A Supply Model of the Equity Premium

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The equity risk premium (ERP) is almost certainly the most important variable in finance. It tells you how much you need to save, how much you can spend, and how to allocate your assets between equities and bonds. Yet, recognized experts cannot agree on the ERP's value within an order of magnitude or even agree whether it is negative or positive. At a 2001 symposium, the predecessor of the one documented in this book, Robert Arnott and Ronald Ryan set forth an ERP estimate of −0.9 percent and Roger Ibbotson and Peng Chen proposed +6 percent.[1] The estimates in this book are much more tightly clustered, but considerable disagreement remains about how to estimate the premium as well as its size.

Grinold and Kroner (2002) proposed a model of the ERP that linked equity returns to gross domestic product (GDP) growth.[2] The key insight, which draws on earlier work by a number of authors, was that aggregate corporate profits cannot grow indefinitely much faster—or much slower—than GDP. (And as Herbert Stein was fond of reminding us, any economic trend that cannot continue forever will not.) If profits grow faster than GDP, they eventually take over the economy, leaving nothing for labor, government, natural resource owners, or other claimants. If profits grow more slowly than

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[1]See Arnott and Ryan (2001); Ibbotson and Chen (2003). The Ibbotson and Chen estimate of 6 percent is an arithmetic mean expectation; their geometric mean expectation was 4 percent.
[2]A second printing of this article, from March 2004, is available online at www.cfapubs.org/userimages/ContentEditor/1141674677679/equity_risk_premium.pdf.

GDP, they eventually disappear and businesses will have no profit motive to continue operating. Thus, in the very long run, the ratio of profits to GDP is roughly constant.

The title of this paper, a shortened and updated version of Grinold and Kroner (2002), refers to the "supply model" of Diermeier, Ibbotson, and Siegel (1984), who differentiated between the demand for capital market returns (what investors need to compensate them for risk) and the supply of returns (what the macroeconomy makes available). The original supply model likewise made use of a link between profits and GDP. Grinold and Kroner (2002) was titled "The Equity Risk Premium: Analyzing the Long-Run Prospects for the Stock Market," but the similarity with the title of this book forced us to rename the current paper. Although our method is designed to produce an ERP estimate that reflects both supply and demand, the link to macroeconomic performance gives it a supply-side flavor.[3]

When we revisited the estimates from Grinold and Kroner (2002), we found that not all the components could be updated with equal accuracy, so the ERP estimate provided here is subject to some important caveats regarding data adequacy. The method that we recommend, however, remains largely unchanged from Grinold and Kroner (2002).

The Equity Risk Premium Model

We define the equity risk premium as the expected total return differential between the S&P 500 Index and a 10-year par U.S. government bond over the next 10 years. Our forecast of the return to the 10-year government bond over the next 10 years is simply the yield on that bond. Therefore, the ERP becomes

$$E\left(R_S - R_B\right) = \text{Expected S\&P 500 return} - \text{10-year bond yield.} \qquad (1)$$

A purer and more "modern" approach is to conduct the whole analysis in real terms and to use the yield on a 10-year par Treasury Inflation-Protected Securities (TIPS) bond or, alternatively, a 10-year TIPS strip as the relevant bond yield. The authors of some of the other papers in this book do just that. We estimate the ERP over 10-year nominal bonds, however, because that is what Grinold and Kroner (2002) did. The numerical difference between the results of the two methods, real and nominal, is not large.

Forecasting the return on the S&P 500 over the next 10 years is more difficult and, therefore, gets most of the attention in this paper. The framework we use is to decompose equity returns into several understandable pieces and then examine each piece separately.

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[3]A more detailed history of the estimation of the ERP can be found in the foreword (by Laurence B. Siegel) in Kaplan (2011).

The return to equities over a single period can always be broken down as

$$R_S = \text{Income return} + \text{Nominal earnings growth} + \text{Repricing}. \tag{2}$$

The income return is the percentage of market value that is distributed to shareholders as cash. If dividends are the only source of income, then the income return is equivalent to the dividend yield. Today, share repurchase programs (buybacks) are another common means of distributing cash to shareholders. Cash takeovers (by one company of another) should also be counted in the income return of an index that includes the stock of the acquired company.

The next two terms in Equation 2 represent the capital gain. Capital gains come from a combination of earnings growth and P/E expansion or contraction, which we call "repricing."

For expository purposes, we decompose the components further and use more precise notation. The return over a single period is

$$R = \underbrace{\frac{D}{P} - \Delta S}_{\text{Income}} + \underbrace{i + g}_{\text{Earnings growth}} + \underbrace{\Delta PE}_{\text{Repricing}}. \tag{3}$$

The first term, D/P, is simply the dividend yield. The second term, $-\Delta S$, is the percentage change in the number of shares outstanding. The percentage change in the number of shares outstanding equals the "repurchase yield" (which theoretically also includes cash takeovers) minus new shares issued (dilution); it has a negative sign because a decrease in the number of shares outstanding adds to return and an increase subtracts from return.[4] Together, the terms D/P and $-\Delta S$ measure the fraction of market capitalization that the companies in an index, in aggregate, return to shareholders in cash. Therefore, we refer to the sum of these two terms as the "income return."

