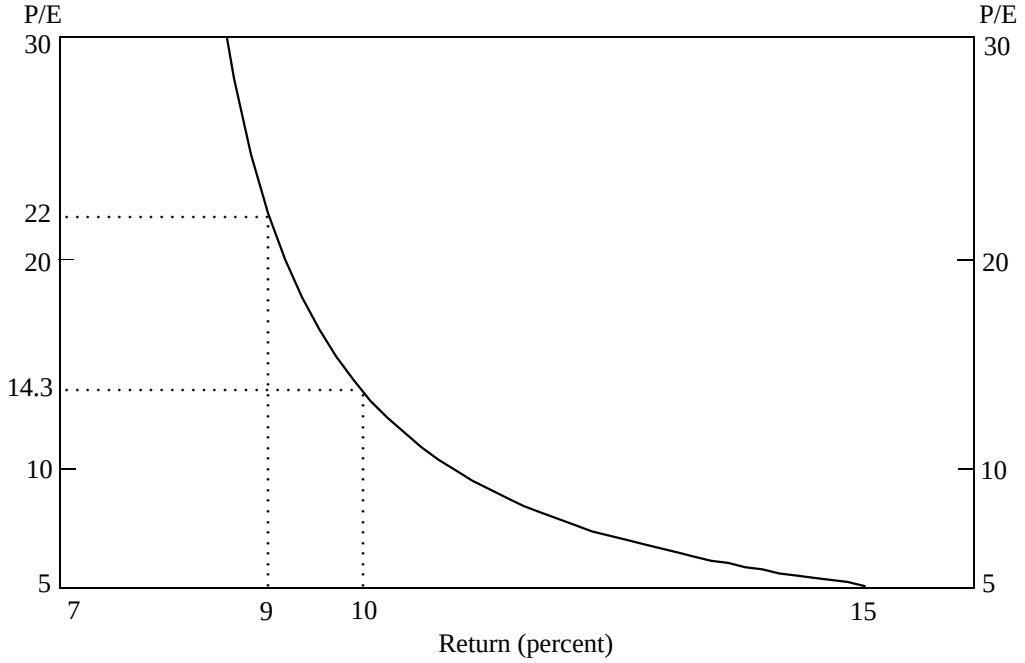
The relationship between price-earnings ratios and long-run returns can be understood by considering the two components of stock returns, price growth and dividends. To maintain price-earnings ratios at their current levels, stock prices must grow at the same rate as earnings. That is, stock prices can grow at their long-run historical rate if earnings continue to grow at this rate. If the dividend payout ratio is steady, however, high stock prices imply low dividend yields. Thus, with average growth in prices and below-average dividend yields, long-run returns will be below average.

Chart 8 illustrates the relationship between P/E ratios and long-run returns. The relationship, which is derived in the appendix, is defined by the following equation:

$$P/E = \frac{payout\ ratio}{stock\ return - retention\ ratio \times return\ on\ equity}$$

The chart is based on the assumption that corporations pay out 40 percent of their after-tax earnings to shareholders as dividends (payout ratio) and retain the other 60 percent to increase equity (retention ratio). These proportions correspond to recent payout and reinvestment ratios for the S&P 500. In addition, corporations are

Chart 8
P/E RATIO DEPENDS ON LONG-RUN RETURN



assumed to earn 12 percent on their equity (assets less debt), which is the level assumed by many industry analysts (Leibowitz and Kogelman). Under these assumptions, stock returns at the historical average of 10 percent correspond to a P/E ratio of 14.3. A rise in the P/E ratio to its recent level near 22 only requires the return to drop to 9 percent. That is, recent P/E ratios in the vicinity of 22 are consistent with a one-percentage-point decline in the required return on stocks, from 10 to 9 percent. Thus, because recent P/E ratios are consistent with only a modest decline in long-run returns, it is not unreasonable for some analysts to believe P/E ratios have risen permanently.

