



Estimating the Real Rate of Return on Stocks Over the Long Term

Papers by

John Y. Campbell

Peter A. Diamond

John B. Shoven

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TABLE OF CONTENTS

Introduction	1
Forecasting U.S. Equity Returns in the 21st Century	3
<i>John Y. Campbell</i>	
I. Methods for Forecasting Returns	3
II. Current Market Conditions	6
III. Implications for Future Returns	6
What Stock Market Returns to Expect for the Future: An Update	11
What Stock Market Returns to Expect for the Future?	17
<i>Peter A. Diamond</i>	
I. Summary	17
II. Introduction	18
III. Historical Record	19
IV. Why Future Returns May Differ From Past Returns	20
V. Other Issues	31
VI. Conclusion	33
What Are Reasonable Long-Run Rates of Return To Expect on Equities?	47
<i>John B. Shoven</i>	
I. Introduction	47
II. Dividends Are Obsolete	47
III. The Model	48
IV. Steady State Returns	49
V. The Big Question: Future P-E Ratios	49
VI. The Long-Run Outlook for Equity Rates of Return	50
VII. Why Won't Equity Returns Be As Good In the 21 st Century?	51
VIII. The Equity Premium Will Be Lower Because Real Interest Rates Are Higher	51
IX. Which Rate to Use for Projections?	52
X. Conclusions	52
Biographies of Authors	54
Appendix: Equity Yield Assumptions Used by the Office of the Chief Actuary, Social Security Administration, to Develop Estimates for Proposals with Trust Fund and/or Individual Account Investments	55
<i>Stephen C. Goss</i>	
Social Security Advisory Board	59

INTRODUCTION

In recent years there have been a variety of proposals that would change the current Social Security system to include some form of investment of funds in private equities. These proposals include allowing or requiring individuals to use a portion of the payroll tax to fund individual investment accounts, either as part of the Social Security system or as an addition to it. They also include proposals to require the government to invest a portion of the Social Security Trust Funds in equities.

A key element in evaluating these proposals is the rate of return that can be expected on such investments. The members of the 1994-1996 Advisory Council on Social Security agreed to use a real annual rate of 7 percent (the average for the period 1900-1995) to compare the three plans put forward by the Council. The Office of the Chief Actuary (OCACT) of the Social Security Administration has continued to use 7 percent to evaluate proposals for investment in stocks. However, there is a question as to whether the historical rate for the last century should be used to make long-term projections over the coming decades or whether an alternative rate or range of rates is more appropriate.

This document includes papers by three distinguished economists that examine this important question, including the issue of how to reflect the higher risk inherent in stock investment relative to investment in U.S. Treasury securities. The papers are by John Campbell, Otto Eckstein Professor of Applied Economics at Harvard University; Peter Diamond, Institute Professor at the Massachusetts Institute of Technology; and John Shoven, Charles Schwab Professor of Economics at Stanford University. The Board is publishing them in order to make them available to policy makers and members of the public who are interested in the issue of how to ensure the long-term solvency of the Social Security system.

The papers (which have been updated for purposes of this document) were the basis for a discussion sponsored by the Social Security Advisory Board on May 31, 2001. The purpose of the discussion was to enable individuals from OCACT who have the responsibility of estimating the effects of changes in the Social Security system to hear a range of views on the likely real yields on equities over the long term. Participants in the discussion from OCACT included Stephen Goss, Chief Actuary; Alice Wade, Deputy Chief Actuary; Patrick Skirvin, Lead Economist; and Anthony Cheng, Economist.

Participants also included three other distinguished economists who were on the 1999 Technical Panel on Assumptions and Methods: Eugene Steuerle, Senior Fellow, The Urban Institute; Deborah Lucas, Professor of Finance, Northwestern University and currently Chief Economist, Congressional Budget Office; and Andrew Samwick, Assistant Professor of Economics, Dartmouth College. The 1999 Technical Panel, which was sponsored by the Advisory Board, was charged with reviewing the assumptions and methods used in the long-term projections of the Social Security Trust Funds. The Panel also examined the question of how to evaluate the returns and risks involved in stock market investments. The Panel's report was published by the Board in November 1999 and is available on the Board's Web site (www.ssab.gov).

Forecasting U.S. Equity Returns in the 21st Century

**John Y. Campbell, Professor of Economics
Harvard University
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What returns should investors expect the U.S. stock market to deliver on average during the next century? Does the experience of the last century provide a reliable guide to the future? In this short note I first discuss alternative methodologies for forecasting average future equity returns, then discuss current market conditions, and finally draw conclusions for long-term return forecasts. Throughout I work in real, that is inflation-adjusted, terms.

I. Methods for Forecasting Returns

1. Average past returns

Perhaps the simplest way to forecast future returns is to use some average of past returns. Very naturally, this method has been favored by many investors and analysts. However there are several difficulties with it.

a) *Geometric average or arithmetic average?* The geometric average return is the cumulative past return on U.S. equities, annualized. Siegel (1998) studies long-term historical data on value-weighted U.S. share indexes. He reports a geometric average of 7.0% over two different sample periods, 1802-1997 and 1871-1997. The arithmetic average return is the average of one-year past returns on U.S. equities. It is considerably higher than the geometric average return, 8.5% over 1802-1997 and 8.7% over 1871-1997.¹

When returns are serially uncorrelated, the arithmetic average represents the best forecast of future return in any randomly selected future year. For long holding periods, the best forecast is the arithmetic average compounded up appropriately. If one is making a 75-year forecast, for example, one should forecast a cumulative return of 1.085^{75} based on 1802-1997 data.

When returns are negatively serially correlated, however, the arithmetic average is not necessarily superior as a forecast of long-term future returns. To understand this, consider an extreme example in which prices alternate deterministically between 100 and 150. The return is 50% when prices rise, and -33% when prices fall. Over any even number of periods, the geometric average return is zero, but the arithmetic average return is 8.5%. In this case the arithmetic average return is misleading because it fails to take account of the fact that high returns always multiply a low initial price of 100, while low returns always multiply a high initial price of

¹ When returns are lognormally distributed, the difference between the two averages is approximately one-half the variance of returns. Since stock returns have an annual standard deviation of about 18% over these long periods, the predicted difference is $0.18^2/2=0.016$ or 1.6%. This closely matches the difference in the data.

150. The geometric average is a better indication of long-term future prospects in this example.²

This point is not just a theoretical curiosity, because in the historical data summarized by Siegel, there is strong evidence that the stock market is mean-reverting. That is, periods of high returns tend to be followed by periods of lower returns. This suggests that the arithmetic average return probably overstates expected future returns over long periods.

b) Returns are very noisy. The randomness in stock returns is extreme. With an annual standard deviation of real return of 18%, and 100 years of past data, a single year's stock return that is only one standard deviation above average increases the average return by 18 basis points. A lucky year that is two standard deviations above average increases the average return by 36 basis points. Even when a century or more of past data is used, forecasts based on historical average returns are likely to change substantially from one year to the next.

c) Realized returns rise when expected returns fall. To the extent that expected future equity returns are not constant, but change over time, they can have perverse effects on realized returns. Suppose for example that investors become more risk-tolerant and reduce the future return that they demand from equities. If expected future cash flows are unchanged, this drives up prices and realized returns. Thus an estimate of future returns based on average past realized returns will tend to increase just as expected future returns are declining.

Something like this probably occurred in the late 1990's. A single good year can have a major effect on historical average returns, and several successive good years have an even larger effect. But it would be a mistake to react to the spectacular returns of 1995-99 by increasing estimates of 21st Century returns.

d) Unpalatable implications. Fama and French (2000) point out that average past U.S. stock returns are so high that they exceed estimates of the return to equity (ROE) calculated for U.S. corporations from accounting data. Thus if one uses average past stock returns to estimate the cost of capital, the implication is that U.S. corporate investments have destroyed value; corporations should instead have been paying all their earnings out to stockholders. This conclusion is so hard to believe that it further undermines confidence in the average-return methodology.

One variation of the average-past-returns approach is worth discussing. One might take the view that average past equity returns in other countries provide relevant evidence about U.S. equity returns. Standard international data from Morgan Stanley Capital International,

² One crude way to handle this problem is to measure the annualized variance of returns over a period such as 20 years that is long enough for returns to be approximately serially uncorrelated, and then to adjust the geometric average up by one-half the annualized 20-year variance as would be appropriate if returns are lognormally distributed. Campbell and Viceira (2001, Figure 4.2) report an annualized 20-year standard deviation of about 14% in long-term annual U.S. data, which would imply an adjustment of $0.14^2/2=0.010$ or 1.0%.

available since the early 1970's, show that equity returns in most other industrialized countries have been about as high as those in the U.S. The exceptions are the heavily commodity-dependent markets of Australia and Canada, and the very small Italian market (Campbell 1999). Jorion and Goetzmann (1999) argue that other countries' returns were lower than U.S. returns in the early 20th Century, but this conclusion appears to be sensitive to their omission of the dividend component of return (Dimson, Marsh, and Staunton 2000). Thus the use of international data does not change the basic message that the equity market has delivered high average returns in the past.

2. Valuation ratios

An alternative approach is to use valuation ratios—ratios of stock prices to accounting measures of value such as dividends or earnings—to forecast future returns. In a model with constant valuation ratios and growth rates, the famous Gordon growth model says that the dividend-price ratio

$$\frac{D}{P} = R - G, \quad (1)$$

where R is the discount rate or expected equity return, and G is the growth rate of dividends (equal to the growth rate of prices when the valuation ratio is constant). This formula can be applied either to price per share and conventional dividends per share, or to the total value of the firm and total cash paid out by the firm (including share repurchases). A less well-known but just as useful formula says that in steady state, where earnings growth comes from reinvestment of retained earnings which earn an accounting ROE equal to the discount rate R ,

$$\frac{E}{P} = R. \quad (2)$$

Over long periods of time summarized by Siegel (1998), these formulas give results consistent with average realized returns. Over the period 1802-1997, for example, the average dividend-price ratio was 5.4% while the geometric average growth rate of prices was 1.6%. These numbers add to the geometric average return of 7.0%. Over the period 1871-1997 the average dividend-price ratio was 4.9% while the geometric average growth rate of prices was 2.1%, again adding to 7.0%. Similarly, Campbell and Shiller (2001) report that the average P/E ratio for S&P 500 shares over the period 1872-2000 was 14.5. The reciprocal of this is 6.9%, consistent with average realized returns.

When valuation ratios and growth rates change over time, these formulas are no longer exactly correct. Campbell and Shiller (1988) and Vuolteenaho (2000) derive dynamic versions of the formulas that can be used in this context. Campbell and Shiller show, for example, that the log dividend-price ratio is a discounted sum of expected future discount rates, less a discounted sum of expected future dividend growth rates. In this note I will work with the simpler deterministic formulas.

II. Current Market Conditions

Current valuation ratios are wildly different from historical averages, reflecting the unprecedented bull market of the last 20 years, and particularly the late 1990's. The attached figure, taken from Campbell and Shiller (2001), illustrates this point. (See p. 9) The bottom left panel shows the dividend-price ratio D/P in January of each year from 1872-2000. The long-term historical average is 4.7%, but D/P has fallen dramatically since 1982 to about 1.2% in January 2000 (and 1.4% today).

The dividend-price ratio may have fallen in part because of shifts in corporate financial policy. An increased tendency for firms to repurchase shares rather than pay dividends increases the growth rate of dividends per share, by shrinking the number of shares. Thus it increases G in the Gordon growth formula and reduces conventionally measured D/P . One way to correct for this is to add repurchases to conventional dividends. Recent estimates of this effect by Liang and Sharpe (1999) suggest that it may be an upward adjustment of 75 to 100 basis points, and more in some years. Of course, this is not nearly sufficient to explain the recent decline in D/P .

Alternatively, one can look at the price-earnings ratio. The top left panel of the figure shows P/E over the same period. This has been high in recent years, but there are a number of earlier peaks that are comparable. Close inspection of these peaks shows that they often occur in years such as 1992, 1934, and 1922 when recessions caused temporary drops in (previous-year) earnings. To smooth out this effect, Campbell and Shiller (2001), following Graham and Dodd (1934), advocate averaging earnings over 10 years. The price-averaged earnings ratio is illustrated in the top right panel of the figure. This peaked at 45 in January 2000; the previous peak was 28 in 1929. The decline in the S&P 500 since January 2000 has only brought the ratio down to the mid-30's, still higher than any level seen before the late 1990's.

The final panel in the figure, on the bottom right, shows the ratio of current to 10-year average earnings. This ratio has been high in recent years, reflecting robust earnings growth during the 1990's, but it is not unprecedentedly high. The really unusual feature of the recent stock market is the level of prices, not the growth of earnings.

III. Implications for Future Returns

The implications of current valuations for future returns depend on whether the market has reached a new steady state, in which current valuations will persist, or whether these valuations are the result of some transitory phenomenon.

If current valuations represent a new steady state, then they imply a substantial decline in the equity returns that can be expected in the future. Using Campbell and Shiller's (2001) data, the unadjusted dividend-price ratio has declined by 3.3 percentage points from the historical average. Even adjusting for share repurchases, the decline is at least 2.3 percentage points. Assuming constant long-term growth of the economy, this would imply that the geometric average return on equity is no longer 7%, but 3.7% or at most 4.7%. Looking at the price-averaged earnings ratio,

adjusting for the typical ratio of current to averaged earnings, gives an even lower estimate. Current earnings are normally 1.12 times averaged earnings; $1.12/35=0.032$, implying a 3.2% return forecast. These forecasts allow for only a very modest equity premium relative to the yield on long-term inflation-indexed bonds, currently about 3.5%, or the 3% safe real return assumed recently by the Trustees.

If current valuations are transitory, then it matters critically what happens to restore traditional valuation ratios. One possibility is that earnings and dividends are below their long-run trend levels; rapid earnings and dividend growth will restore traditional valuations without any declines in equity returns below historical levels. While this is always a possibility, Campbell and Shiller (2001) show that it would be historically unprecedented. The U.S. stock market has an extremely poor record of predicting future earnings and dividend growth. Historically stock prices have increased relative to earnings during decades of rapid earnings growth, such as the 1920's, 1960's, or 1990's, as if the stock market anticipates that rapid earnings growth will continue in the next decade. However there is no systematic tendency for a profitable decade to be followed by a second profitable decade; the 1920's, for example, were followed by the 1930's and the 1960's by the 1970's. Thus stock market optimism often fails to be justified by subsequent earning growth.³

A second possibility is that stock prices will decline or stagnate until traditional valuations are restored. This has occurred at various times in the past after periods of unusually high stock prices, notably the 1900's and 1910's, the 1930's, and the 1970's. This would imply extremely low and perhaps even negative returns during the adjustment period, and then higher returns afterwards.

The unprecedented nature of recent stock market behavior makes it impossible to base forecasts on historical patterns alone. One must also form a view about what happened to drive stock prices up during the 1980's and particularly the 1990's. One view is that there has been a structural decline in the equity premium, driven either by the correction of mistaken perceptions of risk (aided perhaps by the work of economists on the equity premium puzzle), or by the reduction of barriers to participation and diversification by small investors.⁴ Economists such as McGrattan and Prescott (2001) and Jagannathan, McGrattan, and Scherbina (2001) argue that the structural equity premium is now close to zero, consistent with theoretical models in which investors effectively share risks and have modest risk aversion, and consistent with the view that the U.S. market has reached a new steady state.

³ Vuolteenaho (2000) notes, however, that U.S. corporations were unusually profitable in the late 1990's and that profitability has some predictive power for future earnings growth.