The remaining terms, $i + g + \Delta PE$, make up the capital gain. The term i represents the inflation rate. The term g is the real earnings (not earnings per share) growth rate over the period of measurement. The final term, ΔPE, is the percentage change in the P/E multiple over the period. We refer to this last piece as the "repricing" part of the return.

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[4]Share buybacks may be viewed as either a component of income return or a component of capital gain. An owner of a single share who holds on to the share through the share buyback program experiences the buyback as a component of capital gain because the same earnings are divided among fewer shares, which causes EPS to rise although earnings (not per share) have not changed. If the stock's P/E and all other factors are held equal, then the stock price rises. An index fund investor, however, experiences the share buyback as cash income because the index fund manager—who tenders some of the shares to the issuer to keep the stock's (now decreased) weight in the fund proportionate to its weight in the index—receives cash, which is then distributed to, or held by, fund shareholders like any other cash (tax considerations aside). We choose to view share buybacks as a component of income return.

It is important to realize that this decomposition of returns is essentially an identity, not an assumption, *so any view on the equity risk premium can be mapped into these components*. To illustrate, if the current 10-year bond yield is 3 percent, anyone who believes that the ERP is currently 4 percent must believe that the income return, nominal earnings growth, and repricing sum to 7 percent.

Historical Returns

Let us briefly consider what risk premium markets have provided historically. Over the last 85 years (1926–2010), the U.S. stock market and the intermediate-term U.S. Treasury bond market have delivered compound annual nominal returns of 9.9 percent and 5.4 percent, respectively.[5] Thus, the realized premium that stocks delivered over bonds was 4.5 percent.[6] The historical return decomposition in **Table 1** can be used to better understand this 9.9 percent annual equity return.

The income return (through dividends only, not share buybacks) on the S&P 500 was 4.1 percent annualized over this 85-year period. In this decomposition, we adjusted earnings growth for increases in the number of shares to arrive at *earnings per share (EPS) growth*. EPS grew at a rate of about 4.9 percent per year (1.9 percent real growth and 3.0 percent inflation) over the period.

Table 1. Decomposition of Total Returns on the S&P 500,[a] 1926–2010

Income return	4.10%
Real EPS growth	1.91
Inflation	2.99
P/E repricing	0.58
Within-year reinvestment return[b]	0.28
Total return	9.87%

[a]S&P 90 from January 1926 to February 1957; S&P 500 from March 1957 to 2010.
[b]Reinvestment of dividends paid during the year in the capital gain index (which consists of real EPS growth plus inflation plus P/E repricing).
Source: Morningstar/Ibbotson (used by permission).

[5]See the data for large-company stocks (i.e., the S&P 90 from January 1926 through February 1957 and the S&P 500 thereafter) in Table 2.1 in Ibbotson SBBI (2011, p. 32). Returns are before fees, transaction costs, taxes, and other costs.

[6]This amount is the arithmetic difference of geometric means. The geometric difference of geometric means, or the compound annual rate at which stocks outperformed bonds, is given by $(1 + 0.099)/(1 + 0.054) - 1 = 4.27$ percent.

The remainder of the total return on equities was due to repricing. The P/E of the market, measured as the end-of-year price divided by trailing 12-month earnings, grew from 11.3 at year-end 1925 to 18.5 at year-end 2010.[7] This repricing works out to an additional return, or P/E expansion, of 0.58 percent per year. A common view is that this P/E expansion was understandable and reasonable in light of the technological and financial innovations over this long period. For example, accounting standards became more transparent (recent "fraud stocks" notwithstanding). Such innovations as the index fund made it easier for investors to diversify security-specific risk and to save on costs. Mutual fund complexes provided easier access to institutional-quality active management. Finally, many market observers perceive the business cycle to have been under better control in recent decades than it was in the 1920s and 1930s, which made expected earnings smoother; the recent near depression and quick recovery, at least in corporate profits and the stock market, support this view somewhat. All these factors have made equity investing less risky and contributed to the repricing over this 85-year period.

But the presence of these factors in the past does not mean that we should build continued upward repricing into our forecasts. We consider this issue later in this paper.

Chart 1 of Grinold and Kroner (2002) further dissects the return decomposition into annual return contributions. Their graph demonstrates that the noisiest component of returns is clearly P/E repricing, followed by real earnings growth. Inflation and income returns are relatively stable through time. This observation implies that our real earnings growth and repricing forecasts are likely to be the least accurate and our inflation and income return forecasts are likely to be more accurate.