To sum up, this section shows that increases in P/E ratios are associated with declines in long-run returns. The calculations presented here show that current P/E ratios are consistent with a slight decline in long-run returns, from 10 to 9 percent. Many analysts, however, believe high P/E ratios imply stocks are temporarily overvalued, and they predict price declines will lead to below-average returns. If prices do decline, of course, long-run returns could revert to their historical average. This article does not take a position on the difficult issue of whether high stock prices are permanent or temporary. Instead, the analysis shows that if P/E ratios on stocks are permanently high, long-run returns could fall modestly from their long-run historical average.

Why might stock returns have declined?

The above analysis suggests that P/E ratios may be high because long-run returns have declined. But, what change in the economy would cause returns to decline? Some analysts think returns are lower because stocks have become less risky. The total return on a stock depends on the size of its risk premium—the difference between its return and the return on less risky investments such as U.S. Treasury bills. If investors perceive that stocks have become less risky, the risk premium, and therefore the total return, will decline.

Researchers who contend that stock returns have declined offer three reasons why the risk premium may have declined. First, stocks have become less volatile. Renshaw, for example, shows that the maximum annual loss on the S&P 500 has been lower in the 1980s and 1990s than in previous decades. As another measure of volatility, he calculates the ratio of the market high to the market low on an intrayear basis for each year between 1928 and 1994. Over this 67-year interval, the three least volatile years all occurred in the 1990s. A third measure of volatility is the length of time between significant market corrections. The S&P 500 index dropped 9.6 percent between February 18, 1997, and April 11,1997, which was the first 9 percent correction in over six years. Previously, the longest interval between 9 percent corrections was only 20 months, ending in September 1986.

Siegel and Thaler offer a second reason the risk premium may have declined. They suggest the risk premium may have been too high in the past. According to this explanation, investors are willing to accept a lower return on stocks because they recognize that stocks are not as risky over the long run as they previously believed. Siegel presents evidence to support this view. He calculates that stocks outperformed bonds over every 30-year interval since 1871, and that average stock returns exceeded average bond returns by 5 percent per year during this period.[17]

Recent demographic trends provide a third reason the risk premium may have declined. People are generally living longer and many of them are retiring earlier, so the time horizon for the typical investor may be increasing. Average stock returns are less volatile over longer investment horizons, so investors with long horizons should view stocks as less risky than investors with short horizons.

In addition to reducing the risk premium, demographic trends suggest another reason the return on stocks may have declined. The tax code enhances the value of stocks relative to bonds. Most investor income from stocks is classified as long-term capital gains, which are taxed at lower rates than interest payments for many taxpayers. In addition, capital gains taxes can be deferred until stocks are sold.[18] Over a 30-year horizon, Siegel calculates that the value of tax deferral adds one percentage point to the effective return on stocks. This tax advantage of stocks over bonds rises as the investment horizon gets longer, so investors would accept lower stock returns as their investment horizon lengthens.

IV. CONCLUSION

Before investors can develop successful financial plans, they need to have realistic expectations of long-run stock returns. This article examines the outlook for long-run stock returns. Although many individual investors expect the 15 percent returns of the past decade to continue, their expectations are not consistent with macroeconomic fundamentals. If official estimates of the growth of capital, labor, and total factor productivity are approximately correct, macroeconomic effects could actually reduce returns a little below their 10 percent historical average.

If productivity is growing a percentage point faster than official estimates, macroeconomic effects could raise returns a little. In either case, however, recent macroeconomic trends will not change long-run returns much from their historical average.

Contrary to expectations of continuing 15 percent returns, some analysts believe that returns could drop below the 10 percent long-run historical average. These analysts suggest that P/E ratios may be high because stocks have become less risky, which implies investors are willing to accept lower long-run returns. Specifically, a modest decline in long-run returns from 10 to 9 percent would be consistent with a rise in the P/E ratio from its historical average near 14 to its recent level near 22. This analysis, of course, presumes that stock prices remain at elevated levels. If the price rise is only temporary, near-term returns will be below average and the subsequent long-run returns will be about the same as their historical averages.