⁴ Heaton and Lucas (1999) model barriers of this sort. It is hard to get large effects of increased participation on stock prices unless initial participation levels are extremely low. Furthermore, one must keep in mind that what matters for pricing is the wealth-weighted participation rate, that is, the probability that a randomly selected dollar of wealth is held by an individual who can participate in the market. This is higher than the equal-weighted participation rate, the probability that a randomly selected individual can participate.

An alternative view is that the equity premium has declined only temporarily, either because investors irrationally overreacted to positive fundamental news in the 1990's (Shiller 2000), or because the strong economy made investors more tolerant of risk.⁵ On this view the equity premium will return to historical levels, implying extremely poor near-term returns and higher returns in the more distant future after traditional valuations have been restored.

It is too soon to tell which of these views is correct, and I believe it is sensible to put some weight on each of them. That is, I expect valuation ratios to return part way but not fully to traditional levels.⁶ A rough guess for the long term, after the adjustment process is complete, might be a geometric average equity return of 5% to 5.5% or an arithmetic average return of 6.5% to 7%.

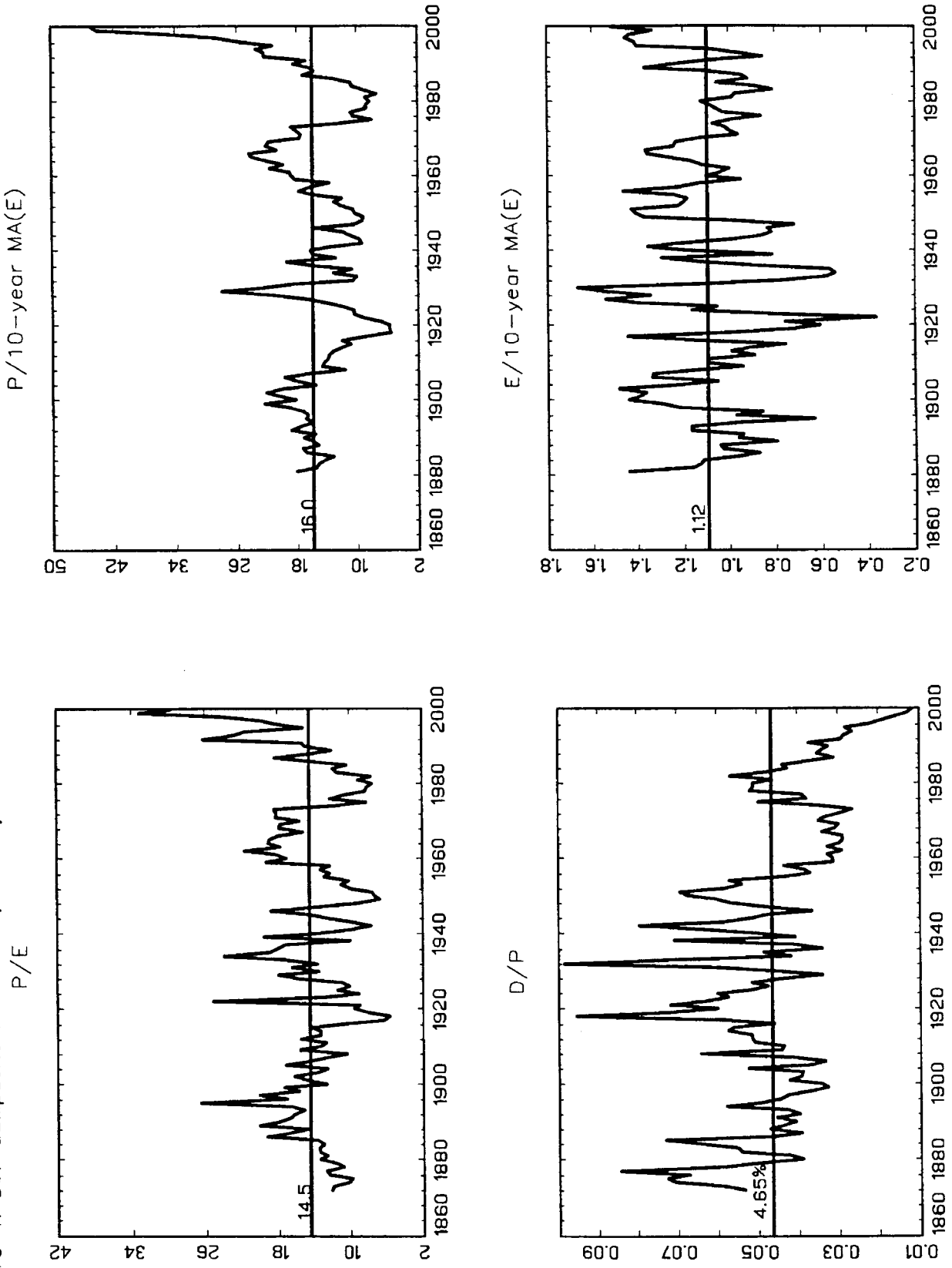
If equity returns are indeed lower on average in the future, it is likely that short-term and long-term real interest rates will be somewhat higher. That is, the total return to the corporate capital stock is determined primarily by the production side of the economy and by national saving and international capital flows; the division of total return between riskier and safer assets is determined primarily by investor attitudes towards risk. Reduced risk aversion then reduces the equity premium both by driving down the equity return and by driving up the riskless interest rate. The yield on long-term inflation-indexed Treasury securities (TIPS) is about 3.5%, while short-term real interest rates have recently averaged about 3%. Thus 3% to 3.5% would be a reasonable guess for safe real interest rates in the future, implying a long-run average equity premium of 1.5% to 2.5% in geometric terms or about 3% to 4% in arithmetic terms.

Finally, I note that it is tricky to use these numbers appropriately in policy evaluation. Average equity returns should never be used in base-case calculations without showing alternative calculations to reflect the possibilities that realized returns will be higher or lower than average. These calculations should include an alternative in which equities underperform Treasury bills. Even if the probability of underperformance is small over a long holding period, it cannot be zero or the stock market would be offering an arbitrage opportunity or "free lunch". Equally important, the bad states of the world in which underperformance occurs are heavily weighted by risk-averse investors. Thus policy evaluation should use a broad range of returns to reflect the uncertainty about long-run stock market performance.

⁵ Campbell and Cochrane (1999) present a model in which investors judge their well-being by their consumption relative to a recent average of past aggregate consumption. In this model investors are more risk-tolerant when consumption grows rapidly and they have a "cushion of comfort" relative to their minimum expectations. The Campbell-Cochrane model fits past cyclical variations in the stock market, which will likely continue in the future, but it is hard to explain the extreme recent movements using this model.

⁶ This compromise view also implies that negative serial correlation, or mean-reversion, is likely to remain a characteristic of stock returns in the 21st Century.

Figure 4. S&P Composite Stock Data, January Values 1872-1997



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What Stock Market Returns to Expect for the Future: An Update

**Peter A. Diamond, Professor of Economics
Massachusetts Institute of Technology
July 23, 2001**

This note updates the calculations in my previous analysis of this issue (Social Security Bulletin, 2000, vol. 63, no. 2, pp. 38-52).^{*} The calculations address two issues. First, what are the implications of assuming an annual 7% real return on equities throughout the next 75 years (along with the assumptions in the Trustees' Report), as has been the practice in OCACT projections of Social Security reform proposals that include equities. While the numbers are changed some from those based on the end of 1998, calculations done for the end of 2000 and the end of the first quarter of 2001 continue to show that a 7% return throughout the next 75 years from these starting points is implausible.

Second, what are the implications for stock market values in ten years if there is to be a lower rate of return for the next decade, followed by a return to the historical average return thereafter. As before, the returns over the next decade need to be very low, indeed an unchanged nominal value for stocks at the end of the decade is roughly consistent with close to a 7% return thereafter.

The calculations reported here are based on the Gordon formula, relating stock values to returns and the growth of returns. A first step in considering stock market returns is to project the future net cash flow to stockholders. This is normally done in three steps. First is to estimate the current net cash flow. Second is to adjust that for reasons to believe that the long-run relationship to GDP may be different from the current relationship. And third is to assume a constant relationship to GDP given the first two steps.

The cash flow to holders of publicly traded stocks as a whole contains many pieces. Easy to measure is the flow of dividends. Then there is the cash flow arising from share repurchase. This happens in two ways – direct repurchase of a corporation's own shares and acquisition of the shares of other corporations for cash or debt. Sometimes acquired shares are retired and sometimes they are not. This may be a complication in estimation given how data are presented – I have not reviewed measurement in data sources.

In order to maintain any given fraction of the value of shares outstanding, there are also pieces that are equivalent to negative cash flows. When employees exercise stock options and so acquire shares at less than market value, there is a dilution of the stock value of existing owners. This can be approached by thinking about the excess of market value over exercise price or by considering the value of options that are given to employees.

^{*} See article beginning on p. 17.

I am grateful to Mauricio Soto for excellent research assistance, doing the calculations reported here. I am also grateful for financial support from the Retirement Research Center at Boston College.

Some existing firms go out of business while new firms are created. For considering the return on a given fraction of the entire outstanding traded stock, it is necessary to include the negative cash flow associated with additional traded companies. The direct cash flow of IPO's that are previously owned by individuals is such a negative cash flow. In addition, the value retained by the original owners also represents a dilution in the value of existing shareholders and also needs to be counted. Thus actual cash flow for new firms that were previously private needs to be increased by a multiplier – with 3 being a reasonable estimate. However, the analysis is different for new companies that are spin-offs from existing firms. The cash flow paid for them is a negative cash flow for shareholders as a whole. However, there is no need for a multiplier since the value of retained shares by corporations is retained by the aggregate of current shareholders. Thus there is a need to separate out these two types of IPO's. I have not seen an estimate separating these two parts.

In the methodology used in my previous paper, these various steps, along with any divergence of the current position from a steady state, were combined to produce a range of values referred to as adjusted dividend flow. In Table 1 are the implied ratios of stock market value to GDP at the end of the 75-year projection period based on stock market and GDP values at the end of 1998 and the assumptions in the 1999 Trustees' Report as well as values at the end of 2000 and end of the first quarter of 2001 and the assumptions in the 2001 Trustees' Report. The Table suggests that the 7 percent assumption throughout the next 75 years is not plausible in that it requires a rise in stock values to GDP that is implausible. The level of implausibility is not quite as high as two years ago, but it is still implausible. A sensitivity analysis is presented in Table 2 that varies the growth rate of GDP. Moderate increases in GDP growth above the levels assumed in the Trustees' Report still leave a 7% return throughout the next 75 years implausible.

Table 3 presents the size of the real drop in stock market values over the next ten years that are sufficient for the Gordon formula to yield a steady return of 7 percent thereafter (along with calculations for 6.5 and 6.0). Poor returns over the next ten years are needed for consistency with a higher ultimate long-run number, almost as poor as two years ago, for a given adjusted dividend level. Table 4 presents sensitivity analysis.

An important issue is whether it is more plausible to have a poor short-run return followed by a return to historic yields or to believe that the long-run ultimate return has dropped. Given the rest of the assumptions used by OCACT (particularly the assumption of a 3% real yield on long-term Treasuries), that is tantamount to a drop in the equity premium. I think many investors are not expecting as low a return as would be called for by the assumption that we are now in a steady state. Therefore, I continue to think a poor return over the next decade is a more plausible assumption. It seems sensible to lower the long-run return a little from the 7% historic norm in recognition of the unusually long period of very high returns that we have experienced (although one can wonder what would have happened in the late 20's and early 30's if Alan Greenspan had headed the Fed). Moreover, since it is impossible to predict timing of market corrections and it is sensible to work with a single rate of return for projection purposes, a lower rate of return is appropriate to correct for a period of lower returns even if the correction scenario returning all the way to 7% is right. Thus projection values around 6.0% or 6.5% seem to me appropriate for projection purposes. Of course, a wider band is important for high and low cost projections in order to show the extreme uncertainty associated with such a projection.

Table 1

Projections of the Ratio of Stock Market Value To GDP Assuming 7 Percent Real Return

End of 1998 Projections

	2.0%	Adjusted Dividends		
		2.5%	3.0%	3.5%
2073 Market to GDP	68.49	58.32	48.16	38.00
Ratio 2073 to Current	37.76	32.15	26.55	20.95

End of 2000 Projections

	2.0%	Adjusted Dividends		
		2.5%	3.0%	3.5%
2075 Market to GDP	44.93	37.73	30.54	23.34
Ratio 2075 to Current	26.47	22.23	17.99	13.75

End of First Quarter 2001 Projections

	2.0%	Adjusted Dividends		
		2.5%	3.0%	3.5%
2075 Market to GDP	39.54	33.29	27.03	20.77
Ratio 2075 to Current	26.81	22.57	18.33	14.08

Table 2

Projections of the Ratio of Stock Market Value To GDP Assuming 7 Percent Real Return

End of First Quarter 2001 Projections

	Adjusted Dividends			
	2.0%	2.5%	3.0%	3.5%
<i>Under Current Projections</i>				
2075 Market to GDP	39.54	33.29	27.03	20.77
Ratio 2075 to Current	26.81	22.57	18.33	14.08
<i>GDP Growth 0.1% Higher</i>				
2075 Market to GDP	36.34	30.43	24.51	18.60
Ratio 2075 to Current	24.64	20.63	16.62	12.61
<i>GDP Growth 0.3% Higher</i>				
2075 Market to GDP	30.65	25.37	20.08	14.79
Ratio 2075 to Current	20.78	17.20	13.61	10.02
<i>GDP Growth 0.5% Higher</i>				
2075 Market to GDP	25.81	21.07	16.34	11.60
Ratio 2075 to Current	17.50	14.29	11.08	7.86

*Assuming 7% stock yield, and using 2001 trustees projections.

** Using Estimated Market Value for April 1, 2001.

Table 3

Required Percentage Decline in Real Stock Prices Over the Following Ten Years To Justify a 7.0, 6.5, and 6.0 Percent Return Thereafter (end 1998)

Adjusted Dividend Yield	Long-run Return		
	7.0	6.5	6.0
2.0	55	51	45
2.5	44	38	31
3.0	33	26	18
3.5	21	13	4

Required Percentage Decline in Real Stock Prices Over the Following Ten Years To Justify a 7.0, 6.5, and 6.0 Percent Return Thereafter (end 2000)

Adjusted Dividend Yield	Long-run Return		
	7.0	6.5	6.0
2.0	53	48	42
2.5	41	35	28
3.0	29	22	13
3.5	17	9	-1

Source: Author's Calculations

Note: Derived from the Gordon Formula. Dividends are assumed to grow in line with GDP, which the OCACT assumed in 1999 is 2.0 percent over the next 10 years and 1.5 percent for the long run; and in 2001, 2.3 percent and then 1.6 percent.

Table 4

Required Percentage Decline in Real Stock Prices Over the Next Ten Years To Justify a 7.0, 6.5, and 6.0 Percent Return Thereafter (end 2000)

Under Current Projections

Adjusted Dividend Yield	Long-run Return		
	7.0	6.5	6.0
2.0	53	48	42
2.5	41	35	28
3.0	29	22	13
3.5	17	9	-1

GDP Growth 0.3% Higher Each Year

Adjusted Dividend Yield	Long-run Return		
	7.0	6.5	6.0
2.0	48	43	36
2.5	35	28	20
3.0	23	14	4
3.5	10	0	-12

Source: Author's Calculations

Note: Derived from the Gordon Formula. Dividends are assumed to grow in line with GDP, which the OACT assumes is 2.3 percent over the next 10 years. For long-run GDP growth, the OACT assumes 1.6 percent.

What Stock Market Returns to Expect for the Future?