Mehra and Prescott (1985), and many others, argued that the equity premium of 4.5 percent was a multiple of the amount that should have been necessary to entice investors to hold on to the risky cash flows offered by equities instead of the certain cash flows offered by bonds. This contention spawned a huge literature on the "equity risk premium puzzle."[8] We have always been perplexed by a debate that suggests that investors were wrong while a specific macroeconomic theory is right, but Rajnish Mehra sheds additional light on this question elsewhere in this book.

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[7]Because earnings were growing very quickly at the end of 2010, the more familiar P/E calculated as the current price divided by 12-month *forward* (forecast) earnings was lower than the P/E shown here.

[8]For surveys of this literature, see Kocherlakota (1996); Mehra (2003).

Looking to the Future

Next, we will examine each term in Equation 3 to determine which data are needed to forecast these terms over the moderately long run (10 years). Later in the paper, we will combine the elements to estimate, or forecast, the total return on the S&P 500 over that time frame. Finally, we will subtract the 10-year Treasury bond yield to arrive at the expected equity risk premium.

Income Return. The income return is the percentage of market capitalization that is distributed to shareholders in cash. Currently, companies have two principal means of distributing cash to shareholders: dividend payments and share repurchases. A third method, buying other companies for cash, "works" at the index level because index investors hold the acquired company and the acquiring company if the index is broad enough.

Until the mid-1980s, dividends were essentially the only means of distributing earnings. Since then, repurchases have skyrocketed in popularity, in part because they are a more tax-efficient means of distributing earnings and in part because companies with cash to distribute may not want to induce investors to expect a distribution every quarter (and cutting dividends is painful and often causes the stock price to decline). In addition, dividend-paying companies may suffer from a stigma of not being "growth" companies.

In fact, according to Grullon and Michaely (2000), the nominal growth rate of repurchases between 1980 and 1998 was 28.3 percent. Numerous other studies have shown that share repurchases have surpassed dividends as the preferred means of distributing earnings.[9] According to Fama and French (2001), only about one-fifth of publicly traded (nonfinancial and nonutility) companies paid any dividends at the time of their study, compared with about two-thirds as recently as 1978. So the "repurchase yield" now exceeds the dividend yield.

Currently (as of 18 March 2011), the dividend yield is 1.78 percent.[10] Like a bond yield, the current (not historical average) dividend yield is likely the best estimate of the income return over the near to intermediate future, so we use 1.78 percent as our estimate of D/P in Equation 3.

To estimate the repurchase yield, we used historical data over the longest period for which data were available from Standard & Poor's, the 12 years from 1998 through 2009. We calculated the annual repurchase yield as the sum of a given year's share repurchases divided by the end-of-year capitalization of the market. **Table 2** shows these data. The average of the 12 annual repurchase yields is 2.2 percent, which we use in our ERP estimate.

[9]See, for example, Fama and French (2001); Grullon and Michaely (2000); Fenn and Liang (2000).
[10]We obtained this number at www.multpl.com/s-p-500-dividend-yield on 18 March 2011.

Table 2. Repurchase Return of the S&P 500, 1998–2009

Year	Year-End Market Capitalization ($ billions)	Share Repurchases during Year ($ billions)	Share Repurchase Return (%)
1998	9,942.37	125	1.26
1999	12,314.99	142	1.15
2000	11,714.55	151	1.29
2001	10,463.39	132.21	1.26
2002	8,107.41	127.25	1.57
2003	10,285.83	131.05	1.27
2004	11,288.60	197.48	1.75
2005	11,254.54	349.22	3.10
2006	12,728.86	431.83	3.39
2007	12,867.85	589.12	4.58
2008	7,851.81	339.61	4.33
2009	9,927.56	137.60	1.39
Average			2.20

Source: Standard & Poor's.

It is possible to make the case for a much higher repurchase yield forecast by giving greater weight to more recent information (which is basically what we did with the dividend yield). According to Standard & Poor's (2008), "Over the past fourteen quarters, since the buyback boom began during the fourth quarter of 2004, S&P 500 issues have spent approximately $1.55 trillion on stock buybacks compared to . . . $783 billion on dividends." Although buybacks collapsed in 2009, they rebounded in 2010 and 2011. If the two-to-one ratio of buybacks to dividend payments observed by Standard & Poor's over 2004–2008 persists in the future, the repurchase yield will be as high as 3.5–3.6 percent. Aiming for a "fair and balanced" estimate, we use the lower number, 2.2 percent, which we obtained by weighting all 12 years of historical share repurchase data equally.[11]

We have not included cash buyouts in our estimate of the repurchase yield. From the perspective of an investor who holds an index containing companies A, B, C, and so forth, a cash buyout or takeover—a payment by company A to

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[11]The use of this lower number is neutral, not conservative in the sense of numerically minimizing the ERP estimate. The reason is that there are offsetting biases. Our buyback estimate of 2.2 percent is too high because we do not subtract the historical contribution of buybacks to the dilution estimate (discussed later). And it is too low because very recent buyback rates have been much higher than 2.2 percent, not to mention the fact that we fully ignore the cash takeover yield.

an investor holding shares of company B in exchange for a tender of those shares—is no different from a share buyback, which is a payment by company A to an investor holding shares of A in exchange for a tender of *those* shares. Thus, the "cash buyout yield" needs to be added to the repurchase yield when summing all the pieces of $-\Delta S$. However, we do not have data for cash buyouts. If we did, they would increase our forecast of the equity risk premium (because cash buyouts must be a positive number and no other component of the ERP would change).