APPENDIX

THE RELATIONSHIP BETWEEN LONG-RUN STOCK RETURNS AND THE PRICE-EARNINGS RATIO

The relationship between stock returns and the price-earnings ratio can be developed from the relationship between a stock's return, its price growth, and its dividend yield. Stock returns (R) are the sum of the percentage growth in stock prices (G_P) plus the dividend yield (D/P):

$$R = G_P + D/P. \qquad \text{(A1)}$$

In a long-run equilibrium a stock's price will rise at the same rate as its fundamentals, as measured by either earnings, dividends, or equity. If the company neither issues new shares nor buys back previously issued shares, stock prices will grow at the same rate as equity over the long run. Equity growth (G_E) equals retained earnings (RE) divided by the initial equity (EQ). Thus, $G_P = G_E = RE/EQ$. Continuing, retained earnings equals the retention ratio (RR) times total earnings (E), and this substitution implies: $G_P = RR \times E/EQ$. But, E/EQ is the return on equity (ROE), so one more substitution yields: $G_P = ROE \times RR$. Because dividends equal earnings times the payout ratio (PR), the dividend yield can be rewritten as $D/P = E \times PR/P = PR \div P/E$. Substituting these expressions for G_P and D/P into equation A1 yields:

$$R = ROE \times RR + PO \div P/E\ . \qquad \text{(A2)}$$

Solving equation A2 for the P/E ratio yields:

$$P/E = PO/(R - ROE \times RR)\ . \qquad \text{(A3)}$$

Given estimates of the retention ratio, payout ratio, and return on equity, this expression defines how the P/E ratio depends on long-run stock returns. If the retention ratio equals 0.6 (payout ratio=0.4) and the return on equity equals 0.12, the expression becomes:

$$P/E = .4/(R - 0.072)\ . \qquad \text{(A4)}$$

ENDNOTES

[1] Returns described in this article are nominal rather than real returns. Although real returns are more important economically, financial economists in both the business press and academic journals typically focus on nominal returns. Economists often ignore the effects of inflation on stock returns because they are uncertain of the exact relationship between inflation and returns.

Much of the discussion of nominal long-run returns in this article can be converted to real returns by subtracting 3 percent. Inflation has averaged about 3 percent since 1927, and forecasters expect inflation to be approximately 3 percent over the next decade (Federal Reserve Bank of Philadelphia).

[2] Throughout this article, the S&P 500 index is used as a broad measure of the stock market. The index includes 500 of the largest U.S. companies, and represents more than 60 percent of the value of publicly traded stocks (the companies included in the index change over time). Other sectors of the market generally move in parallel with the S&P 500 index. Over the past two years, however, small capitalization stocks have not risen as much as the large capitalization stocks in the index.

[3] The annual returns shown in Chart 1 are based on the dividends paid during the calendar year and the average January prices of the following year.

Throughout this article, average returns are calculated arithmetically. Geometric averages, which are arguably more relevant for long-run investors, are slightly less than arithmetic averages. The use of arithmetic averages follows the convention adopted by many articles in the business press.

[4] Siegel calculates that stock returns averaged 9.5 percent between 1802 and 1992, and averaged 10.3 percent between 1871 and 1992. The averages would rise slightly if updated to include recent high returns. This article uses 10 percent as a representative number for historical long-run returns.

[5] The stock market has declined substantially for short periods, particularly in 1987 and 1990, but year-over-year returns have been positive in almost every year since 1974. Returns were also slightly negative over the December 31, 1989 to December 31, 1990 interval, but were positive based on the average January price used in Chart 1 (see endnote 3).