Peter A. Diamond

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High stock prices, together with projected slow economic growth, are not consistent with the 7.0 percent return that the Office of the Chief Actuary has generally used when evaluating proposals with stock investments. Routes out of the inconsistency include assuming higher GDP growth, a lower long-run stock return, or a lower short-run stock return with a 7.0 percent return on a lower base thereafter. In short, either the stock market is overvalued and requires a correction to justify a 7.0 percent return thereafter, or it is correctly valued and the long-run return is substantially lower than 7.0 percent (or some combination of the two). This article argues that the former view is more convincing, since accepting the “correctly valued” hypothesis implies an implausibly small equity premium.

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I. Summary

In evaluating proposals for reforming Social Security that involve stock investments, the Office of the Chief Actuary (OACT) has generally used a 7.0 percent real return for stocks. The 1994-96 Advisory Council specified that OACT should use that return in making its 75-year projections of investment-based reform proposals. The assumed ultimate real return on Treasury bonds of 3.0 percent implies a long-run equity premium of 4.0 percent. There are two equity-premium concepts: the *realized* equity premium, which is measured by the actual rates of return; and the *required* equity premium, which investors expect to receive for being willing to hold available stocks and bonds. Over the past two centuries, the realized premium was 3.5 percent on average, but 5.2 percent for 1926 to 1998.

Some critics argue that the 7.0 percent projected stock returns are too high. They base their arguments on recent developments in the capital market, the current high value of the stock market, and the expectation of slower economic growth.

Increased use of mutual funds and the decline in their costs suggest a lower required premium, as does the rising fraction of the American public investing in stocks. The size of the decrease is limited, however, because the largest cost savings do not apply to the very wealthy and to large institutional investors, who hold a much larger share of the stock market's total value than do new investors. These trends suggest a lower equity premium for projections than the 5.2 percent of the past 75 years. Also, a declining required premium is likely to imply a temporary increase in the realized premium because a rising willingness to hold stocks tends to increase their price. Therefore, it would be a mistake during a transition period to extrapolate what may be a temporarily high realized return. In the standard (Solow) economic growth model, an assumption of slower long-run growth lowers the marginal product of capital if the savings rate is constant. But lower savings as growth slows should partially or fully offset that effect.

The present high stock prices, together with projected slow economic growth, are not consistent with a 7.0 percent return. With a plausible level of adjusted dividends (dividends plus net share repurchases), the ratio of stock value to gross domestic product (GDP) would rise more than 20-fold over 75 years. Similarly, the steady-state Gordon formula—that stock returns equal the adjusted dividend yield plus the growth rate of stock prices (equal to that of GDP)—suggests a return of roughly 4.0 percent to 4.5 percent. Moreover, when relative stock values have been high, returns over the following decade have tended to be low.

To eliminate the inconsistency posed by the assumed 7.0 percent return, one could assume higher GDP growth, a lower long-run stock return, or a lower short-run stock return with a 7.0 percent return on a lower base thereafter. For example, with an adjusted dividend yield of 2.5 percent to 3.0 percent, the market would have to decline about 35 percent to 45 percent in real terms over the next decade to reach steady state.

In short, either the stock market is overvalued and requires a correction to justify a 7.0 percent return thereafter, or it is correctly valued and the long-run return is substantially lower than 7.0 percent (or some combination). This article argues that the “overvalued” view is more convincing, since the “correctly valued” hypothesis implies an implausibly small equity premium. Although OCACT could adopt a lower rate for the entire 75-year period, a better approach would be to assume lower returns over the next decade and a 7.0 percent return thereafter.

II. Introduction

All three proposals of the 1994-96 Advisory Council on Social Security (1997) included investment in equities. For assessing the financial effects of those proposals, the Council members agreed to specify a 7.0 percent long-run real (inflation-adjusted) yield from stocks.¹ They devoted little attention to different short-run returns from stocks.² The Social Security Administration’s Office of the Chief Actuary (OCACT) used this 7.0 percent return, along with a 2.3 percent long-run real yield on Treasury bonds, to project the impact of the Advisory Council’s proposals.

Since then, OCACT has generally used 7.0 percent when assessing other proposals that include equities.³ In the 1999 Social Security Trustees Report, OCACT used a higher long-term real rate on Treasury bonds of 3.0 percent.⁴ In the first 10 years of its projection period, OCACT makes separate assumptions about bond rates for each year and assumes slightly lower real rates in the short run.⁵ Since the assumed bond rate has risen, the assumed equity premium, defined as the difference between yields on equities and Treasuries, has declined to 4.0 percent in the long run.⁶ Some critics have argued that the assumed return on stocks and the resulting equity premium are still too high.⁷

This article examines the critics’ arguments and, rather than settling on a single recommendation, considers a range of assumptions that seem reasonable.⁸ The article:

- Reviews the historical record on rates of return,
- Assesses the critics' reasons why future returns may be different from those in the historical record and examines the theory about how those rates are determined, and
- Considers two additional issues: the difference between gross and net returns, and investment risk.

Readers should note that in this discussion, a decline in the equity premium need not be associated with a decline in the return on stocks, since the return on bonds could increase. Similarly, a decline in the return on stocks need not be associated with a decline in the equity premium, since the return on bonds could also decline. Both rates of return and the equity premium are relevant to choices about Social Security reform.

III. Historical Record

Realized rates of return on various financial instruments have been much studied and are presented in Table 1.⁹ Over the past 200 years, stocks have produced a real return of 7.0 percent per year. Even though annual returns fluctuate enormously, and rates vary significantly over periods of a decade or two, the return on stocks over very long periods has been quite stable (Siegel 1999).¹⁰ Despite that long-run stability, great uncertainty surrounds both a projection for any particular period and the relevance of returns in any short period of time for projecting returns over the long run.

The equity premium is the difference between the rate of return on stocks and on an alternative asset—Treasury bonds, for the purpose of this article. There are two concepts of equity premiums. One is the *realized* equity premium, which is measured by the actual rates of return. The other is the *required* equity premium, which equals the premium that investors expect to get in exchange for holding available quantities of assets. The two concepts are closely related but different—significantly different in some circumstances.

The realized equity premium for stocks relative to bonds has been 3.5 percent for the two centuries of available data, but it has increased over time (Table 2).^{11, 12} That increase has resulted

Period	Stocks	Bonds	Bills	Gold	Inflation
1802-1998	7.0	3.5	2.9	-0.1	1.3
1802-1870	7.0	4.8	5.1	0.2	0.1
1871-1925	6.6	3.7	3.2	-0.8	0.6
1926-1998	7.4	2.2	0.7	0.2	3.1
1946-1998	7.8	1.3	0.6	-0.7	4.2

Source: Siegel (1999).

Table 2. Equity premiums: Differences in annual rates of return between stocks and fixed-income assets, 1802-1998		
Period	Equity premium (percent)	
	With bonds	With bills
1802-1998	3.5	5.1
1802-1870	2.2	1.9
1871-1925	2.9	3.4
1926-1998	5.2	6.7
1946-1998	6.5	7.2

Source: Siegel (1999).

from a significant decline in bond returns over the past 200 years. The decline is not surprising considering investors' changing perceptions of default risk as the United States went from being a less-developed country (and one with a major civil war) to its current economic and political position, where default risk is seen to be virtually zero.¹³

These historical trends can provide a starting point for thinking about what assumptions to use for the future. Given the relative stability of stock returns over time, one might initially choose a 7.0 percent assumption for the return on stocks—the average over the entire 200-year period. In contrast, since bond returns have tended to decline over time, the 200-year number does not seem to be an equally good basis for selecting a long-term bond yield. Instead, one might choose an assumption that approximates the experience of the past 75 years—2.2 percent, which suggests an equity premium of around 5.0 percent. However, other evidence, discussed below, argues for a somewhat lower value.¹⁴

IV. Why Future Returns May Differ From Past Returns

Equilibrium and Long-Run Projected Rates of Return

The historical data provide one way to think about rates of return. However, thinking about how the future may be different from the past requires an underlying theory about how those returns are determined. This section lists some of the actions by investors, firms, and government that combine to determine equilibrium; it can be skipped without loss of continuity.

In asset markets, the demand by individual and institutional investors reflects a choice among purchasing stocks, purchasing Treasury bonds, and making other investments.¹⁵ On the supply side, corporations determine the supplies of stocks and corporate bonds through decisions on dividends, new issues, share repurchases, and borrowing. Firms also choose investment levels. The supplies of Treasury bills and bonds depend on the government's budget and debt management policies as well as monetary policy. Whatever the supplies of stocks and bonds, their

prices will be determined so that the available amounts are purchased and held by investors in the aggregate.

The story becomes more complicated, however, when one recognizes that investors base decisions about portfolios on their projections of both future prices of assets and future dividends.¹⁶ In addition, market participants need to pay transactions costs to invest in assets, including administrative charges, brokerage commissions, and the bid-ask spread. The risk premium relevant for investors' decisions should be calculated net of transactions costs. Thus, the greater cost of investing in equities than in Treasuries must be factored into any discussion of the equity premium.¹⁷ Differences in tax treatments of different types of income are also relevant (Gordon 1985; Kaplow 1994).

In addition to determining the supplies of corporate stocks and bonds, corporations also choose a debt/equity mix that affects the risk characteristics of both bonds and stocks. Financing a given level of investment more by debt and less by equity leaves a larger interest cost to be paid from the income of corporations before determining dividends. That makes both the debt and the equity more risky. Thus, changes in the debt/equity mix (possibly in response to prevailing stock market prices) should affect risk and, therefore, the equilibrium equity premium.¹⁸

Since individuals and institutions are generally risk averse when investing, greater expected variation in possible future yields tends to make an asset less valuable. Thus, a sensible expectation about long-run equilibrium is that the expected yield on equities will exceed that on Treasury bonds. The question at hand is how much more stocks should be expected to yield.¹⁹ That is, assuming that volatility in the future will be roughly similar to volatility in the past, how much more of a return from stocks would investors need to expect in order to be willing to hold the available supply of stocks. Unless one thought that stock market volatility would collapse, it seems plausible that the premium should be significant. For example, equilibrium with a premium of 70 basis points (as suggested by Baker 1999a) seems improbable, especially since transactions costs are higher for stock than for bond investments. In considering this issue, one needs to recognize that a greater willingness to bear the risk associated with stocks is likely to be accompanied by greater volatility of stock prices if bond rates are unchanged. That is, fluctuations in expected growth in corporate profits will have bigger impacts on expected discounted returns (which approximate prices) when the equity premium, and so the discount rate, is lower.²⁰

Although stocks should earn a significant premium, economists do not have a fully satisfactory explanation of why stocks have yielded so much more than bonds historically, a fact that has been called the equity-premium puzzle (Mehra and Prescott 1985; Cochrane 1997). Ongoing research is trying to develop more satisfactory explanations, but the theory still has inadequacies.²¹ Nevertheless, to explain why the future may be different from the past, one needs to rely on some theoretical explanation of the past in order to have a basis for projecting a different future.

Commentators have put forth three reasons as to why future returns may be different from those in the historical record. First, past and future long-run trends in the capital market may imply a decline in the equity premium. Second, the current valuation of stocks, which is historically high relative to various benchmarks, may signal a lower future rate of return on

equities. Third, the projection of slower economic growth may suggest a lower long-run marginal product of capital, which is the source of returns to financial assets. The first two issues are discussed in the context of financial markets; the third, in the context of physical assets. One should distinguish between arguments that suggest a lower equity premium and those that suggest lower returns to financial assets generally.

Equity Premium and Developments in the Capital Market

The capital market has experienced two related trends—the decrease in the cost of acquiring a diversified portfolio of stocks and the spread of stock ownership more widely in the economy. The relevant equity premium for investors is the equity premium net of the costs of investing. Thus, if the cost of investing in some asset decreases, that asset should have a higher price and a lower expected return gross of investment costs. The availability of mutual funds and the decrease in the cost of purchasing them should lower the equity premium in the future relative to long-term historical values. Arguments have also been raised about investors' time horizons and their understanding of financial markets, but the implications of those arguments are less clear.

Mutual Funds. In the absence of mutual funds, small investors would need to make many small purchases in different companies in order to acquire a widely diversified portfolio. Mutual funds provide an opportunity to acquire a diversified portfolio at a lower cost by taking advantage of the economies of scale in investing. At the same time, these funds add another layer of intermediation, with its costs, including the costs of marketing the funds.

Nevertheless, as the large growth of mutual funds indicates, many investors find them a valuable way to invest. That suggests that the equity premium should be lower in the future than in the past, since greater diversification means less risk for investors. However, the significance of the growth of mutual funds depends on the importance in total equity demand of “small” investors who purchase them, since this argument is much less important for large investors, particularly large institutional investors. According to recent data, mutual funds own less than 20 percent of U.S. equity outstanding (Investment Company Institute 1999).

A second development is that the average cost of investing in mutual funds has decreased. Rea and Reid (1998) report a drop of 76 basis points (from 225 to 149) in the average annual charge of equity mutual funds from 1980 to 1997. They attribute the bulk of the decline to a decrease in the importance of front-loaded funds (funds that charge an initial fee when making a deposit in addition to annual charges). The development and growth of index funds should also reduce costs, since index funds charge investors considerably less on average than do managed funds while doing roughly as well in gross rates of return. In a separate analysis, Rea and Reid (1999) also report a decline of 38 basis points (from 154 to 116) in the cost of bond mutual funds over the same period, a smaller drop than with equity mutual funds. Thus, since the cost of stock funds has fallen more than the cost of bond funds, it is plausible to expect a decrease in the equity premium relative to historical values. The importance of that decline is limited, however, by the fact that the largest cost savings do not apply to large institutional investors, who have always faced considerably lower charges.

A period with a declining required equity premium is likely to have a temporary increase in the realized equity premium. Assuming no anticipation of an ongoing trend, the divergence occurs because a greater willingness to hold stocks, relative to bonds, tends to increase the price of stocks. Such a price rise may yield a realized return that is higher than the required return.²² The high realized equity premium since World War II may be partially caused by a decline in the required equity premium over that period. During such a transition period, therefore, it would be a mistake to extrapolate what may be a temporarily high realized return.

Spread of Stock Ownership. Another trend that would tend to decrease the equity premium is the rising fraction of the American public investing in stocks either directly or indirectly through mutual funds and retirement accounts (such as 401(k) plans). Developments in tax law, pension provision, and the capital markets have expanded the base of the population who are sharing in the risks associated with the return to corporate stock. The share of households investing in stocks in any form increased from 32 percent in 1989 to 41 percent in 1995 (Kennickell, Starr-McCluer, and Sundén 1997). Numerous studies have concluded that widening the pool of investors sharing in stock market risk should lower the equilibrium risk premium (Mankiw and Zeldes 1991; Brav and Geczy 1996; Vissing-Jorgensen 1997; Diamond and Geanakoplos 1999; Heaton and Lucas 2000). The importance of that trend must be weighted by the low size of investment by such new investors.²³

Investors' Time Horizons. A further issue relevant to the future of the equity premium is whether the time horizons of investors, on average, have changed or will change.²⁴ Although the question of how time horizons should affect demands for assets raises subtle theoretical issues (Samuelson 1989), longer horizons and sufficient risk aversion should lead to greater willingness to hold stocks given the tendency for stock prices to revert toward their long-term trend (Campbell and Viceira 1999).²⁵

The evidence on trends in investors' time horizons is mixed. For example, the growth of explicit individual retirement savings vehicles, such as individual retirement accounts (IRAs) and 401(k)s, suggests that the average time horizons of individual investors may have lengthened. However, some of that growth is at the expense of defined benefit plans, which may have longer horizons. Another factor that might suggest a longer investment horizon is the increase in equities held by institutional investors, particularly through defined benefit pension plans. However, the relevant time horizon for such holdings may not be the open-ended life of the plan but rather the horizon of the plans' asset managers, who may have career concerns that shorten the relevant horizon.

