What Risk Premium Is "Normal"?

Robert D. Arnott
Managing Partner
First Quadrant, L.P.

Peter L. Bernstein
President of Peter L. Bernstein, Inc.
Consulting Editor at *The Journal of Portfolio Management*

1/10/2002 DRAFT COPY. PENDING PUBLICATION IN THE FINANCIAL ANALYSTS JOURNAL, MARCH/APRIL 2002.

We are in an industry that thrives on the expedient of forecasting the future by extrapolating the past. As a consequence, investors have grown accustomed to the idea that stocks "normally" produce an 8% real return and a 5% risk premium over bonds, compounded annually over many decades.[1] Why? Because long-term historical returns have been in this range, with impressive consistency. Because investors see these same long-term historical numbers, year after year, these expectations are now embedded into the collective psyche of the investment community.[2]

Both figures are unrealistic from current market levels. Few have acknowledged that an important part of the lofty real returns of the past has stemmed from rising valuation levels and from high dividend yields which have since diminished. As this article will demonstrate, the long-term forward-looking risk premium is nowhere near the 5% of the past; indeed, it may well be near-zero today, perhaps even negative. Credible studies, in the US and overseas, are now challenging this flawed conventional view, in well-researched studies by Claus and Thomas [2001] and Fama and French [2000, Working Paper], to name just two.[3] Similarly, the long-term forward-looking real return from stocks is nowhere near history's 8%. Our argument will show that, barring unprecedented economic growth or unprecedented growth in earnings as a percentage of the economy, real stock returns will probably be roughly 2-4%, similar to bonds. Indeed, even this low real return figure assumes that current near-record valuation levels are "fair," and likely to remain this high in the years ahead. "Reversion to the mean" would push future real returns lower still.

Furthermore, if we examine the historical record, neither the 8% real return nor the 5% risk premium for stocks relative to government bonds has ever been a realistic *expectation*, except from major market bottoms or at times of crisis, such as wartime. Should investors require an 8% real return, or should a 5% risk premium be necessary to induce an investor to bear stock market risk? These returns and risk premiums are so grand that investors should perhaps have bid them away a long time ago – indeed, they may have done so in the immense bull market of 1982-1999.

Intuition suggests that investors should not require such outsize returns, and the historical evidence supports this view. This is a topic meriting careful exploration. After all, according to the Ibbotson data, stock market investors earned 8% real returns and stocks have outpaced bonds by over 5% over the past 75 years. So, why shouldn't investors have expected these returns in the past and why shouldn't they continue to do so? Expressed in a slightly different way, we examine two questions. First, can we derive an objective estimate of what investors should have had good reasons to have expected in the past? And, why should we expect less in the future than we've earned in the past?

---

[1] The "bible" for the return assumptions that drive our industry is the work of Ibbotson Associates, building on the pioneering work of Roger Ibbotson and Rex Sinquefield [1976]. The most recent update of the annual Ibbotson Associates data shows returns for stocks, bonds, bills and inflation of 11.0%, 5.3%, 3.8% and 3.1%, respectively. This implies a real return for stocks of 7.9% and a risk premium over bonds of 5.7%, both measured over a very long 75-year span. These data shape the expectations of the actuarial community, much of the consulting community and many fund sponsors.

[2] Fischer Black was fond of pointing out that examining the same history again and again, with one new year added each passing year, is an insidious form of data mining. The past looks best when non-recurring developments and valuation level changes have distorted the results; extrapolating the past tacitly implies a belief that these non-recurring developments can recur and that the valuation level changes will continue.

[3] See also Arnott and Ryan [2001].

The answers to both questions lie in the difference between the *observed* excess return and the *prospective* risk premium, two fundamentally different concepts that unfortunately carry the same label, "risk premium." If we distinguish between past excess returns and future expected risk premiums, it is not at all unreasonable that the future risk premiums should be different from past excess returns.[4]

This is a complex topic, requiring several careful steps to evaluate correctly. To gauge the risk premium for stocks relative to bonds, we need an expected real stock return and an expected real bond return. To gauge the expected real bond return, we need both bond yields and an estimate of expected inflation through history. To gauge the expected real stock return, we need both stock dividend yields and an estimate of expected real dividend growth. Accordingly, we go through each of these steps, in reverse order, to form the building blocks for the final goal: an estimate of the objective, forward-looking equity risk premium, relative to bonds, through history.