[6] The number of companies in the Industrials Index has varied over time, but has usually included about 400 companies. Market-to-book data are shown for the S&P Industrials Index instead of the S&P 500 index because data are available further back in time. Even for the Industrials Index, however, book value data are not available as far back as dividends and earnings data. The chart is based on the price and book value at the beginning of the year. At press time, book value was not yet available for the beginning of 1997. Book value is assumed to have grown by 7 percent during 1996, which was the growth rate in 1995.

[7] An example illustrates how the return to capital determines earnings growth. Consider a company that does not finance any of its assets with debt, so shareholders' equity equals the value of the corporation's physical assets. Capital growth (g_C) equals retained earnings (RE) divided by the initial capital (C): $g_C = RE/C$. Retained earnings, of course, equals the retention ratio (RR) times total earnings (E), so $g_C = RR \times E/C$. Over the long run, earnings will grow (g_E) at the same rate as capital, so $g_E = RR \times E/C$. That is, earnings growth is directly proportional to the return to capital (E/C).

In the context of this article, capital always refers to physical capital. The article does not explicitly consider human capital, which is also an important element of economic performance. Corporations own physical capital and do not own human capital, so corporate earnings depend primarily on physical capital.

[8] Discussions of productivity in the business press typically refer to labor productivity, which has risen faster than total factor productivity. One reason workers have become more productive, however, is that the capital invested per worker has grown. Total factor productivity measures the increase in output that cannot be attributed to either capital or labor.

[9] As defined in the National Income and Product Accounts (NIPA), the major categories of capital income are corporate earnings, interest payments to lenders, and rent payments to landlords. The NIPA measure of capital income, however, does not include capital gains and losses from movements in financial markets.

[10] Cobb and Douglas developed a model of economic production to fit their evidence that the capital and labor shares of economic output are constant. Chart 6 assumes that the "proprietor's income" category of the National Income and Product Accounts is all capital income.

Economists generally recognize that this category includes some labor income, but they are uncertain about how much. Some economists, however, estimate labor's share as 75 percent instead of the 70 percent assumed in the calculations throughout this paper. A 75 percent labor share would not change the conclusions of this article.

[11] The mathematical form of the Cobb-Douglas model is $Y = AK^{\alpha}L^{(1-\alpha)}$, where Y is economic output, A is total factor productivity, K is capital, L is labor, and α is capital's share of output (labor's share = $1-\alpha$). The return to capital can be written as $\alpha Y/K$, or $\alpha A(L/K)^{(1-\alpha)}$. From this relationship, the growth in the return to capital can be calculated as $g_R = g_A + (1-\alpha)(g_L - g_K)$, where g_A, g_L , and g_K are the growth rates of productivity, labor, and capital, respectively.

[12] Calculations of the capital stock are based on an approach by Christensen and Jorgenson, who assign different depreciation rates to different components of the capital stock. Economists generally recognize that these capital stock estimates are more accurate than estimates in the National Income and Product Accounts. Although economists' estimates of the capital stock are uncertain, the conclusions in this article are not sensitive to alternative measures of the capital stock.

[13] As developed in endnote 11, the growth rate for the return to capital can be calculated as $g_R = g_A + (1-\alpha)(g_L - g_K)$, where g_A, g_L, and g_K are the growth rates of productivity, labor, and capital. Substituting the estimated growth rates from the text, $g_R = .72 + .7 \times (1.05 - 2.8) = -0.5$ percent per year. Thus, a 10 percent return would become $10 \times (1-.005) = 9.95$ percent after one year. After declining at 0.5 percent per year for ten years, a 10 percent return would decline to $10 \times (1-.005)^{10} = 9.5$ percent.

A potential weakness of the constant-share growth model is that all capital is lumped into a single category. That is, the model describes how changes in the macroeconomy will affect the return on aggregate capital, not the return on a specific type of capital such as corporate equity. The returns on different subcategories of capital, of course, depend on the their risk characteristics. Nevertheless, if the relative risk and relative return of the subcategories do not change, changes in the return on aggregate capital will also apply to the subcategories.