Other developments may tend to lower the average horizon. Although the retirement savings of baby boomers may currently add to the horizon, their aging and the aging of the population generally will tend to shorten horizons. Finally, individual stock ownership has become less concentrated (Poterba and Samwick 1995), which suggests a shorter time horizon because less wealthy investors might be less concerned about passing assets on to younger generations. Overall, without detailed calculations that would go beyond the scope of this article, it is not clear how changing time horizons should affect projections.

Investors' Understanding. Another factor that may affect the equity premium is investors' understanding of the properties of stock and bond investments. The demand for stocks might be affected by the popular presentation of material, such as Siegel (1998), explaining to the general public the difference between short- and long-run risks. In particular, Siegel highlights the risks, in real terms, of holding nominal bonds. While the creation of inflation-indexed Treasury bonds might affect behavior, the lack of wide interest in those bonds (in both the United States and the United Kingdom) and the failure to fully adjust future amounts for inflation generally (Shafir, Diamond, and Tversky 1997) suggest that nominal bonds will continue to be a major part of portfolios. Perceptions that those bonds are riskier than previously believed would then tend to decrease the required equity premium.

Popular perceptions may, however, be excessively influenced by recent events—both the high returns on equity and the low rates of inflation. Some evidence suggests that a segment of the public generally expects recent rates of increase in the prices of assets to continue, even when those rates seem highly implausible for a longer term (Case and Shiller 1988). The possibility of such extrapolative expectations is also connected with the historical link between stock prices and inflation. Historically, real stock prices have been adversely affected by inflation in the short run. Thus, the decline in inflation expectations over the past two decades would be associated with a rise in real stock prices if the historical pattern held. If investors and analysts fail to consider such a connection, they might expect robust growth in stock prices to continue without recognizing that further declines in inflation are unlikely. Sharpe (1999) reports evidence that stock analysts' forecasts of real growth in corporate earnings include extrapolations that may be implausibly high. If so, expectations of continuing rapid growth in stock prices suggest that the required equity premium may not have declined.

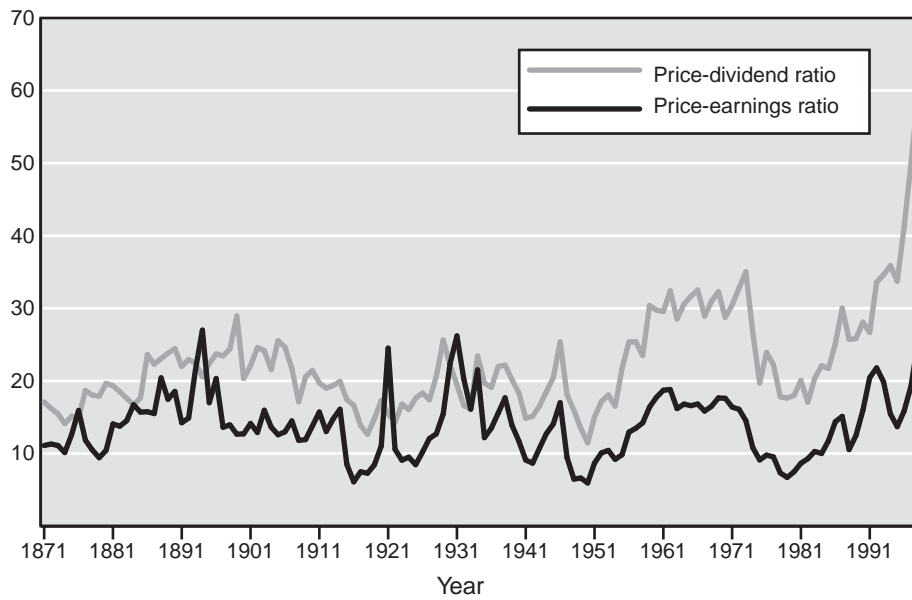
On balance, the continued growth and development of mutual funds and the broader participation in the stock market should contribute to a drop in future equity premiums relative to the historical premium, but the drop is limited.²⁶ Other factors, such as investors' time horizons and understanding, have less clear-cut implications for the equity premium.

Equity Premium and Current Market Values

At present, stock prices are very high relative to a number of different indicators, such as earnings, dividends, book values, and gross domestic product (GDP) (Charts 1 and 2). Some critics, such as Baker (1998), argue that this high market value, combined with projected slow economic growth, is not consistent with a 7.0 percent return. Possible implications of the high prices have also been the subject of considerable discussion in the finance community (see, for example, Campbell and Shiller 1998; Cochrane 1997; Philips 1999; and Siegel 1999).

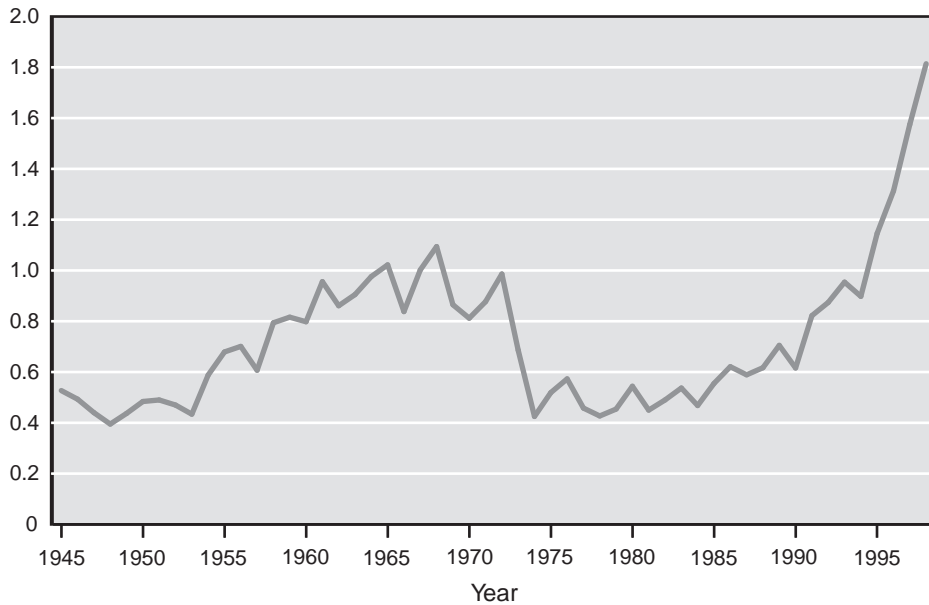
The inconsistency of current share prices and 7.0 percent real returns, given OCACT's assumptions for GDP growth, can be illustrated in two ways. The first way is to project the ratio of the stock market's value to GDP, starting with today's values and given assumptions about the future. The second way is to ask what must be true if today's values represent a steady state in the ratio of stock values to GDP.

Chart 1.
Price-dividend ratio and price-earnings ratio, 1871-1998



Source: Robert Shiller, Yale University. Available at www.econ.yale.edu/~shiller/data/chapt26.html.
Note: These ratios are based on Standard and Poor's Composite Stock Price Index.

Chart 2.
Ratio of market value of stocks to gross domestic product, 1945-1998



Source: Bureau of Economic Analysis data from the national income and product accounts and federal flow of funds.

The first calculation requires assumptions for stock returns, adjusted dividends (dividends plus net share repurchases),²⁷ and GDP growth. For stock returns, the 7.0 percent assumption is used. For GDP growth rates, OCACT's projections are used. For adjusted dividends, one approach is to assume that the ratio of the aggregate adjusted dividend to GDP would remain the same as the current level. However, as discussed in the accompanying box, the current ratio seems too low to use for projection purposes. Even adopting a higher, more plausible level of adjusted dividends, such as 2.5 percent or 3.0 percent, leads to an implausible rise in the ratio of stock value to GDP—in this case, a more than 20-fold increase over the next 75 years. The calculation derives each year's capital gains by subtracting projected adjusted dividends from the total cash flow to shareholders needed to return 7.0 percent on that year's share values. (See Appendix A for an alternative method of calculating this ratio using a continuous-time differential equation.)

A second way to consider the link between stock market value, stock returns, and GDP is to look at a steady-state relationship. The Gordon formula says that stock returns equal the ratio of adjusted dividends to prices (or the adjusted dividend yield) plus the growth rate of stock prices.²⁸ In a steady state, the growth rate of prices can be assumed to equal that of GDP. Assuming an adjusted dividend yield of roughly 2.5 percent to 3.0 percent and projected GDP growth of 1.5 percent, the Gordon equation implies a stock return of roughly 4.0 percent to 4.5 percent, not 7.0 percent. Those lower values would imply an equity premium of 1.0 percent to 1.5 percent, given OCACT's assumption of a 3.0 percent yield on Treasury bonds. Making the equation work with a 7.0 percent stock return, assuming no change in projected GDP growth, would require an adjusted dividend yield of roughly 5.5 percent—about double today's level.²⁹

For such a large jump in the dividend yield to occur, one of two things would have to happen—adjusted dividends would have to grow much more rapidly than the economy, or stock prices would have to grow much less rapidly than the economy (or even decline). But a consistent projection would take a very large jump in adjusted dividends, assuming that stock prices grew along with GDP starting at today's value. Estimates of recent values of the adjusted dividend yield range from 2.10 percent to 2.55 percent (Dudley and others 1999; Wadhvani 1998).³⁰

Even with reasons for additional growth in the dividend yield, which are discussed in the box on projecting future dividends, an implausible growth of adjusted dividends is needed if the short- and long-term returns on stocks are to be 7.0 percent. Moreover, historically, very low values of the dividend yield and earnings-price ratio have been followed primarily by adjustments in stock prices, not in dividends and earnings (Campbell and Shiller 1998).

If the ratio of aggregate adjusted dividends to GDP is unlikely to change substantially, there are three ways out of the internal inconsistency between the market's current value and OCACT's assumptions for economic growth and stock returns. One can:

- Assume higher GDP growth, which would decrease the implausibility of the calculations described above for either the ratio of market value to GDP or the steady state under the Gordon equation. (The possibility of more rapid GDP growth is not explored further in this article.³¹)

Projecting Future Adjusted Dividends

This article uses the concept of adjusted dividends to estimate the dividend yield. The adjustment begins by adding the value of net share repurchases to actual dividends, since that also represents a cash flow to stockholders in aggregate. A further adjustment is then made to reflect the extent to which the current situation might not be typical of the relationship between dividends and gross domestic product (GDP) in the future. Three pieces of evidence suggest that the current ratio of dividends to GDP is abnormally low and therefore not appropriate to use for projection purposes.

First, dividends are currently very low relative to corporate earnings—roughly 40 percent of earnings compared with a historical average of 60 percent. Because dividends tend to be much more stable over time than earnings, the dividend-earnings ratio declines in a period of high growth of corporate earnings. If future earnings grow at the same rate as GDP, dividends will probably grow faster than GDP to move toward the historical ratio.¹ On the other hand, earnings, which are high relative to GDP, might grow more slowly than GDP. But then, corporate earnings, which have a sizable international component, might grow faster than GDP.

Second, corporations are repurchasing their outstanding shares at a high rate. Liang and Sharpe (1999) report on share repurchases by the 144 largest (nonbank) firms in the Standard and Poor's 500. From 1994 to 1998, approximately 2 percent of share value was repurchased, although Liang and Sharpe anticipate a lower value in the future. At the same time, those firms were issuing shares because employees were exercising stock options at prices below the share values, thus offsetting much of the increase in the number of shares outstanding. Such transfers of net wealth to employees presumably reflect past services. In addition, initial public offerings (IPOs) represent a negative cash flow from stockholders as a whole. Not only the amount paid for stocks but also the value of the shares held by insiders represents a dilution relative to a base for long-run returns on all stocks. As a result, some value needs to be added to the current dividend ratio to adjust for net share repurchases, but the exact amount is unclear. However, in part, the high rate of share repurchase may be just another reflection of the low level of dividends, making it inappropriate to both project much higher dividends in the near term and assume that all of the higher share repurchases will continue. Exactly how to project current numbers into the next decade is not clear.

Finally, projected slow GDP growth, which will plausibly lower investment levels, could be a reason for lower retained earnings in the future. A stable level of earnings relative to GDP and lower retained earnings would increase the ratio of adjusted dividends to GDP.²

In summary, the evidence suggests using an "adjusted" dividend yield that is larger than the current level. Therefore, the illustrative calculations in this article use adjusted dividend yields of 2.0 percent, 2.5 percent, 3.0 percent, and 3.5 percent. (The current level of dividends without adjustment for share repurchases is between 1.0 percent and 2.0 percent.)

¹ For example, Baker and Weisbrot (1999) appear to make no adjustment for share repurchases or for current dividends being low. However, they use a dividend payout of 2.0 percent, while Dudley and others (1999) report a current dividend yield on the Wilshire 5000 of 1.3 percent.

² Firms might change their overall financing package by changing the fraction of net earnings they retain. The implications of such a change would depend on why they were making it. A long-run decrease in retained earnings might merely be increases in dividends and borrowing, with investment held constant. That case, to a first approximation, is another application of the Modigliani-Miller theorem, and the total stock value would be expected to fall by the decrease in retained earnings. Alternatively, a change in retained earnings might signal a change in investment. Again, there is ambiguity. Firms might be retaining a smaller fraction of earnings because investment opportunities were less attractive or because investment had become more productive. These issues tie together two parts of the analysis in this article. If slower growth is associated with lower investment that leaves the return on capital relatively unchanged, then what financial behavior of corporations is required for consistency? Baker (1999b) makes such a calculation; it is not examined here.

- Adopt a long-run stock return that is considerably less than 7.0 percent.
- Lower the rate of return during an intermediate period so that a 7.0 percent return could be applied to a lower market value base thereafter.

A combination of the latter two alternatives is also possible.

In considering the prospect of a near-term market decline, the Gordon equation can be used to compute the magnitude of the drop required over, for example, the next 10 years in order for stock returns to average 7.0 percent over the remaining 65 years of OCACT's projection period (see Appendix B). A long-run return of 7.0 percent would require a drop in real prices of between 21 percent and 55 percent, depending on the assumed value of adjusted dividends (Table 3).³² That calculation is relatively sensitive to the assumed rate of return—for example, with a long-run return of 6.5 percent, the required drop in the market falls to a range of 13 percent to 51 percent.³³

The two different ways of restoring consistency—a lower stock return in all years or a near-term decline followed by a return to the historical yield—have different implications for Social Security finances. To illustrate the difference, consider the contrast between a scenario with a steady yield of 4.25 percent derived by using current values for the Gordon equation as described above (the steady-state scenario) and a scenario in which stock prices drop by half immediately and the yield on stocks is 7.0 percent thereafter (the market-correction scenario).³⁴ First, dollars newly invested in the future (that is, after any drop in share prices) earn only 4.25 percent per year under the steady-state scenario, compared with 7.0 percent per year under the market-correction scenario. Second, even for dollars currently in the market, the long-run yield differs under the two scenarios when the returns on stocks are being reinvested.

Under the steady-state scenario, the yield on dollars currently in the market is 4.25 percent per year over any projected time period; under the market-correction scenario, the annual rate of return depends on the time horizon used for the calculation.³⁵ After one year, the latter scenario has a rate of return of -46 percent. By the end of 10 years, the annual rate of return with the latter scenario is -0.2 percent; by the end of 35 years, 4.9 percent; and by the end of 75 years, 6.0 percent. Proposals for Social Security generally envision a gradual buildup of stock investments, which suggests that those investments would fare better under the market-correction scenario. The importance of the difference between scenarios depends also on the choice of additional changes to Social Security, which affect how long the money can stay invested until it is needed to pay benefits.

Given the different impacts of these scenarios, which one is more likely to occur? The key issue is whether the current stock market is overvalued in the sense that rates of return are likely to be lower in the intermediate term than in the long run. Economists have divergent views on this issue.