■ *Effect of Dilution on Income Return.* Dilution is the effect of new issuance of shares by existing companies and takes place through secondary offerings and the exercise of stock options. Dilution may be regarded as reflecting capital that needs to be injected from the labor market (or from elsewhere) into the stock market so investors can participate fully in the real economic growth described in the next section. Formally, dilution (expressed as an annual rate or a decrement to the total expected equity return) is the difference between the growth rate of dividends and the growth rate of dividends per share. If the payout ratio is assumed to be constant, dilution is also equal to the difference between the earnings growth rate and the EPS growth rate.

Grinold and Kroner (2002) estimated dilution from secondary offerings using historical data and dealt with stock options separately. Here, because we do not have the data to properly update the dilution estimates in Grinold and Kroner (2002), we use a shortcut: We directly adopt the 2 percent per year dilution estimate from Bernstein and Arnott (2003).

Bernstein and Arnott (2003) studied U.S. stocks from 1871 to 2000 and stocks from other countries over shorter periods. Instead of measuring the difference between the growth rate of earnings and that of EPS, they used a proxy: They measured the difference between the growth rate of total market capitalization and the capital appreciation return (price return) on existing shares. Dilution thus measured is net of share buybacks and cash buyouts (which are forms of negative dilution because giving cash back to shareholders is the opposite of raising capital by selling shares). The 2 percent dilution estimate for U.S. stocks is supported by evidence from other countries.[12]

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[12]For a fuller discussion of dilution and an excellent description of the Bernstein and Arnott (2003) method, see Cornell (2010), who wrote, "Bernstein and Arnott (2003) suggested an ingenious procedure for estimating the combined impact of both effects [the need of existing corporations to issue new shares and the effect of start-ups] on the rate of growth of earnings to which current investors have a claim. They noted that total dilution on a marketwide basis can be measured by the ratio of the proportionate increase in market capitalization to the value-weighted proportionate increase in stock price. More precisely, net dilution for each period is given by the equation Net dilution = $(1 + c)/(1 + k) - 1$, where c is the percentage capitalization increase and k is the percentage increase in the value-weighted price index. Note that this dilution measure holds exactly only for the aggregate market portfolio" (p. 60).

We should subtract from the 2 percent dilution estimate that part of historical dilution that was due to buybacks and cash takeovers (but *not* the part of dilution that was due to stock option issuance because these cash flows went to employees, not shareholders). We do not have the data to perform these adjustments, however, so we do not attempt them. We simply use the 2 percent estimate. (Note that the number of buybacks was tiny until the mid-1980s—that is, over approximately the first 115 years of the 130-year sample—so historical buybacks probably had a minimal impact on the average rate of dilution for the entire period.)

■ *Numerical Estimate of Income Return.* The income return forecast consists of the expected dividend yield, D/P, minus the expected rate of change in the number of shares outstanding, ΔS. The expected dividend yield is 1.78 percent. The number of new shares is expected to decline at a −0.2 percent annual rate, consisting of 2 percent dilution minus a 2.2 percent repurchase yield. After adding up all the pieces, the income return forecast is 1.98 percent.
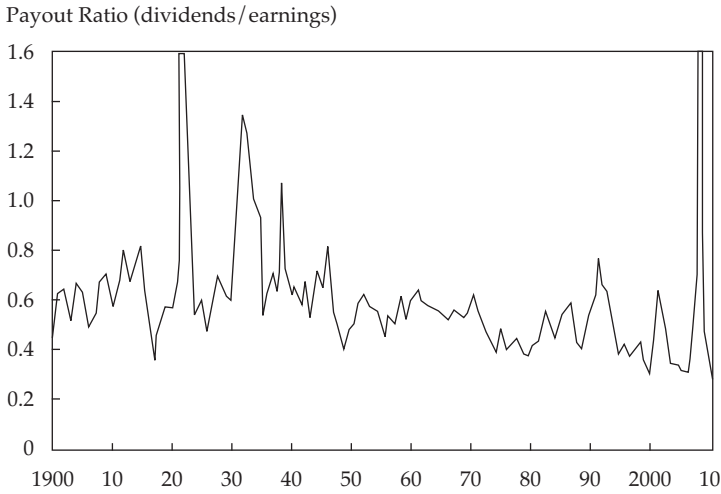
Expected Real Earnings Growth. We expect real dividend growth, real earnings growth, and real GDP growth—all expressed in aggregate, not in per share or per capita, terms—to be equal to each other.