Does the Risk Premium Have any Natural Limits?

It is unnatural for equities to have a zero or negative risk premium relative to bonds, because stocks are, on average over time, more volatile than bonds. Even if that were not the case, stocks are a secondary call on the resources of a company; bondholders have the first call. Since the risk premium is usually measured as corporate stocks as compared with government debt obligations (bonds or Treasury bills), the comparison is even more stark. Stocks should be priced to offer a superior return relative to corporate bonds, which should offer a premium yield (due to default risk and tax differential) relative to government bonds, which should typically offer a premium yield (due to yield curve risk) relative to Treasury bills. After all, long bonds have greater duration, hence greater volatility of price in response to yield changes, so it is easier to have a capital loss on a Treasury bond than on a Treasury bill.

In other words, the current circumstance, in which stocks appear to have a near-zero (or negative) risk premium relative to government bonds, is abnormal in the extreme. Even if we add one percent to the risk premium, to allow for the impact of stock buybacks, today's risk premium relative to the more relevant corporate bond alternatives is still negligible or negative. This was demonstrated in Arnott, Ryan [2001], and is explored further below.

While zero is the natural minimum risk premium, is there a natural maximum? Not really. In times of financial distress, in which the collapse of a nation's economy, hyperinflation, war or revolution threatens the capital base, it is not unreasonable to expect a very large reward for exposing capital to risk. Our own analysis suggests that the equity risk premium approached or exceeded 10% in the Civil War, the Great Depression, and in the

[4] The authors strongly suggest that the investment community should draw a distinction between past "excess returns" (observed returns from the past) and expected "risk premiums" (expected return differences in the future) to avoid continued confusion and to reduce the dangerous temptation to merely extrapolate past excess returns in shaping expectations for the risk premium. This habit is an important source of confusion that quite literally (mis)shapes decisions influencing the management of trillions in assets worldwide. It's an important and fixable problem. We propose that the investment community should begin applying the label "risk premium" *only* to expected future return differences while applying the label "excess returns" to observed historical return differences.

wake of World War I and II. That said, it is hard to see how one might objectively measure the forward-looking risk premium in such conditions.

A 5% excess return on stocks over bonds, earned over very long spans, compounds so mightily that - if they believed stocks were going to earn a 5% "risk premium"[5] - most serious fiduciaries would not even consider including bonds in a portfolio with a horizon of more than a few years: the probabilities of stocks outperforming bonds would be too high to resist. Hence, under so-called "normal" conditions, encompassing booms and recessions, bull and bear markets, and "ordinary" economic stresses, it is difficult to find a good explanation for why expected long-term real returns should ever reach double digits or that the expected long-term risk premium of stocks over bonds should ever exceed perhaps around 5%. These upper bounds for expected real returns or for the risk premium, unlike the lower bound of zero, are "soft" limits; in times of real crisis or distress, the sky's the limit.

"Expected" Returns versus "Hoped-For" Returns

Throughout this paper, we are dealing with "expected" returns and "expected" risk premiums. This concept is rooted in objective data and defensible expectations for portfolio returns, rather than in the returns than an investor might have *hoped* to earn. The distinction is subtle, since both represent expectations, one objective and the other subjective. Even at times in the past, when valuation levels were high and when stockholders would have had no objective reason to expect any growth in real dividends over the long run, hopes of better-than-market short-term profits have always been the primary lure into the game.