Table 3. Required percentage decline in real stock prices over the next 10 years to justify a return of 7.0, 6.5, and 6.0 percent thereafter			
Adjusted dividend yield	Percentage decline to justify a long-run return of—		
	7.0	6.5	6.0
2.0	55	51	45
2.5	44	38	31
3.0	33	26	18
3.5	21	13	4

Source: Author's calculations.
Note: Derived from the Gordon formula. Dividends are assumed to grow in line with gross domestic product (GDP), which the Office of the Chief Actuary (OCACT) assumes is 2.0 percent over the next 10 years. For long-run GDP growth, OCACT assumes 1.5 percent.

One possible conclusion is that current stock prices signal a significant drop in the long-run required equity premium. For example, Glassman and Hassett (1999) have argued that the equity premium will be dramatically lower in the future than it has been in the past, so that the current market is not overvalued in the sense of signaling lower returns in the near term than in the long run.³⁶ Indeed, they even raise the possibility that the market is “undervalued” in the sense that the rate of return in the intermediate period will be higher than in the long run, reflecting a possible continuing decline in the required equity premium. If their view is right, then a 7.0 percent long-run return, together with a 4.0 percent equity premium, would be too high.

Others argue that the current stock market values include a significant price component that will disappear at some point, although no one can predict when or whether it will happen abruptly or slowly. Indeed, Campbell and Shiller (1998) and Cochrane (1997) have shown that when stock prices (normalized by earnings, dividends, or book values) have been far above historical ratios, the rate of return over the following decade has tended to be low, and the low return is associated primarily with the price of stocks, not the growth of dividends or earnings.³⁷ Thus, to project a steady rate of return in the future, one needs to argue that this historical pattern will not repeat itself. The values in Table 3 are in the range suggested by the historical relationship between future stock prices and current price-earnings and price-dividend ratios (see, for example, Campbell and Shiller 1998).

Therefore, either the stock market is overvalued and requires a correction to justify a 7.0 percent return thereafter, or it is correctly valued and the long-run return is substantially lower than 7.0 percent. (Some combination of the two is also possible.) Under either scenario, stock returns would be lower than 7.0 percent for at least a portion of the next 75 years. Some evidence

suggests, however, that investors have not adequately considered that possibility.³⁸ The former view is more convincing, since accepting the “correctly valued” hypothesis implies an implausibly small long-run equity premium. Moreover, when stock values (compared with earnings or dividends) have been far above historical ratios, returns over the following decade have tended to be low. Since this discussion has no direct bearing on bond returns, assuming a lower return for stocks over the near- or long-term also means assuming a lower equity premium.

In short, given current stock values, a constant 7.0 percent return is not consistent with OCACT’s projected GDP growth.³⁹ However, OCACT could assume lower returns for a decade, followed by a return equal to or about 7.0 percent.⁴⁰ In that case, OCACT could treat equity returns as it does Treasury rates, using different projection methods for the first 10 years and for the following 65. This conclusion is not meant to suggest that anyone is capable of predicting the timing of annual stock returns, but rather that this is an approach to financially consistent assumptions. Alternatively, OCACT could adopt a lower rate of return for the entire 75-year period.

Marginal Product of Capital and Slow Growth

In its long-term projections, OCACT assumes a slower rate of economic growth than the U.S. economy has experienced over an extended period. That projection reflects both the slowdown in labor force growth expected over the next few decades and the slowdown in productivity growth since 1973.⁴¹ Some critics have suggested that slower growth implies lower projected rates of return on both stocks and bonds, since the returns to financial assets must reflect the returns on capital investment over the long run. That issue can be addressed by considering either the return to stocks directly, as discussed above, or the marginal product of capital in the context of a model of economic growth.⁴²

For the long run, the returns to financial assets must reflect the returns on the physical assets that support the financial assets. Thus, the question is whether projecting slower economic growth is a reason to expect a lower marginal product of capital. As noted above, this argument speaks to rates of return generally, not necessarily to the equity premium.

The standard (Solow) model of economic growth implies that slower long-run economic growth with a constant savings rate will yield a lower marginal product of capital, and the relationship may be roughly point-for-point (see Appendix C). However, the evidence suggests that savings rates are not unaffected by growth rates. Indeed, growth may be more important for savings rates than savings are for growth rates. Bosworth and Burtless (1998) have observed that savings rates and long-term rates of income growth have a persistent positive association, both across countries and over time. That observation suggests that if future economic growth is slower than in the past, savings will also be lower. In the Solow model, low savings raise the marginal product of capital, with each percentage-point decrease in the savings rate increasing the marginal product by roughly one-half of a percentage point in the long run. Since growth has fluctuated in the past, the stability in real rates of return to stocks, as shown in Table 1, suggests an offsetting savings effect, preserving the stability in the rate of return.⁴³

Focusing directly on demographic structure and the rate of return rather than on labor force growth and savings rates, Poterba (1998) does not find a robust relationship between demographic structure and asset returns. He does recognize the limited power of statistical tests based on the few “effective degrees of freedom” in the historical record. Poterba suggests that the connection between demography and returns is not simple and direct, although such a connection has been raised as a possible reason for high current stock values, as baby boomers save for retirement, and for projecting low future stock values, as they finance retirement consumption. Goyal (1999) estimates equity premium regressions and finds that changes in population age structure add significant explanatory power. Nevertheless, using a vector autoregression approach, his analysis predicts no significant increase in *average* outflows over the next 52 years. That occurs despite the retirement of baby boomers. Thus, both papers reach the same conclusion—that demography is not likely to effect large changes in the long-run rate of return.

Another factor to consider in assessing the connection between growth and rates of return is the increasing openness of the world economy. Currently, U.S. corporations earn income from production and trade abroad, and individual investors, while primarily investing at home, also invest abroad. It is not clear that putting the growth issue in a global context makes much difference. On the one hand, since other advanced economies are also aging, increased economic connections with other advanced countries do not alter the basic analysis. On the other hand, although investment in the less-developed countries may preserve higher rates, it is not clear either how much investment opportunities will increase or how to adjust for political risk. Increasing openness further weakens the argument for a significant drop in the marginal product of capital, but the opportunities abroad may or may not be realized as a better rate of return.

On balance, slower projected growth may reduce the return on capital, but the effect is probably considerably less than one-for-one. Moreover, this argument relates to the overall return to capital in an economy, not just stock returns. Any impact would therefore tend to affect returns on both stocks and bonds similarly, with no directly implied change in the equity premium.⁴⁴

V. Other Issues

This paper has considered the gross rate of return to equities and the equity premium generally. Two additional issues arise in considering the prospect of equity investment for Social Security: how gross returns depend on investment strategy and how they differ from net returns; and the degree of risk associated with adding stock investments to a current all-bond portfolio.

Gross and Net Returns

A gross rate of return differs from a net return because it includes transactions costs such as brokerage charges, bid-ask spreads, and fees for asset management.⁴⁵

If the Social Security trust fund invests directly in equities, the investment is likely to be in an index fund representing almost all of the equities outstanding in the United States. Thus, the

analysis above holds for that type of investment. Although some critics have expressed concern that political influence might cause deviations from a broad-based indexing strategy, the evidence suggests that such considerations would have little impact on the expected rate of return (Munnell and Sundén 1999).

If the investment in stocks is made through individual accounts, then individuals may be given some choice either about the makeup of stock investment or about varying the mix of stocks and bonds over time. In order to consider the rate of return on stocks held in such individual accounts, one must consider the kind of portfolio choices individuals might make, both in the composition of the stock portfolio and in the timing of purchases and sales. Given the opportunity, many individuals would engage in numerous transactions, both among stocks and between stocks and other assets (attempts to time the market).

The evidence suggests that such transactions reduce gross returns relative to risks, even before factoring in transactions costs (Odean 1998). Therefore, both the presence of individual accounts with choice and the details of their regulation are likely to affect gross returns. On average, individual accounts with choice are likely to have lower gross returns from stocks than would direct trust fund investment.

Similarly, the cost of administration as a percentage of managed assets varies depending on whether there are individual accounts and how they are organized and regulated (National Academy of Social Insurance 1998; Diamond 2000). Estimates of that cost vary from 0.5 basis points for direct trust fund investment to 100 to 150 basis points for individually organized individual accounts, with government-organized individual accounts somewhere in between.

Investment Risk of Stocks

The Office of the Chief Actuary's projections are projections of plausible long-run scenarios (ignoring fluctuations). As such, they are useful for identifying a sizable probability of future financial needs for Social Security. However, they do not address different probabilities for the trust fund's financial condition under different policies.⁴⁶ Nor are they sufficient for normative evaluation of policies that have different distributional or risk characteristics.

Although investment in stocks entails riskiness in the rate of return, investment in Treasury bonds also entails risk. Therefore, a comparison of those risks should consider the distribution of outcomes—concern about risk should not be separated from the compensation for bearing risk. That is, one needs to consider the probabilities of both doing better and doing worse as a result of holding some stocks. Merely observing that stocks are risky is an inadequate basis for policy evaluations. Indeed, studies of the historical pattern of returns show that portfolio risk decreases when some stocks are added to a portfolio consisting only of nominal bonds (Siegel 1998). Furthermore, many risks affect the financial future of Social Security, and investing a small portion of the trust fund in stocks is a small risk for the system as a whole relative to economic and demographic risks (Thompson 1998).

As long as the differences in risk and expected return are being determined in a market and reflect the risk aversion of market participants, the suitability of the trust fund's portfolio can be considered in terms of whether Social Security has more or less risk aversion than current investors. Of course, the "risk aversion" of Social Security is a derived concept, based on the risks to be borne by future beneficiaries and taxpayers, who will incur some risk whatever portfolio Social Security holds. Thus, the question is whether the balance of risks and returns looks better with one portfolio than with another. The answer is somewhat complex, since it depends on how policy changes in taxes and benefits respond to economic and demographic outcomes. Nevertheless, since individuals are normally advised to hold at least some stocks in their own portfolios, it seems appropriate for Social Security to also hold some stocks when investing on their behalf, at least in the long run, regardless of the rates of return used for projection purposes (Diamond and Geanakoplos 1999).⁴⁷

VI. Conclusion

Of the three main bases for criticizing OCACT's assumptions, by far the most important one is the argument that a constant 7.0 percent stock return is not consistent with the value of today's stock market and projected slow economic growth. The other two arguments—pertaining to developments in financial markets and the marginal product of capital—have merit, but neither suggests a dramatic change in the equity premium.

Given the high value of today's stock market and an expectation of slower economic growth in the future, OCACT could adjust its stock return projections in one of two ways. It could assume a decline in the stock market sometime over the next decade, followed by a 7.0 percent return for the remainder of the projection period. That approach would treat equity returns like Treasury rates, using different short- and long-run projection methods for the first 10 years and the following 65 years. Alternatively, OCACT could adopt a lower rate of return for the entire 75-year period. That approach may be more acceptable politically, but it obscures the expected pattern of returns and may produce misleading assessments of alternative financing proposals, since the appropriate uniform rate to use for projection purposes depends on the investment policy being evaluated.

Notes

Peter Diamond is Institute Professor at the Massachusetts Institute of Technology, where he has taught since 1966. He is a member of the Board of the National Academy of Social Insurance, where he has been President, Chair of the Board, and Chair of the Panel on Privatization of Social Security. He has written on public finance, macroeconomics, and the economics of uncertainty.

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¹ This 7.0 percent real rate of return is gross of administrative charges.

² To generate short-run returns on stocks, the Social Security Administration's Office of the Chief Actuary (OCACT) multiplied the ratio of one plus the ultimate yield on stocks to one plus the ultimate yield on bonds by the annual bond assumptions in the short run.

³ An exception was the use of 6.75 percent for the President's proposal evaluated in a memorandum on January 26, 1999.

⁴ This report is formally called the *1999 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Disability Insurance Trust Funds*.

⁵ For OCACT's short-run bond projections, see Table II.D.1 in the 1999 Social Security Trustees Report.

⁶ This article was written in the summer of 1999 and uses numbers appropriate at the time. The 2000 Trustees Report uses the same assumptions of 6.3 percent for the nominal interest rate and 3.3 percent for the annual percentage change in the consumer price index. The real wage is assumed to grow at 1.0 percent, as opposed to 0.9 percent in the 1999 report.

⁷ See, for example, Baker (1999a) and Baker and Weisbrot (1999). This article only considers return assumptions given economic growth assumptions and does not consider growth assumptions.

⁸ This article does not analyze the policy issues related to stock market investment either by the trust fund or through individual accounts. Such an analysis needs to recognize that higher expected returns in the U.S. capital market come with higher risk. For the issues relevant for such a policy analysis, see National Academy of Social Insurance (1998).

⁹ Ideally, one would want the yield on the special Treasury bonds held by Social Security. However, this article simply refers to published long-run bond rates.

¹⁰ Because annual rates of return on stocks fluctuate so much, a wide band of uncertainty surrounds the best statistical estimate of the average rate of return. For example, Cochrane (1997) notes that over the 50 years from 1947 to 1996, the excess return of stocks over Treasury bills was 8 percent, but, assuming that annual returns are statistically independent, the standard statistical confidence interval extends from 3 percent to 13 percent. Using a data set covering a longer period lowers the size of the confidence interval, provided one is willing to assume that the stochastic process describing rates of return is stable for the longer period. This article is not concerned with that uncertainty, only with the appropriate rate of return to use for a central (or intermediate) projection. For policy purposes, one must also look at stochastic projections (see, for example, Copeland, VanDerhei, and Salisbury 1999; and Lee and Tuljapurkar 1998). Despite the value of stochastic projections, OCACT's central projection plays an important role in thinking about policy and in the political process. Nevertheless, when making a long-run projection, one must realize that great uncertainty surrounds any single projection and the relevance of returns in any short period of time.

¹¹ Table 2 also shows the equity premiums relative to Treasury bills. Those numbers are included only because they arise in other discussions; they are not referred to in this article.

¹² For determining the equity premium shown in Table 2, the rate of return is calculated assuming that a dollar is invested at the start of a period and the returns are reinvested until the end of the period. In contrast to that geometric average, an arithmetic average is the average of the annual rates of return for each of the years in a period. The arithmetic average is larger than the geometric average. Assume, for example, that a dollar doubles in value in year 1 and then halves in value from year 1 to year 2. The geometric average over the 2-year period is zero; the arithmetic average of +100 percent and -50 percent annual rates of return is +25 percent. For projection purposes, one looks for an estimated rate of return that is suitable for investment over a long period. Presumably the best approach would be to take the arithmetic average of the rates of return that were each the geometric average for different historical periods of the same length as the average investment period within the projection period. That calculation would be close to the geometric average, since the variation in 35- or 40-year geometric

rates of return, which is the source of the difference between arithmetic and geometric averages, would not be so large.

¹³ In considering recent data, some adjustment should be made for bond rates being artificially low in the 1940s as a consequence of war and postwar policies.

¹⁴ Also relevant is the fact that the real rate on 30-year Treasury bonds is currently above 3.0 percent.

¹⁵ Finance theory relates the willingness to hold alternative assets to the expected risks and returns (in real terms) of the different assets, recognizing that expectations about risk and return are likely to vary with the time horizon of the investor. Indeed, time horizon is an oversimplification, since people are also uncertain about when they will want to have access to the proceeds of those investments. Thus, finance theory is primarily about the difference in returns to different assets (the equity premium) and needs to be supplemented by other analyses to consider the expected return to stocks.

¹⁶ With Treasury bonds, investors can easily project future nominal returns (since default risk is taken to be virtually zero), although expected real returns depend on projected inflation outcomes given nominal yields. With inflation-protected Treasury bonds, investors can purchase bonds with a known real interest rate. Since those bonds were introduced only recently, they do not play a role in interpreting the historical record for projection purposes. Moreover, their importance in future portfolio choices is unclear.