We expect dividend and earnings growth to be equal because we assume a constant payout ratio. Although the payout ratio has fluctuated widely in the past, it has trended downward over time, presumably because of tax and corporate liquidity considerations. But the decline has effectively stopped. **Figure 1** shows the dividend payout ratio for the U.S. stock market for 1900–2010; this curious series looks as though it has been bouncing between a declining lower bound (which has now leveled off near 30 percent) and an almost unlimited upper bound. The highest values of the payout ratio occurred when there was an earnings collapse (as in 2008–2009), but companies are loath to cut dividends more than they have to.[13] The lower bound reflects payout policy during normally prosperous times.

The current lower bound of about 30 percent would be a reasonable forecast of the payout ratio, but we do not need an explicit forecast because we have already assumed that it will be constant over the 10-year term of our ERP estimate. It is helpful to have empirical support for our assumption of a constant payout ratio, however, and the recent relative stability of the lower bound in Figure 1 provides this support.

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[13]The all-time high level of the payout ratio, 397 percent, occurred in March 2009, when annualized monthly dividends per "share" of the S&P 500 were $27.25 and annualized monthly earnings per "share" were $6.86.

Figure 1.   Payout Ratio of the U.S. Equity Market, 1900–2010


Payout Ratio (dividends/earnings)

Source: Raw data are from Robert Shiller (www.econ.yale.edu/~shiller/data/ie_data.xls, as of 4 November 2011); calculations are by the authors.

We expect real earnings growth to equal real GDP growth for the macro-consistency reason stated earlier: Any other result would, in the very long run, lead to an absurdity—corporate profits either taking over national income entirely or disappearing. **Figure 2** shows the (trendless) fluctuations in the corporate profit share of GDP since 1947.

These observations leave us with the puzzle of forecasting real GDP growth. Grinold and Kroner (2002) engaged in a fairly typical macroeconomic analysis that involved productivity growth, labor force growth, and the expected difference between S&P 500 earnings and overall corporate profits. They did not use historical averages or trends directly as forecasts; rather, they argued that the data plus other factors justified the conclusion that real GDP would most likely grow at 3 percent over the relevant forecast period and that real S&P 500 earnings would grow at 3.5 percent.

Real economic growth, by definition, equals real productivity growth plus labor force growth. Although we can update the historical productivity and labor force growth numbers, doing so would not produce an especially useful forecast any more than it did for Grinold and Kroner (2002), who distanced themselves somewhat from the productivity and labor force growth approach. The reason is that extrapolating recent trends in these components of economic growth can produce unrealistically high or low expectations, and using

Figure 2. Quarterly U.S. Corporate Profits as a Percentage of GDP, 1947–2010
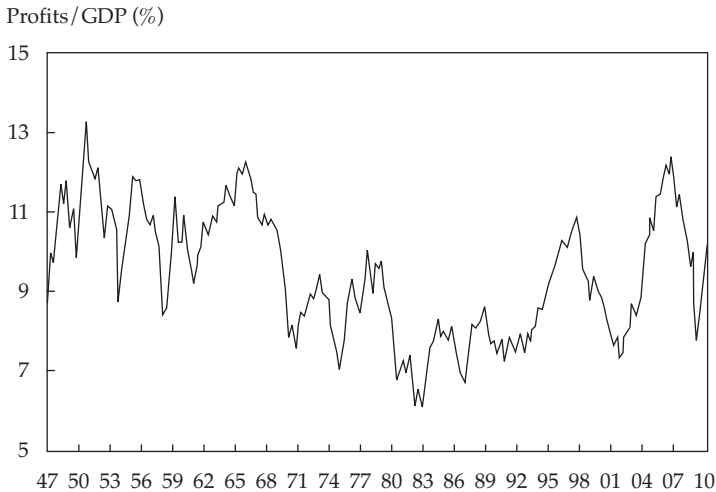
Note: Profits are pre-tax.
*Source:* Haver Analytics, citing U.S. National Income and Product Accounts data.

historical averages provides no insight into possible future changes in the components, which are important. Nevertheless, updates of these components are provided for informational purposes in **Figure 3**.

We can, however, use a different decomposition of real economic growth, which is also definitional: Expected GDP growth equals expected *per capita* GDP growth plus expected population growth. We believe that population growth is easier to forecast than labor force growth because the latter is partly endogenous (e.g., people work longer if they need the money because of a weak economy).[14]

Figure 4 shows that since 1789, real per capita U.S. GDP has grown at a fairly constant 1.8 percent compound annual rate. Cornell (2010) arrived at a global estimate from the high-growth postwar period (1960–2006) that is higher, but not dramatically so: 2.42 percent for mature economies and 2.79 percent for emerging economies. A cautious forecast is that the 1.8 percent growth rate will continue. If this forecast entails substantial risk, it is to the upside because an investment in the S&P 500 is not a pure bet on the U.S. economy; many, if not most, of the companies in the index are global companies that sell to markets that are growing more rapidly than the U.S. market.