No rational investor buys if he or she expects less than 1% real growth per annum in capital; but objective analysis will demonstrate that this is what stocks have actually delivered, plus their dividend yield, plus or minus any profits or losses from changes in yields. Here, we are focusing on what an investor might have objectively expected, rather than what they hoped/dreamed might happen. As Cliff Asness points out in "Bubble Logic" [2000], few buyers of Cisco would have "expected" a 1% IRR at the peak, even though the stock was priced to deliver just that, even using the overly-optimistic consensus earnings and growth forecasts at the time. These buyers were intent on the view that the stock would produce handsome gains, as it had in the past, rather than pursuing an objective evaluation of expected returns, using IRR or similar objective valuation tools. Herewith are planted the seeds of major disappointment.

Throughout this paper, when we refer to "expected" returns or "expected" risk premiums, we are referring to the returns and risk premiums that an *objective* evaluation might have supported at the time, based on past rates of growth of the economy, past and prospective rates of inflation, current stock and bond yields, and so forth. We explicitly do not include any extrapolation of past returns, per se, because past returns are driven largely

[5] For instance, if our ancestors could have earned a mere 1.6% real return on a $1investment, from the birth of Christ in roughly 4 BC to today, we would today have enough to buy more than the entire world economy. Similarly, the island of Manhattan was ostensibly purchased for $24 of goods, approximately the same as an ounce of gold when the dollar was first issued. This modest sum, invested to earn a mere 5% real return would have grown to over $20 billion in the 370 years since the transaction. At an 8% real return, as stocks have earned from 1926 to 2000 in the Ibbotson data, this small investment would now suffice to buy more than the entire world economy.

by changes in valuation levels (e.g., changes in yields), which would not be expected to continue into the indefinite future in an efficient market. By the same token, we explicitly do not presume any "regression to the mean," in which high yields or low yields are presumed to revert towards historical norms. We presume that the current yield is "fair" and is an unbiased estimator for future yields, both for stocks and bonds.

One irony is that few investors, if any, subjectively expect returns as low as the objective returns that this sort of analysis develops. In a 1999 study by Ivo Welch, 236 financial economists projected, on average, a 7.2% risk premium for stocks, relative to Treasury Bills over the next 30 years. If we assume that Treasury Bills offer the same 0.7% real return in the future that they have offered over the past 75 years, then stocks must therefore offer a compounded geometric average real return of about 6.6%.[6] We would postulate that most of the 236 financial economists in this survey earned their PhD's without passing basic arithmetic: given a dividend yield of roughly 1.5% in 1998/99, when the survey was being carried out, these financial economists are clearly presuming that dividend and earnings growth will be at least 5% per annum above inflation, a rate of real growth three to five times the long-term historical norms and substantially faster than plausible long-term economic growth.

Indeed, even if investors take seriously the real return estimates and risk premiums produced by this sort of objective analysis, many of them will continue to believe their own investments cannot fail to do better. Suppose they agree with us that stocks and bonds are priced to deliver 2-4% real returns (before tax ... which could easily fall to 0%-2% net of taxes, especially since the government taxes us on the inflation component of returns). Do they believe that *their personal* investments will produce such uninspired pre-tax real returns? Doubtful. If these kinds of projections were taken seriously, markets would be at far different levels from where they are. Consequently, if these objective expectations are correct, then most investors will be wrong in their (our?) own subjective expectations!

What Were Investors Expecting In 1926, at the Start of the Ibbotson Data?

Are we being reasonable, after a 75-year span with 8% real stock returns and a 5% excess return over bonds, to suggest that an 8% real return or a 5% risk premium is abnormal? Absolutely. The relevant comparison is whether the investors of 1926 would have had reason to *expect* these extraordinary returns. And, in fact, they would not. What they got was different from what they expected, which is a normal result in a world of uncertainty. In other words, their returns and risk premiums were a pleasant surprise, not what they might have objectively anticipated when they bought.

---

[6] The Welch study was based on expected *arithmetic* risk premium, for stocks relative to *cash*, not bonds. The difference between arithmetic and geometric returns is often illustrated by earning 50% in one year and –50% in the next. The arithmetic average is zero, but you're down 25% (or 13.4% per annum). Most practitioners think in terms of compounded geometric returns; in this example, practitioners would focus on the 13% per annum loss, not on the zero arithmetic mean. If stocks have 16% average annual volatility (the average since World War II), this will mean that the arithmetic mean is 1.3% higher than the geometric mean return (the difference is approximately half the variance, or 16% x 16% / 2), a difference that might be considered a "penalty for risk." If we add 0.7% real cash yield (the historical average), plus 7.2% risk premium, minus 1.3% "penalty for risk", then we're left with 6.6% as the implied consensus for the geometric real stock returns that financial economists in the Welch survey appear to expect.