¹⁷ In theory, for determining asset prices at which markets clear, one wants to consider marginal investments. Those investments are made up of a mix of marginal portfolio allocations by all investors and by marginal investors who become participants (or nonparticipants) in the stock and/or bond markets.

¹⁸ This conclusion does not contradict the Modigliani-Miller theorem. Different firms with the same total return distributions but different amounts of debt outstanding will have the same total value (stock plus bond) and so the same total expected return. A firm with more debt outstanding will have a higher expected return on its stock in order to preserve the total expected return.

¹⁹ Consideration of equilibrium suggests an alternative approach to analyzing the historical record. Rather than looking at realized rates of return, one could construct estimates of expected rates of return and see how they have varied in the past. That approach has been taken by Blanchard (1993). He concluded that the equity premium (measured by expectations) was unusually high in the late 1930s and 1940s and, since the 1950s, has experienced a long decline from that unusually high level. The high realized rates of return over this period are, in part, a consequence of a decline in the equity premium needed for people to be willing to hold stocks. In addition, the real expected returns on bonds have risen since the 1950s, which should have moderated the impact of a declining equity premium on expected stock returns. Blanchard examines the importance of inflation expectations and attributes some of the recent trend to a decline in expected inflation. He concluded that the premium in 1993 appeared to be around 2 percent to 3 percent and would probably not move much if inflation expectations remain low. He also concluded that decreases in the equity premium were likely to involve both increases in expected bond rates and decreases in expected rates of return on stocks.

²⁰ If current cash returns to stockholders are expected to grow at rate g , with projected returns discounted at rate r , this fundamental value is the current return divided by $(r - g)$. If r is smaller, fluctuations in long-run projections of g result in larger fluctuations in the fundamental value.

²¹ Several explanations have been put forth, including: (1) the United States has been lucky, compared with stock investment in other countries, and realized returns include a premium for the possibility that the U.S. experience might have been different; (2) returns to actual investors are considerably less than the returns on indexes that have been used in analyses; and (3) individual preferences are different from the simple models that have been used in examining the puzzle.

²² The timing of realized returns that are higher than required returns is somewhat more complicated, since recognizing and projecting such a trend will tend to boost the price of equities when the trend is recognized, not when it is realized.

²³ Nonprofit institutions, such as universities, and defined benefit plans for public employees now hold more stock than in the past. Attributing the risk associated with that portfolio to the beneficiaries of those institutions would further expand the pool sharing in the risk.

²⁴ More generally, the equity premium depends on the investment strategies being followed by investors.

²⁵ This tendency, known as mean reversion, implies that a short period of above-average stock returns is likely to be followed by a period of below-average returns.

²⁶ To quantify the importance of these developments, one would want to model corporate behavior as well as

investor behavior. A decline in the equity premium reflects a drop to corporations in the “cost of risk” in the process of acquiring funds for risky investment. If the “price per unit of risk” goes down, corporations might respond by selecting riskier investments (those with a higher expected return), thereby somewhat restoring the equity premium associated with investing in corporations.

²⁷ In considering the return to an individual from investing in stocks, the return is made up of dividends and a (possible) capital gain from a rise in the value of the shares purchased. When considering the return to all investment in stocks, one needs to consider the entire cash flow to stockholders, including dividends and net share repurchases by the firms. That suggests two methods of examining the consistency of any assumed rate of return on stocks. One is to consider the value of all stocks outstanding. If one assumes that the value of all stocks outstanding grows at the same rate as the economy (in the long run), then the return to all stocks outstanding is that rate of growth plus the sum of dividends and net share repurchases, relative to total share value. Alternatively, one can consider ownership of a single share. The assumed rate of return minus the rate of dividend payment then implies a rate of capital gain on the single share. However, the relationship between the growth of value of a single share and the growth of the economy depends on the rate of share repurchase. As shares are being repurchased, remaining shares should grow in value relative to the growth of the economy. Either approach can be calculated in a consistent manner. What must be avoided is an inconsistent mix, considering only dividends and also assuming that the value of a single share grows at the same rate as the economy.

²⁸ Gordon (1962). For an exposition, see Campbell, Lo, and MacKinlay (1997).

²⁹ The implausibility refers to total stock values, not the value of single shares—thus, the relevance of net share repurchases. For example, Dudley and others (1999) view a steady equity premium in the range of 1.0 percent to 3.0 percent as consistent with current stock prices and their projections. They assume 3.0 percent GDP growth and a 3.5 percent real bond return, both higher than the assumptions used by OCACT. Wadhvani (1998) finds that if the S&P 500 is correctly valued, he has to assume a negative risk premium. He considers various adjustments that lead to a higher premium, with his “best guess” estimate being 1.6 percent. That still seems too low.

³⁰ Dudley and others (1999) report a current dividend yield on the Wilshire 5000 of 1.3 percent. They then make an adjustment that is equivalent to adding 80 basis points to that rate for share repurchases, for which they cite Campbell and Shiller (1998). Wadhvani (1998) finds a current expected dividend yield of 1.65 percent for the S&P 500, which he adjusts to 2.55 percent to account for share repurchases. For a discussion of share repurchases, see Cole, Helwege, and Laster (1996).

³¹ Stock prices reflect investors’ assumptions about economic growth. If their assumptions differ from those used by OCACT, then it becomes difficult to have a consistent projection that does not assume that investors will be surprised.

³² In considering these values, note the observation that a fall of 20 percent to 30 percent in advance of recessions is typical for the U.S. stock market (Wadhvani 1998). With OCACT assuming a 27 percent rise in the price level over the next decade, a 21 percent decline in real stock prices would yield the same nominal prices as at present.

³³ The importance of the assumed growth rate of GDP can be seen by redoing the calculations in Table 3 for a growth rate that is one-half of a percent larger in both the short and long runs. Compared with the original calculations, such a change would increase the ratios by 16 percent.

³⁴ Both scenarios are consistent with the Gordon formula, assuming a 2.75 percent adjusted dividend yield (without a drop in share prices) and a growth of dividends of 1.5 percent per year.

³⁵ With the steady-state scenario, a dollar in the market at the start of the steady state is worth 1.0425^t dollars t years later, if the returns are continuously reinvested. In contrast, under the market-correction scenario, a dollar in the market at the time of the drop in prices is worth $(1/2)(1.07^t)$ dollars t years later.

³⁶ The authors appear to assume that the Treasury rate will not change significantly, so that changes in the equity premium and in the return to stocks are similar.

³⁷ One could use equations estimated on historical prices to check the plausibility of intermediate-run stock values with the intermediate-run values needed for plausibility for the long-run assumptions. Such a calculation is not considered in this article. Another approach is to consider the value of stocks relative to the replacement cost of the capital that corporations hold, referred to as Tobin’s q . That ratio has fluctuated considerably and is currently unusually high. Robertson and Wright (1998) have analyzed the ratio and concluded that a cumulative real decline in the stock market over the first decades of the 21st century has a high probability.

³⁸ As Wadhvani (1998, p. 36) notes, “Surveys of individual investors in the United States regularly suggest that they expect returns above 20 percent, which is obviously unsustainable. For example, in a survey conducted by Montgomery Asset Management in 1997, the typical mutual fund investor expected annual returns from the

stock market of 34 percent over the next 10 years! Most U.S. pension funds operate under actuarial assumptions of equity returns in the 8-10 percent area, which, with a dividend yield under 2 percent and nominal GNP growth unlikely to exceed 5 percent, is again, unsustainably high.”

³⁹ There is no necessary connection between the rate of return on stocks and the rate of growth of the economy. There is a connection among the rate of return on stocks, the current stock prices, dividends relative to GDP, and the rate of growth of the economy.

⁴⁰ The impact of such a change in assumptions on actuarial balance depends on the amount that is invested in stocks in the short term relative to the amount invested in the long term. The levels of holdings at different times depend on both the speed of initial investment and whether stock holdings are sold before very long (as would happen with no other policy changes) or whether, instead, additional policies are adopted that result in a longer holding period, possibly including a sustained sizable portfolio of stocks. Such an outcome would follow if Social Security switched to a sustained level of funding in excess of the historical long-run target of just a contingency reserve equal to a single year’s expenditures.

⁴¹ “The annual rate of growth in total labor force decreased from an average of about 2.0 percent per year during the 1970s and 1980s to about 1.1 percent from 1990 to 1998. After 1998 the labor force is projected to increase about 0.9 percent per year, on average, through 2008, and to increase much more slowly after that, ultimately reaching 0.1 percent toward the end of the 75-year projection period” (Social Security Trustees Report, p. 55). “The Trustees assume an intermediate trend growth rate of labor productivity of 1.3 percent per year, roughly in line with the average rate of growth of productivity over the last 30 years” (Social Security Trustees Report, p. 55).

⁴² Two approaches are available to answer this question. Since the Gordon formula, given above, shows that the return to stocks equals the adjusted dividend yield plus the growth of stock prices, one needs to consider how the dividend yield is affected by slower growth. In turn, that relationship will depend on investment levels relative to corporate earnings. Baker (1999b) makes such a calculation, which is not examined here. Another approach is to consider the return on physical capital directly, which is the one examined in this article.

⁴³ Using the Granger test of causation (Granger 1969), Carroll and Weil (1994) find that growth causes saving but saving does not cause growth. That is, changes in growth rates tend to precede changes in savings rates but not vice versa. For a recent discussion of savings and growth, see Carroll, Overland, and Weil (2000).

⁴⁴ One can also ask how a change in policy designed to build and maintain a larger trust fund in a way that significantly increases national saving might affect future returns. Such a change would plausibly tend to lower rates of return. The size of that effect depends on the size of investment increases relative to available investment opportunities, both in the United States and worldwide. Moreover, it depends on the response of private saving to the policy, including the effect that would come through any change in the rate of return. There is plausibly an effect here, although this article does not explore it. Again, the argument speaks to the level of rates of return generally, not to the equity premium.

⁴⁵ One can also ask how changed policies might affect future returns. A change in portfolio policy that included stocks (whether in the trust fund or in individual accounts) would plausibly lower the equity premium somewhat. That effect could come about through a combination of a rise in the Treasury rate (thereby requiring a change in tax and/or expenditure policy) and a fall in expected returns on stocks. The latter depends on both the underlying technology of available returns to real investments and the effect of portfolio policy on national saving. At this time, research on this issue has been limited, although it is plausible that the effect is not large (Bohn 1998; Abel 1999; Diamond and Geanakoplos 1999).

⁴⁶ For stochastic projections, see Copeland, VanDerhei, and Salisbury (1999); and Lee and Tuljapurkar (1998). OCACT generally provides sensitivity analysis by doing projections with several different rates of return on stocks.

⁴⁷ Cochrane (1997, p. 32) reaches a similar conclusion relative to individual investment: “We could interpret the recent run-up in the market as the result of people finally figuring out how good an investment stocks have been for the last century, and building institutions that allow wise participation in the stock market. If so, future returns are likely to be much lower, but there is not much one can do about it but sigh and join the parade.”

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Appendix A:

Alternative Method for Determining the Ratio of Stock Value to GDP

Variables

- r rate of return on stocks
 g rate of growth of both GDP and dividends
 a adjusted dividend yield at time 0
 $P(t)$... aggregate stock value at time t
 $Y(t)$... GDP at time t
 $D(t)$... dividends at time t

Equations

$$Y(t) = Y(0)e^{gt}$$

$$D(t) = D(0)e^{gt} = aP(0)e^{gt}$$

$$dP(t)/dt = rP - D(t) = rP - aP(0)e^{gt}$$

Solving the differential equation, we have:

$$\begin{aligned} P(t) &= P(0)\{(r - g - a)e^{rt} + ae^{gt}\}/(r - g) \\ &= P(0)\{e^{rt} - (a/(r - g))(e^{rt} - e^{gt})\} \end{aligned}$$

Taking the ratio of prices to GDP, we have:

$$\begin{aligned} P(t)/Y(t) &= \{P(0)/Y(0)\}\{(r - g - a)e^{(r-g)t} + a\}/(r - g) \\ &= \{P(0)/Y(0)\}\{(e^{(r-g)t} - (a/(r - g))(e^{(r-g)t} - 1))\} \end{aligned}$$

Consistent with the Gordon formula, a constant ratio of P/Y (that is, a steady state) follows from $r = g + a$. As a non-steady-state example—with values of .07 for r , .015 for g , and .03 for a — $P(75)/Y(75) = 28.7P(0)/Y(0)$.

Appendix B:

Calculation Using the Gordon Equation

In discrete time, once we are in a steady state, the Gordon growth model relates a stock price P at time t to the expected dividend D in the following period, the rate of growth of dividends G , and the rate of return on the stock R . Therefore, we have:

$$P_t = D_{t+1} / (R - G) = (1 + G)D_t / (R - G)$$

We denote values after a decade (when we are assumed to be in a steady state) by P' and D' and use an “adjusted” initial dividend that starts at a ratio X times current stock prices. Thus, we assume that dividends grow at the rate G from the “adjusted” current value for 10 years, where G coincides with GDP growth over the decade. We assume that dividends grow at G' thereafter, which coincides with long-run GDP growth. Thus, we have:

$$\begin{aligned} P'/P &= (1 + G')D' / ((R - G')P) \\ &= (1 + G')D(1 + G)^{10} / ((R - G')P) \\ &= X(1 + G')(1 + G)^{10} / (R - G') \end{aligned}$$

For the basic calculation, we assume that R is .07, G is .02, G' is .015. In this case, we have:

$$P'/P = 22.5X$$

Thus, for initial ratios of adjusted dividends to stock prices of .02, .025, .03, and .035, P'/P equals .45, .56, .67 and .79, respectively. Subtracting those numbers from 1 yields the required decline in the real value of stock prices as shown in the first column of Table 3. Converting them into nominal values by multiplying by 1.27, we have values of .57, .71, and .86. If the long-run stock return is assumed to be 6.5 percent instead of 7.0 percent, the ratio P'/P is higher and the required decline is smaller. Increasing GDP growth also reduces the required decline. Note that the required declines in stock values in Table 3 is the decline in real values; the decline in nominal terms would be less.

Appendix C:

A Cobb-Douglas Solow Growth Model in Steady State

Variables

Y	.....	output
K	.....	capital
L	.....	labor
a	.....	growth rate of Solow residual
g	.....	growth rate of both K and Y
n	.....	growth rate of labor
b	.....	share of labor
s	.....	savings rate
c	.....	depreciation rate
$MP(K)$	...	marginal product of capital

Equations

$$\begin{aligned}\log[Y] &= at + b\log[L] + (1-b)\log[K] \\ (dL/dt)/L &= n \\ (dY/dt)/Y &= (dK/dt)/K = g \\ dK/dt &= sY - cK \\ (dK/dt)/K &= sY/K - c \\ Y/K &= (g + c)/s \\ MP(K) &= (1-b)Y/K = (1-b)(g + c)/s \\ g &= a + bn + (1-b)g \\ g &= (a + bn)/b \\ MP(K) &= (1-b)\{(a + bn)/(bs) + c/s\} \\ dMP(K)/da &= (1-b)/(bs) \\ dg/da &= 1/b\end{aligned}$$

Assume that the share of labor is .75 and the gross savings rate is .2. Then the change in the marginal product of capital from a change in the growth rate is:

(Note that these are gross savings, not net savings. But the corporate income tax reduces the return to savers relative to the return to corporate capital, so the derivative should be multiplied by roughly 2/3.)

$$dMP(K)/dg = (dMP(K)/da)/(dg/da) = (1-b)/s = .25/.2$$

Similarly, we can consider the effect of a slowdown in labor force growth on the marginal product of capital:

$$dMP(K)/dn = (1 - b)/s$$

$$dg/dn = 1$$

$$dMP(K)/dg = (dMP(K)/dn)/(dg/dn) = (1 - b)/s = .25/.2$$

(This is the same expression as when the slowdown in economic growth comes from a drop in technical progress.)