[14]Population growth is also partly endogenous (because the decisions of how many children to have, whether to emigrate, and so forth, may depend on economic performance). These effects, however, operate with long lags and tend to move the population growth rate slowly.

Figure 3.   U.S. Real Productivity and Labor Force Growth Rates, 1971–2009
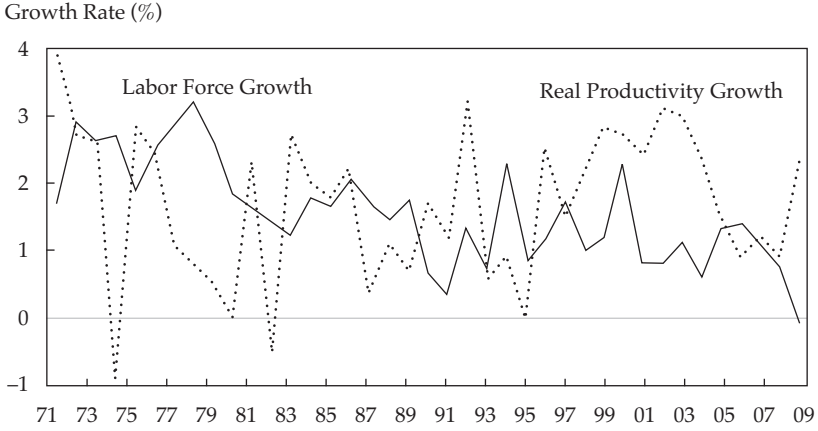
Growth Rate (%)

Source: Organisation for Economic Co-Operation and Development, OECD StatExtracts (http://stats.oecd.org/Index.aspx, as of 14 November 2011: total labour force, U.S., and labour productivity annual growth rate, U.S.).

Figure 4.   Real U.S. GDP per Capita, 1789–2008

Real U.S. GDP per Capita (2010 dollars)
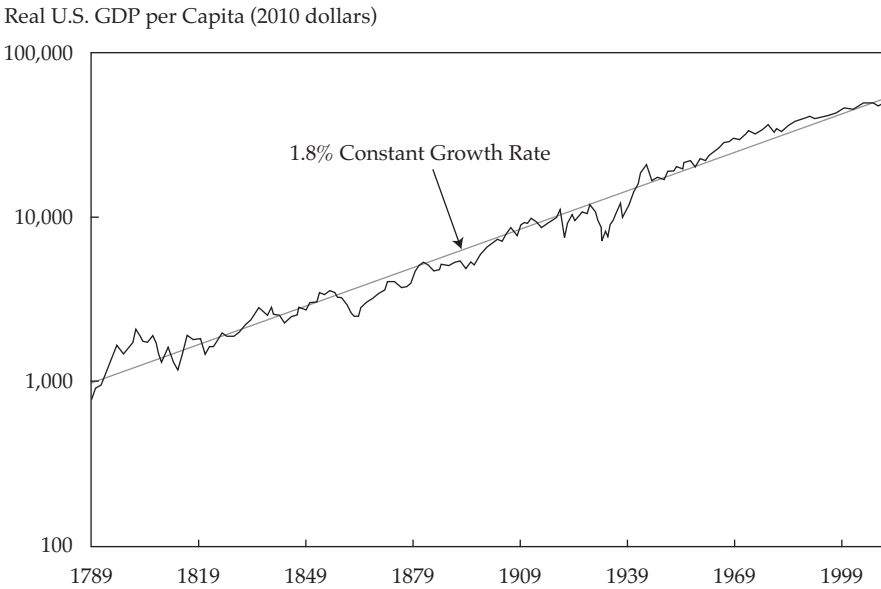
Source: Data are from Robert D. Arnott.

We add to the 1.8 percent real per capita GDP growth estimate the Economist Intelligence Unit 10-year U.S. population growth estimate of 0.85 percent,[15] which gives a total real GDP growth forecast of 2.65 percent. This number is slightly below current consensus estimates.

This simplified method presents some difficulty because if the rate of dilution is 2 percent at all population growth rates, then population growth has a one-for-one effect on the estimate of the expected return on equities and, therefore, on the ERP. This suggests an easy beat-the-market strategy: Invest only in countries with the fastest population growth. This strategy has not worked well in the past, and even if it did over some sample period, easy beat-the-market strategies are usually illusory. Thus, the dilution estimate should probably be higher for countries with high population growth rates or for a country during periods of above-normal population growth. Although the logic of using a link to real GDP growth to forecast the stock market has great intuitive appeal, putting it into practice with any precision will take more work and more thought regarding dilution.[16]

Expected Inflation. Because we are deriving the ERP relative to Treasury bonds, we do not need our own inflation forecast as much as we need an estimate of the inflation rate that is priced into the 10-year Treasury bond market. Historical inflation rates have no bearing on this number, so we do not present them. Fortunately, the yield spread between 10-year nominal Treasury bonds and 10-year TIPS is a direct, although volatile, measure of the inflation rate that is expected by bondholders. (The spread also includes an inflation risk premium, present in nominal bond yields but not in TIPS yields, for which we need to adjust.)