[14] Although economists are uncertain about the bias in the consumer price index, many estimate the index overstates inflation by about 1 percent. If true, this would imply that total factor productivity has grown about 1 percent per year faster than estimated by the Bureau of Labor Statistics.

[15] Cole, Helwege, and Laster calculate the effects of Financial Accounting Standard 106, which changed the accounting procedures for retiree health benefits, on the book value of the S&P Industrials Index. They find the accounting change reduced book value in 1992 and 1993, but the change only partially explains recent high market-to-book value ratios.

[16] Cole, Helwege, and Laster conclude that dividend yields appear low relative to historical averages even after adjusting for stock buybacks and new issues.

[17] Siegel's book (page 31), *Stocks for the Long Run*, compares stock returns to U.S. Treasury bond returns over different horizons. To extend his analysis back to 1802 when data on Treasury securities are unavailable, Siegel used interest rates on other high-quality debt.

[18] Some mutual funds buy and sell stocks frequently. Investors in these funds with "high turnover" are unable to defer taxes on their capital gains. Investors in index funds and individual stocks, however, are able to defer capital gains taxes.

REFERENCES

Abel, Andrew B., and Ben S. Bernanke. 1992. *Macroeconomics*, New York: Addison-Wesley.

Boskin, Michael J., Ellen R. Dulberger, Zvi Griliches, Robert J. Gordon, and Dale W. Jorgenson. 1996. *Toward a More Accurate Measure of the Cost of Living: Final Report to the Senate Finance Committee from the Advisory Commission to Study the Consumer Price Index*, Washington.

Christensen, Laurits R., and Dale W. Jorgenson. 1969. "The Measurement of U.S. Real Capital Input, 1929-1967," *The Review of Income and Wealth*, December, pp. 293-320.

Cobb, Charles W., and Paul H. Douglas. 1928. "A Theory of Production," *American Economic Review*, March, pp. 139-65.

Cochrane, John Y., and Robert J. Shiller. 1988. "Stock Prices, Earnings, and Expected Dividends," *Journal of Finance*, March, pp. 661-76.

Cole, Kevin, Jean Helwege, and David Laster. 1996. "Stock Market Valuation Indicators: Is This Time Differ-

ent?" *Financial Analysts Journal*, May/June, pp. 56-64.

Easton, Thomas. 1997. "Buy High, Sell Low," *Forbes*, April 7, p. 119.

Fama, Eugene F., and Kenneth R. French. 1988. "Dividend Yields and Expected Stock Returns," *Journal of Financial Economics*, October, pp. 3-25.

Federal Reserve Bank of Philadelphia. 1997. *Livingston Survey*, June.

Fullerton, Howard N. 1991. "Labor Force Projections: The Baby Boom Moves On," *Monthly Labor Review*, November, pp. 31-44.

Humphrey, Thomas M. 1997. "Algebraic Production Functions and Their Uses Before Cobb-Douglas," Federal Reserve Bank of Richmond, *Economic Quarterly*, Winter, pp. 51-83.

Leibowitz, Martin L., and Stanley Kogelman. 1990. "Inside the P/E Ratio: The Franchise Factor," *Financial Analysts Journal*, November-December, pp. 17-35.

Renshaw, Edward. 1995. "Is the Stock Market More Stable Than It Used To Be?" *Financial Analysts Journal*, November-December, pp. 81-88.

Siegel, Jeremy J. 1994. *Stocks for the Long Run*. New York: Irwin, p. 11.

Siegel, Jeremy J., and Richard H. Thaler. 1997. "Anomalies - The Equity Premium Puzzle," *Journal of Economic Perspectives*, Winter, pp. 191-200.

Welling, Kathryn M. 1997. "Bull vs. Bear." *Barrons*, May 5, pp. 31-38.

Zuckerman, Gregory. 1997. "Asset Allocators, Cautious on Stocks, Pile Into Bonds," *Wall Street Journal*, June 3, p. C1.