Turning to the effects of changes in the savings rate, we have:

$$dMP(K)/ds = -MP(K)/s = .5$$

Thus, the savings rate has a large impact on the marginal product of capital as well.

Both of these effects are attenuated to the extent that the economy is open and rates of return in the United States change less because some of the effect occurs abroad.

What Are Reasonable Long-Run Rates of Return to Expect on Equities?

**John B. Shoven, Professor of Economics
Stanford University
July 20, 2001**

I. Introduction

The average inflation-adjusted rate of return on large capitalization stocks from 1926-2000 was 9.7 percent (Ibbotson (2001)). Over the same period of time, the average real return on Treasury Bills was 0.8 percent while it was 2.7 percent on long-term U.S. government bonds. The premium of stocks over long-term government bonds was 7.0 percent.¹

The question of interest is not what happened in the past, but what is likely to happen over the next fifty or seventy-five years. Will stocks once again outperform bonds by 7 percent? One needs to be humble when predicting the stock market, although ironically it may be easier to look further into the future than it is to predict what will happen over the next few months or years. In the very long-run, stock returns are more likely to be driven by fundamentals, while in the short-run price movements can appear to have a life of their own.

There are a number of reasons to expect the return on stocks and the premium of the return of stocks over bonds to be lower than over the last three-fourths of the twentieth century. This paper reviews those reasons and concludes with an estimate of the expected long-run real rate of return for equities and an implied equity premium.

II. Dividends Are Obsolete

Traditional equity valuation models (Gordon(1962)) are based on the value of shares being equal to the present value of future dividends. This leads to the result that the expected return to holding stocks is equal to the current dividend yield plus the growth rate in dividend payments. This basic structure is behind most analysis of long-run stock returns today (see, for example, Campbell and Shiller (2001)). The problem with this framework is that dividends are only one way for the corporate sector to transfer money to shareholders and a particularly tax inefficient way at that (Shoven (1987)). Dividend payments are fully taxable for investors who do not have their equity sheltered in pension accounts or other tax deferred or exempt vehicles. In contrast, companies can buy their own shares from their shareholders and achieve the same cash transfer with much lower taxation. With a share repurchase, some of the money is treated as a return of basis and the rest is treated as a capital gain. The tax saving can be enormous. Companies began to take advantage of share repurchases in a significant way in the mid-1980s. In recent years the

¹ All of these numbers are arithmetic averages. The geometric mean real return on large capitalization stocks was 7.7%, whereas it was 2.2% on long-term government bonds. The geometric premium of stocks over long-term government bonds was thus 5.5%.

aggregate amount of share repurchases has exceeded dividends and is currently running at about \$150 billion per year (Liang and Sharpe (1999)). Clearly share repurchases can no longer be treated as a footnote in a story primarily concerned with dividends as a mechanism for transferring cash to shareholders. Companies can also buy the shares of other companies. The extreme form of this is a cash merger. Once again, cash is transferred from companies to shareholders, affecting the valuation of shares. While it is hard to get precise information on the amounts involved, the cash transferred to shareholders via cash mergers is almost certainly even larger than the amount in share repurchases. The point of this is to emphasize that dividends are a choice variable and dividend-price ratios should not be a fundamental building block of share valuation or long-run shareholder return. In fact, it is not clear that companies founded in the 1980s and later will ever pay dividends in the same way as older companies.

III. The Model

The original Gordon model had the intrinsic value of the firm depending on dividends and the growth rate of dividends such that

$$V = \frac{D}{k - g}$$

or

$$k = \frac{D}{V} + g$$

where V is the intrinsic value of the equity, D is the cash dividends, k is capital asset pricing model required rate of return for equity of this risk class, and g is the growth rate of dividends.

The modernized Gordon model can be represented as

$$k = \theta \frac{E}{P} + (1 - \theta)\rho$$

where k is the expected real return to equity, θ is the fraction of earnings paid out to shareholders via dividends or share repurchases, E is earnings per share, P is the current share price and ρ is the ROE (return on equity).² The first right hand side term replaces the dividend yield of the Gordon model with the cash-from-earnings yield including share repurchases. The second term on the right hand side is simply the growth rate of future cash flows and indicates that it depends on the amount of retained earnings and the rate of return associated with those retained earnings.³ This equation is an identity if the various parameters in it remain constant. On the other hand, the observed realized rate of return to holding equity can deviate widely from the value given in the equation if the parameters (particularly the earnings-price ratio) change.

² Share repurchases can be added to the cash flow yield as in the equation in the paper or added to the growth rate term, but not both. Investors who don't participate in a share repurchase benefit from owning a growing fraction of the company. Investors taken as a group receive the cash from a share repurchase just like a dividend. The company's opportunities are the same after the payment of an equivalent amount in dividends or share repurchases.

³ I have not required ρ to equal k in the long-run steady state, although an argument could be made that they should be equated. If they are equal, then the expected return to equity is independent of payout policy and is simply equal to the reciprocal of the P-E ratio.

IV. Steady State Returns

The model just presented gives the steady state real returns that investors can expect to receive from equity markets. The steady state assumption is that aggregate corporate earnings, aggregate dividends, the total market capitalization of stocks, the total money used for share repurchases, and GDP all grow at the same long-run rate. In such a scenario, the price-earnings ratio would remain stable. However, the role of share repurchases would continue to be very important. Due to the declining number of shares, stock prices, dividends per share, and earnings per share would all grow at a rate faster than GDP and the other aggregates. The equilibrium real rate of return to owning stock would be the total of three terms: the dividend rate, the share repurchase rate, and the steady-state growth rate of aggregates in the economy including GDP. That is,

$$k = \frac{D}{P} + \frac{S}{P} + g$$

where S is share repurchases and g is the common steady-state growth rate of economic aggregates. This is simply a different way to write the equation of the previous section. It does highlight that real share prices would go up at the rate of g plus the rate of net share repurchases. To make the equivalence with the previous formulation clear note that

$$\theta \frac{E}{P} = \frac{D}{P} + \frac{S}{P} \text{ and } (1 - \theta)\rho = g$$

V. The Big Question: Future P-E Ratios

The very difficult question is whether the current price-earnings ratio of roughly 25 represents a new steady-state level. Of course, no one would assume that fluctuations in price-earnings ratios will cease, but will 25 be the average level for the next 50 or 75 years? My guess is that the long-run steady state level for the price-earnings ratio will be somewhere between its current level (24 as I write this on July 20, 2001) and its average level over the past 75 years of approximately 15. A reasonable guess would be that P-E ratios might average 20 over the next 50 to 75 years. What would be the consequences of a steady-state P-E ratio of 20 on real expected stock returns? That means that (E/P) would average .05. Firms pay out somewhere between half and three-fourths of their earnings as dividends and net share repurchases, so a reasonable value for θ is 0.625. The ROE of retained earnings is approximately 8 percent, so ρ can be set at that level.⁴ Substituting these values into the model gives

$$k = (.625)(.05) + (.375)(.08) = .03125 + .03 = .06125$$

This model and these parameters predict the expected long-run real return to equity to be 6.125 percent.

⁴ This value is roughly consistent with the rate of return to corporate capital reported in Poterba (1997).

From its current levels, the S&P 500 would not have to crash to reach a P-E level of 20. In fact, the current S&P forecast for next year's earnings of the S&P 500 is \$62.88, so the market is currently selling at 19.3 times next year's predicted earnings. That means that if the market were to go up 3.5 percent over the next year and the 2002 earnings forecasts panned out exactly, then by mid-2002 the market would be selling for exactly 20 times earnings. Obviously, there are other combinations of earnings realizations and price appreciation that would allow the market to equilibrate at a P-E of 20 over the next couple of years.

What would be the consequences of a long run average price-earnings ratio of 15 rather than 20? This would put the P-E ratio close to its average level for the past 75 years. In the short-run this implies that the current market is almost 40 percent overvalued and would indicate that near-term stock returns might be quite poor. On the other hand, once the correction is completed and the equilibrium P-E ratio of 15 is established the real rate of return to equities could average slightly better than 7 percent. If we stick with the assumption that ρ is .08, the expected real return to equity would be in the 7 to 7.5 percent range for all reasonable cash-payout rates (i.e. for all reasonable values of θ).

So, we see that the assumed equilibrium price-earnings rate is important. It should be noted that a near-term market correction to bring about a P-E ratio of 15 would not hurt the proposed Social Security individual accounts as long as it occurred before they had accumulated significant balances. In general, the fact that the individual accounts do not yet exist and will have small balances over the next several years even if they are established soon means that the timing of returns matters a lot. Low returns over the next several years followed by high returns would be much better for the balances in these new Social Security individual accounts than high returns first followed by low ones. There is a big difference between the circumstances of someone who has a lot of wealth but is not saving and someone who is just starting to systematically accumulate assets. The non-saving wealth holder is indifferent to the order of returns. However, the systematic saver has little at stake early in his or her accumulation period, but much more at stake later. Even if real stock returns average 6.0 percent over the next 50 years, the Social Security individual account holders would prefer a pattern where the real returns averaged 2.0 percent for the first decade and 7.0 percent thereafter rather than a pattern of 10.0 percent in the first decade and 5.0 percent thereafter.

VI. The Long-Run Outlook for Equity Rates of Return

My own estimate for the long-run real return to equities looking forward is 6 to 6.5 percent. I come to that using roughly the parameters chosen above. If the P-E ratio fluctuates around 20, the cash payouts to shareholders should range from 3 to 3.5 percent. I am relatively optimistic about the possible steady-state growth rate of GDP and would choose 3 percent for that number.⁵

⁵ It should be noted that the Trustees are projecting long-run average growth in aggregate labor income of slightly less than 2 percent. If 2 percent were the steady-state growth rate rather than three percent, then that would lower my prediction for equilibrium real stock returns by 0.5 percent. The reason that a one-percent drop in the economy wide growth rate would not lower stock returns by a full one percent is that the lower growth rate would require lower retained earnings and permit a higher rate of payout of earnings. For example, you then could support a value of θ of .75 with an E-P ratio of .05 and a value of ρ of .08.

That leads me to my 6 to 6.5 percent real rate of return range. While this is the range that I would choose as the expected return to equities, it does not indicate the degree of uncertainty about actual outcomes over the next 50-75 years. I think there is a great deal of uncertainty about long-run equity returns. A range of outcomes as wide as 2.0 to 10.0 percent would not strike me as unreasonable. Even this wide range of possible outcomes indicates that the 9.7 percent real return that stocks actually earned over the 1926-2000 period is quite unlikely to be repeated.

VII. Why Won't Equity Returns Be As Good in the 21st Century?

Why is it somewhat unlikely that the future returns will be as favorable as the past returns? There actually are quite a few reasons. First, share prices went up faster in the last twenty years than the value of the underlying capital. This relative price appreciation of paper claims to real assets is unlikely to continue over the long haul. Second, of the entire world's equity markets, the American market was the strongest over the last 75 years (see, Jorion and Goetzmann (1999)). While we might come in first again over the next half or three-quarters of a century, one shouldn't count on it. Third, the nature of stockholders has changed dramatically over the last few decades, with far more of the market being held by pension accounts. Whereas stock holdings used to be concentrated amongst the superrich, there has been a noticeable democratization of shareholding over the post World War II period. While it is speculative to be sure, one could argue that the degree of risk aversion displayed in the market has decreased as the market has become more democratic. Fourth, the changing demographics with the increase in the number of elderly relative to the number of working age adults can dampen the demand for financial assets (Schieber and Shoven (1997) and Abel (2001)).⁶ Fifth, stock returns in the past may have been enhanced due to low *ex-post* real returns of long-term bonds. These low real returns were due to unexpectedly high inflation, particularly in the 1960s and 1970s. The total impact of these and other arguments is an equity premium that is likely to be considerably smaller than that observed since 1926.

VIII. The Equity Premium Will Be Lower Because Real Interest Rates Are Higher

The real return on long-run (30-year) inflation-indexed Treasury securities (TIPS) today is about 3.5 percent. Presumably the expected real return on regular nominal Treasury bonds is at least as high. If one uses my central guess for the average real return on equity markets of 6.0 to 6.5 percent, that leaves an equity premium on the order of 2.5 to 3.0 percent. Of course, real interest rates may drift down from current levels, increasing the equity premium. In fact, Social Security currently assumes that long-term government bonds will yield 3.0 percent in the future. That strikes me as reasonable and would not cause me to materially change my 6.0 to 6.5 percent range for the expected long-run real return on equities. Obviously, that leaves an equity premium of 3.0 to 3.5 percent, far lower than experienced during the last three-fourths of the 20th Century.

⁶ For a skeptical view on the impact of demographics on asset prices see Poterba (2001).

IX. Which Rate To Use for Projections?

The next issue is whether one should use the expected equity returns to estimate the future balance of an equity portfolio or should one use the return on safe inflation-indexed government securities. On balance, I favor using the safe bond return on the argument that the extra expected return on equities is compensated for by the extra variance in the outcomes. Both the expected and median return for equities is almost certainly greater than for safe bonds. However, in order for markets to be in equilibrium, the poor equity outcomes must be worse than bond returns. Therefore, a scenario analysis for equity investments would, in my opinion, have to include outcomes worse than bonds as well as those better than for a bond portfolio. I find it preferable to simply calculate the outcomes with a safe investment strategy such as 100 percent Treasury Inflation-Protected Securities and then state that the expected outcome would be higher with stocks in the portfolio but that the risk would be correspondingly greater. The “no free lunch” saying is as true in finance as in the rest of the economy. The extra return of a stock heavy portfolio is matched by the extra riskiness (MaCurdy and Shoven (2000)).

One aside that the discussion of equity premium brings up is the useful role that government bonds play in anchoring financial returns and in providing a relatively risk-free asset alternative. The discussion in Washington of eliminating the publicly held federal debt should at least consider the value of such debt to financial markets. Another point worth remembering is that the traditional pay-as-you-go defined benefit structure is not without risk. The risks of a PAYGO system depend on fertility rates, immigration rates, mortality rates, labor force participation, and worker productivity. The risks of the defined benefit program are not perfectly correlated with the risks of individual accounts invested in private securities. One of the strongest arguments in favor of individual accounts is risk diversification. Clearly more work should be done to quantify the covariance between financial returns and the factors influencing the sustainability of a PAYGO system.

X. Conclusions

My best guess for a real equity return over a long-horizon is 6.0 to 6.5 percent per year. I suggest that Social Security lower its intermediate assumption for real equity returns from its current level of 7.0 percent to 6.5 percent or slightly lower. The narrowness of my range for the expected return does not represent a high degree of certainty about the actually realized real return on equities over the next 50-75 years. Throughout this note I have used terms like “best guess.” That was totally intentional. Even if forecasting stock returns is easier over long horizons, it still isn’t science. To put this concretely, I think that there is something like a 5 percent chance that real stock returns over the next 50 years will be worse than 2.5 percent and there is similarly something like a 5 percent chance that they will exceed 9.5 percent. While it is possible that stocks will underperform bonds over that horizon, it is quite unlikely. However, I think there is only a very slight chance that stocks will outperform bonds in the future by as much as they have in the past. That is, the equity premium is likely to be lower than it has been. My own best guess for the equity premium (stock return over the return on long-term government bonds) is 3.0 to 3.5 percent.