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[15]This number was obtained at http://7marketspot.com/archives/2276 on 2 May 2011 under the heading "USA economy: Ten-year growth outlook" in the column "2011–20." If we instead used real productivity growth plus labor force growth to estimate real GDP growth, we would get a slightly higher number for real productivity growth and a slightly lower number for labor force growth, which would provide a very similar overall real GDP forecast.

[16]Our simplified method has some other characteristics worth noting. It does not specifically account for the wedge between population growth and labor force growth if the proportion of retirees (or children) in the population is expected to change. A growing unproductive retiree population should be considered bearish. Many would-be retirees, however, are not financially prepared for retirement and, willingly or not, will work longer than they originally anticipated, which contributes to GDP. In addition, in an advanced technological society, an aging population distribution within the workforce is not all bad! We are accustomed to thinking of young workers as productive and older workers as unproductive, but this is the case only in a fairly primitive economy where the primary job description is something like "lift this and put it over there." In a technological society, young workers are unproductive—often startlingly so, earning only the minimum wage—and older workers produce most of the added value and make the lion's share of the money. Nevertheless, young workers' productivity grows quickly and older workers' productivity grows slowly or shrinks, so the impact of an aging workforce on *rates of change* in productivity may be less salutary than the impact on the *level* of productivity.

On 22 April 2011, the breakeven inflation rate (the yield spread described above) was 2.60 percent.[17] This rate is high by recent standards—it was as low as 1.5 percent in September 2010—but it is typical of the longer history of the series. Recent concerns about very high and rapidly growing levels of public indebtedness (of the U.S. government, of local governments in the United States, and of non-U.S. governments) have contributed to the increase in inflation expectations. We subtract 0.2 percent for the inflation risk premium to arrive at a 2.4 percent compound annual inflation forecast over the next 10 years.[18]

Expected Repricing. Grinold and Kroner (2002, p. 15, Chart 8) conducted an analysis of the market's P/E that led them to include a nonzero (−0.75 percent per year) value for the repricing term, ΔPE, in Equation 3. At the time the analysis was conducted (November 2001), the market's conventional trailing P/E (price divided by one-year trailing earnings) was a lofty 29.7 and the "Shiller P/E" (price divided by 10-year trailing real earnings) was 30.0, which prompted the authors to conclude that the P/E was likely to decline.[19] (The Shiller P/E is designed to smooth out fluctuations caused by yearly changes in earnings.) And decline it did.

Today, the situation is different. **Figure 5** shows the conventional P/E and the Shiller P/E of the U.S. market. Today's conventional P/E of 18.5 is only modestly higher than the very long-run (1900–2010) average P/E of 15.7, and it is lower than the more recent long-run (1970–2010) average P/E of 18.9. The Shiller P/E tells a slightly less favorable story: The current value is 22.4, compared with an average of 16.3 over 1900–2010 and 19.2 over 1970–2010.[20] Because it averages 10 years of trailing earnings, however, the current Shiller P/E includes an earnings collapse in 2008–2009 that is almost literally unprecedented; even the Great Depression did not see as sharp a contraction in S&P composite index earnings, although overall corporate profits in 1932 were negative. (Huge losses in a few large companies, such as those that occurred in 2008–2009, go a long way toward erasing the profits of other companies when summed across an index.) Only the depression of 1920–1921 is comparable.

Thus, we see no justification for using a nonzero value for the repricing term in Equation 3. The market's current level is already reflected in the (low) dividend yield. To include a repricing term even though the dividend yield already incorporates the market's valuation is, theoretically, not double-counting because the influence of the dividend yield is amortized over an infinite horizon,
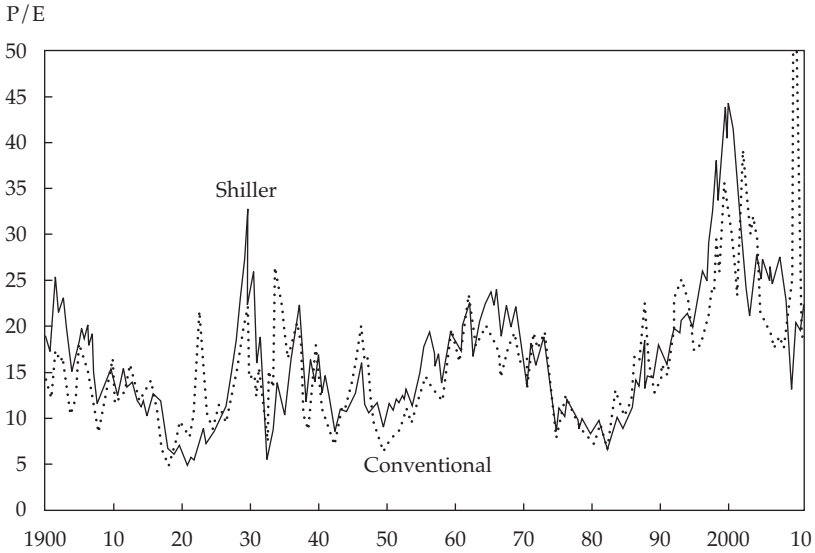
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[17] See www.bloomberg.com/apps/quote?ticker=USGGBE10:IND.