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Biographies of Authors

John Y. Campbell

John Y. Campbell grew up in Oxford, England, and received a B.A from Oxford in 1979. He came to the United States to attend graduate school, earning his Ph. D. from Yale in 1984. He spent the next ten years teaching at Princeton, moving to Harvard in 1994 to become the first Otto Eckstein Professor of Applied Economics. Campbell has co-edited the *American Economic Review* and currently edits the *Review of Economics and Statistics*; he is a Fellow of the Econometric Society and the American Academy of Arts and Sciences, and a Research Associate and former Director of the Program in Asset Pricing at the National Bureau of Economic Research. His research concerns asset markets, the macroeconomy, and the links between them. His graduate-level textbook on empirical finance, *The Econometrics of Financial Markets*, written with Andrew Lo and Craig MacKinlay, was published by Princeton University Press in 1997. His latest book on *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors*, with Luis Viceira, will be published by Oxford University Press in 2001. Campbell is also a founding partner of Arrowstreet Capital, LP, a quantitative asset management firm in Cambridge, Massachusetts.

Peter A. Diamond

Peter Diamond is an Institute Professor at the Massachusetts Institute of Technology, where he has taught since 1966. He received his B.A. in Mathematics from Yale University in 1960 and his Ph.D. in Economics from M.I.T. in 1963. He has been President of the Econometric Society and Vice-President of the American Economic Association. He is a Founding Member and member of the Board of the National Academy of Social Insurance, where he has been President and Chair of the Board. He is a Fellow of the American Academy of Arts and Sciences and a Member of the National Academy of Sciences. He has written on behavioral economics, public finance, social insurance, uncertainty and search theories, and macroeconomics. He was Chair of the Panel on Privatization of Social Security of the National Academy of Social Insurance, whose report, *Issues in Privatizing Social Security* has been published by M.I.T. Press. He has written about social security in Chile, Germany, Italy, the Netherlands, Sweden and the U.S.

John B. Shoven

John Shoven is a member of Stanford University's Economics Department, where he holds the Charles R. Schwab Professorship. The holder of a Ph.D. in economics from Yale University, Dr. Shoven has been at Stanford since 1973, serving as Chairman of the Economics Department from 1986 to 1989, as Director of the Center for Economic Policy Research from 1989 to 1993, and as Dean of the School of Humanities and Sciences from 1993 to 1998. An expert on tax policy, Dr. Shoven was a consultant for the U.S. Treasury Department from 1975 to 1988. The author of approximately eighty professional articles and ten books, he has been a visiting professor at Harvard University, the London School of Economics, Kyoto University and Monash University. In 1995 he was elected a fellow of the American Academy of Arts and Sciences. Dr. Shoven has participated in various Hoover Programs and conferences, including the 1997 symposium "Facing the Age Wave," at which he addressed the taxing of pensions as an illustration of tax policy that seems to have gone awry and that may limit the most important form of savings in America. He also contributed a chapter to the book that resulted from the symposium.

Appendix

Equity Yield Assumptions Used by the Office of the Chief Actuary, Social Security Administration, to Develop Estimates for Proposals with Trust Fund and/or Individual Account Investments

**Stephen C. Goss
Chief Actuary
May 8, 2001**

Initial Assumptions in 1995

The Office of the Chief Actuary (OCACT) has been making estimates for proposals including investments in equities since 1995. A memorandum dated May 12, 1995 presented estimates for the Kerrey-Simpson proposal which included both individual accounts (with the opportunity for equity investment) and provision for investment of 25 percent of OASDI trust fund assets in equities. The assumed average real annual yield on equities for these estimates was 7 percent, consistent with the assumption developed for estimates being produced concurrently for the 1994-96 Advisory Council on Social Security.

Historical analysis of equity yields during the 20th century using Ibbotson data was provided to the Council by Joel Dickson of the Vanguard Group. Based on this analysis, the Advisory Council members and the OCACT agreed that the 7-percent average annual real yield experienced for the 20th century, particularly for the period beginning 1926, seemed to represent a reasonable assumption for an average real yield over long periods in the future as had occurred in the past. It was recognized that this average yield level was recorded rather consistently over long periods of time in the past which incorporated complete market cycles. The work of Dr. Jeremy Siegel of the Wharton School was also noted as supporting a long-term average yield on equities of about 7 percent.

Council Chairman Edward Gramlich noted that the equity market was then currently priced at a level above the historical average, as indicated by relatively high price-to-earnings (PE) ratios. However, it was agreed that in the future market cycles would continue, likely resulting in yields for investments made in successive future years that would average close to the average yields of the past. Estimates produced for the three proposals developed for the Advisory Council (included in Appendix 2 of Volume 1 of the Council's Report) used a 7-percent average real equity yield as an intermediate assumption. Estimates were also produced assuming that equities would achieve a long-term average yield no higher than the yield on long-term U.S. Government marketable securities (Treasury securities), in order to illustrate both the sensitivity of estimates to this assumption and the uncertainty about the likely average yield on equities for even very long periods of time in the future. For individual account proposals, analysis of expected benefit levels and money's worth was also provided using a higher average real annual equity-yield assumption of about 9.6 percent. This higher average yield reflected the arithmetic mean, rather than the

geometric mean (which was 7 percent), of historical data for annual yields. It was suggested by Dr. Dickson that financial analysts generally use the arithmetic mean yield as a basis for illustrating likely expected yield on investments. It was observed that this approach was consistent with assuming that future annual yields would occur as if drawn at random, independently from the distribution of past annual yields.

Estimates for the Kerrey-Simpson proposal and for the Advisory Council proposals were based on the intermediate assumptions of the 1995 Trustees Report, including an assumption of an average annual future real yield of 2.3 percent for Treasury securities. Thus, an equity premium over long-term Treasury securities of 4.7 percentage points was implicitly assumed. It was noted that the historical average equity premium was higher, because the average real yield on Treasury securities was lower than 2.3 percent for the past.

Assumptions Since 1995

Since 1995, the OCACT has continued to use an assumption that average annual real yield on equities will be about 7 percent for investments made in future years. Because the Trustees have gradually increased their assumption for the average future real yield on Treasury securities from 2.3 to 3.0 percent, the implicit equity premium has been reduced from 4.7 to 4 percentage points. In addition, OCACT has continued to provide estimates using lower assumed equity yields for all proposals, in order to illustrate the uncertainty and sensitivity of these estimates.

While it has been recognized that the equity market has continued to be priced at levels above the historical average (as indicated by PE ratios) since 1995, future cycles have been assumed to continue as in the past, so that the average real yield on equity investments made in future years will vary but will still average at a level similar to the past. While an “overpriced” current market suggests that current equity investments may be expected to achieve lower than average real yield, investments made in future years, when the price of stocks may have dropped to a cyclical low, may be expected to achieve a higher than average real yield. Market trends for 2000 and 2001 suggest that the equity market is no longer as “overpriced” as it had been in late 1999, supporting the assumption that future market cycles and average PE ratios may indeed continue to mirror the past.

OCACT has recognized that future equity yields will depend on the future return to capital and many other factors, as it has in the past. Based on the Trustees assumptions in the 2001 Trustees Report, labor productivity is projected to continue to increase in the future at a rate similar to past average growth over long periods of time. This assumption implies that capital deepening (increasing ratio of capital to labor) in the U.S. economy will also continue to trend at about the same rate as in the past. This is believed to be consistent with the assumption that real equity returns and the return to capital will be similar in the future to those in the past. On this basis, OCACT believes that assumption of a future average real equity yield of about 7 percent is consistent with the Trustees assumptions.

Other Views

Some have suggested that slower growth in the U.S. labor force in the future may result in accelerated capital deepening based on an assumed continuation in the historical rate of growth in domestic capital investment, and thus a lower future return to capital (and lower equity yields) in the U.S. economy. Specifically, this would imply that capital investment would grow to levels higher than could be accommodated with current technology while maintaining the marginal product of capital at a maximum. While this may be plausible (if investors have nowhere else to invest and are willing to accept a lower return), it would also imply a higher rate of growth in labor productivity than in the past, and thus would be inconsistent with current Trustees assumptions.

A more compelling argument may be that the general investor may see equities as less risky in the future than in the past, or may be less averse to the level of risk that is present. This attitude would be consistent with a higher level of equity prices, higher PE ratios, lower dividend ratios (to price), and thus a lower real yield on equities (see Diamond 1999). However, OCACT believes that the perception in 1999 that equities will be consistently less risky in the future than in the past may already have been dispelled by price changes since 1999. In the future, OCACT believes that it is likely that stocks will be viewed as risky to about the same extent as in the past, over long periods of time.

Growth in the Total Value of the Equity Market

The assumption that future PE ratios will average at about the same level as in the past implies that the AGGREGATE price of all equities outstanding will grow at the same rate as for aggregate corporate earnings, and thus for GDP. This means that a slower future rate of growth in labor force and GDP (as projected by the Trustees) implies a slower future growth rate for aggregate stock value. In order to be consistent with a continuation of the past equity yield of 7 percent, this would imply that the dividend ratio will be higher in the future, offsetting the lower growth in corporate sales (GDP) and earnings, and thus share values. This would seem to be a reasonable consequence of slower labor force growth. Slower growth in employment from one year to the next means that the share of each year's corporate earnings that must be retained for investment in a growing workforce is reduced. These corporate earnings may reasonably be assumed to be distributed in the form of dividends, providing an equity yield that compensates for the slower increase in equity price.

An alternative assumption might be that corporate earnings that would be retained for a faster growing work force might be invested by the corporation abroad, thus effectively expanding labor and output offshore. This would result in increases in corporate output (although not in domestic GDP) and corporate earnings that would in turn support higher increases in equity prices, and thus total equity yield.

THE SOCIAL SECURITY ADVISORY BOARD

Establishment of the Board

In 1994, when the Congress passed legislation establishing the Social Security Administration as an independent agency, it also created a 7-member bipartisan Advisory Board to advise the President, the Congress, and the Commissioner of Social Security on matters relating to the Social Security and Supplemental Security Income (SSI) programs. The conference report on this legislation passed both Houses of Congress without opposition. President Clinton signed the Social Security Independence and Program Improvements Act of 1994 into law on August 15, 1994 (P.L. 103-296).

Advisory Board members are appointed to 6-year terms, made up as follows: 3 appointed by the President (no more than 2 from the same political party); and 2 each (no more than one from the same political party) by the Speaker of the House (in consultation with the Chairman and Ranking Minority Member of the Committee on Ways and Means) and by the President pro tempore of the Senate (in consultation with the Chairman and Ranking Minority Member of the Committee on Finance). Presidential appointees are subject to Senate confirmation. Board members serve staggered terms. There is currently one vacancy on the Board.

The Chairman of the Board is appointed by the President for a 4-year term, coincident with the term of the President, or until the designation of a successor.

Members of the Board

Stanford G. Ross, Chairman

Stanford Ross is a partner in the law firm of Arnold & Porter, Washington, D.C. He has dealt extensively with public policy issues while serving in the Treasury Department, on the White House domestic policy staff, as Commissioner of Social Security, and as Public Trustee of the Social Security and Medicare Trust Funds. He is a Founding Member and a former Director and President of the National Academy of Social Insurance. He has provided technical assistance on Social Security and tax issues under the auspices of the International Monetary Fund, World Bank, and U.S. Treasury Department to various foreign countries. He has taught at the law schools of Georgetown University, Harvard University, New York University, and the University of Virginia, and has been a Visiting Fellow at the Hoover Institution, Stanford University. He is the author of many papers on Social Security and Federal taxation subjects. Term of office: October 1997 to September 2002.

Jo Anne Barnhart

Jo Anne Barnhart is a political consultant and public policy consultant to State and local governments on welfare and social services program design, policy, implementation, evaluation, and legislation. From 1990 to 1993 she served as Assistant Secretary for Children and Families, Department of Health and Human Services, overseeing more than 65 programs, including Aid to Families with Dependent Children, the Job Opportunities and Basic Skills Training program,

Child Support Enforcement, and various child care programs. Previously, she was Minority Staff Director for the U.S. Senate Committee on Governmental Affairs, and legislative assistant for domestic policy issues for Senator William V. Roth. Ms. Barnhart served as Political Director for the National Republican Senatorial Committee. First term of office: March 1997 to September 1998; current term of office: October 1998 to September 2004.

Martha Keys

Martha Keys served as a U.S. Representative in the 94th and 95th Congresses. She was a member of the House Ways and Means Committee and its Subcommittees on Health and Public Assistance and Unemployment Compensation. Ms. Keys also served on the Select Committee on Welfare Reform. She served in the executive branch as Special Advisor to the Secretary of Health, Education, and Welfare and as Assistant Secretary of Education. She was a member of the 1983 National Commission (Greenspan) on Social Security Reform. Martha Keys is currently consulting on public policy issues. She has held executive positions in the non-profit sector, lectured widely on public policy in universities, and served on the National Council on Aging and other Boards. Ms. Keys is the author of *Planning for Retirement: Everywoman's Legal Guide*. First term of office: November 1994 to September 1999; current term of office: October 1999 to September 2005.

David Podoff

David Podoff is visiting Associate Professor at the Department of Economics and Finance at the Baruch College of the City University of New York. Recently, he was Minority Staff Director and Chief Economist for the Senate Committee on Finance. Previously, he also served as the Committee's Minority Chief Health and Social Security Counselor and Chief Economist. In these positions on the Committee he was involved in major legislative debates with respect to the long-term solvency of Social Security, health care reform, the constitutional amendment to balance the budget, the debt ceiling, plans to balance the budget, and the accuracy of inflation measures and other government statistics. Prior to serving with the Finance Committee he was a Senior Economist with the Joint Economic Committee and directed various research units in the Social Security Administration's Office of Research and Statistics. He has taught economics at the University of Massachusetts and the University of California at Santa Barbara. He received his Ph.D. in economics from the Massachusetts Institute of Technology and a B.B.A. from the City University of New York. Term of office: October 2000 to September 2006.

Sylvester J. Schieber

Sylvester Schieber is Director of the Research and Information Center at Watson Wyatt Worldwide, where he specializes in analysis of public and private retirement policy issues and the development of special surveys and data files. From 1981 to 1983, Mr. Schieber was the Director of Research at the Employee Benefit Research Institute. Earlier, he worked for the Social Security Administration as an economic analyst and as Deputy Director at the Office of Policy Analysis. Mr. Schieber is the author of numerous journal articles, policy analysis papers, and several books including: *Retirement Income Opportunities in An Aging America: Coverage and Benefit Entitlement*; *Social Security: Perspectives on Preserving the System*; and *The Real Deal: The History and Future of Social Security*. He served on the 1994-1996 Advisory Council on Social Security. He received his Ph.D. from the University of Notre Dame. Term of office: January 1998 to September 2003.

Gerald M. Shea

Gerald M. Shea is currently assistant to the president for Government Affairs at the AFL-CIO. He previously held several positions within the AFL-CIO, serving as the director of the policy office with responsibility for health care and pensions, and also in various executive staff positions. Before joining the AFL-CIO, Mr. Shea spent 21 years with the Service Employees International Union as an organizer and local union official in Massachusetts and later on the national union's staff. He was a member of the 1994-1996 Advisory Council on Social Security. Mr. Shea serves as a public representative on the Joint Commission on the Accreditation of Health Care Organizations, is a founding Board member of the Foundation for Accountability, Chair of the RxHealth Value Project, and is on the Board of the Forum for Health Care Quality and Measurement. He is a graduate of Boston College. First term of office: January 1996 to September 1997; current term of office: October 2000 to September 2004.

Members of the Staff

Margaret S. Malone, Staff Director

Michael Brennan

Beverly Rollins

George Schuette

Wayne Sulfridge

Jean Von Ancken

David Warner

Social Security Advisory Board
400 Virginia Avenue, SW
Suite 625
Washington, D.C. 20024
Tel: (202) 475-7700
Fax: (202) 475-7715
www.ssab.gov