[18] This estimate of the inflation risk premium comes from Hördahl (2008, p. 31, Graph 2).

[19] Shiller (2000) describes the Shiller P/E.

[20] In this section, "current" values are as of December 2010.

Figure 5.   Conventional and Shiller P/Es for the U.S. Equity Market, 1900–2010

Note: The October 2009 conventional P/E equals 86.

Source: Spreadsheet available at Robert Shiller's website (www.econ.yale.edu/~shiller/data/ie_data.xls).

whereas our forecast is for only the next 10 years. Thus, if we believe that the market is mispriced in such a way that it will be fully corrected within 10 years, a nonzero repricing term is warranted. Although Grinold and Kroner (2002) argued that the market P/E was too high at that time and would decline at an expected rate of 0.75 percent per year over the forecast horizon, we think the market is currently not too high (or too low), and our repricing forecast is zero.

Bringing It All Together

In this section, we estimate the expected total nominal return on equities, as expressed in Equation 3, using the inputs we derived in the foregoing sections. We then subtract the 10-year nominal Treasury bond yield to arrive at our estimate of the ERP over the next 10 years.

Income return $(D/P - \Delta S)$ = 1.78 percent dividend yield
  − (−0.2 percent repurchase yield net of dilution)
  = 1.98 percent.

Capital gain $(i + g + \Delta PE)$ = 2.4 percent inflation
  + 1.8 percent real per capita GDP growth
  + 0.85 percent population growth
  = 5.05 percent.

Total expected equity return = 1.98 percent + 5.05 percent

= 7.03 percent (rounded to 7 percent)

– 3.40 percent 10-year Treasury bond on 22 April 2011[21]

= 3.6 percent expected ERP over 10-year Treasuries.

Arithmetic vs. Geometric Mean Forecasts

Our forecasts thus far have been geometric means (r_G). To estimate the equivalent arithmetic mean return expectation (r_A) for use as an optimizer input, we rely on the following approximation:

$$1 + r_G \approx \left(1 + r_A\right) - \frac{\sigma^2}{2}. \qquad (4)$$

We use standard deviations drawn from 1970 to 2010 because we do not necessarily expect bond returns to be as placid as they have been recently. Thus, for the purpose of estimating standard deviations, we include this long period because it includes the bond bear market of 1970–1980 and the dramatic subsequent recovery.[22] We obtain the following:

Expected arithmetic mean equity total return = 8.59 percent.

Expected arithmetic mean 10-year Treasury bond total return = 3.96 percent.

Difference (expected arithmetic mean ERP) = 4.63 percent.

A limitation of this study is that we use U.S., not global, macroeconomic data in our estimate of the expected return on the S&P 500. The S&P 500 is a global index, in that it contains many companies that earn most, or a substantial share, of their profits outside the United States. Perhaps global economic growth rates are more relevant to the expected return on the S&P 500 than U.S. growth rates. Future research should examine this possibility.

Assessing the Previous Grinold and Kroner Forecast

Grinold and Kroner (2002) identified three camps of ERP forecasters: "risk premium is dead," "rational exuberance," and "risk is rewarded." They called the first two views "extreme" and wished to be counted among the moderate "risk is rewarded" camp, in keeping with the belief that markets are generally efficient and that prices, therefore, do not stray far from genuine values for very long.

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[21]This number was obtained from Yahoo! Finance on 22 April 2011.

[22]Stocks = 17.68 percent; bonds = 9.73 percent (these data are from Aswath Damodaran's website, http://pages.stern.nyu.edu/~adamodar, as of 3 June 2011).

Grinold and Kroner's (2002) forecast, evaluated over 2002–2011, was too high. The main problem was the volatile repricing term. They seriously underestimated the speed with which the unusually high P/Es that then prevailed would revert toward their historical mean. In this paper, we forecast a repricing of zero, consistent with our view that the market is finally, after two bear markets and two recoveries, roughly fairly priced. Because the repricing term is noisy, we know that our current forecast is more likely to be too high or too low than just right when evaluated over the next 10 years. We believe, however, that we have identified the middle of the range of likely outcomes. Although black swans, fat tails, and tsunamis are the talk of the day, such large unexpected events tend to fade in importance as they are averaged in with less dramatic events over extended periods and the underlying long-term trends reveal themselves once more.[23] We expect moderate growth in the stock market.

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[23] Siegel (2010) provided a skeptical look at the phenomenon of black swans.

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