At the start of 1926, the beginning of the returns covered in the Ibbotson data, investors were not pricing stocks to deliver the 8% real returns that have been earned over the past 75 years, nor to provide the 5% excess return over bonds that we have subsequently earned. On the contrary, investors had no reason to expect such large returns on stocks or excess returns over bonds. Rather, these outcomes were the consequence of a series of historical accidents that uniformly helped stocks and/or helped the risk premium.

Let us consider what investors might, objectively, have expected at the start of 1926 from their long-term investments in stocks and bonds.

In January 1926, government bonds were yielding 3.7%. We were on a gold standard, government was small relative to the economy as a whole, and the price level, although volatile, had been trendless throughout most of U.S. history up to that moment, so inflation expectations were nil. It was a time of relative stability and prosperity, so investors would have had no reason to expect to receive less than this government bond yield. Accordingly, the real return that investors would have expected on their government bonds was 3.7%, plain and simple.

Meanwhile, the dividend yield on stocks was 5.1%. We take that number as the starting point to apply the sound theoretical notion that the real return on stocks is equal to:

- the dividend yield
- plus (or minus) any change in the real dividend (now viewed as participation in economic growth),
- plus (or minus) any change in valuation levels, as measured by price/earnings ratios or dividend yields.

What did the investors expect in early 1926? This was the tail end of the era of "robber baron capitalism." As Edward Chancellor [1999] observes, investors were accustomed to the fact that management would often dilute the shareholder if an enterprise was successful, but that the shareholder was a full partner in any business declines. More important, the long-run history of the market was trendless. Thoughts of long-term economic growth, or long-run capital appreciation in equity holdings, were simply not part of the tool kit of return calculations in those days.

Investors generally did not yet consider stocks as a "growth" investment, although a few people were beginning to acknowledge the full import of Edgar Lawrence Smith's extraordinary study, *Common Stocks as Long-Term Investments*, which had appeared in 1924 and demonstrated how stocks had outperformed bonds over the years from 1901 to 1922.[7] Smith was the Jeremy Siegel of his time and became the bible of the bulls as the bubble of the late 1920s progressed. Prior to 1926, however, investors continued to follow J.P. Morgan's dictum that the market would fluctuate, a traditional view hallowed by over a hundred years of stock market history. In other words, investors had no *trend* in mind. The effort was to buy low and to sell high, period.

Assuming markets were fairly priced in early 1926, investors should have expected little or no benefit from rising valuation levels. Accordingly, the real long-term return that stock investors would reasonably have expected on the average, or from the market as a whole, was the 5.1% dividend yield, give or take a little. This means that stock investors

[7] Smith's work even won a favorable review from John Maynard Keynes.

would have expected roughly a 1.4% "risk premium," over bonds, not the 5% they actually earned over the next 75 years. The markets exceeded these objective expectations, as a consequence of a series of historical accidents:

> **Historical Accident #1.** *Decoupling yields from real yields.* The Great Depression introduced a revolutionary increase in the role of government in peacetime economic policy, simultaneously driving the U.S. – and just about the whole rest of the world – off the gold standard. As prosperity came back in a big way after World War II, expected inflation became a normal part of bond valuation. This created a one-time shock to bonds that decoupled nominal yields from real yields, and drove nominal yields higher, even as real yields fell. Real yields at yearend 2001 are 3.4% (the TIPS yield), but nominal yields are 5.8%. The rise in nominal yields from 3.7% to 5.8% (even with real yields steady) has cost bond holders 0.4% per annum over seventy-five years. That alone accounts for nearly one-tenth of the seventy-five year excess return for stocks relative to bonds.
>
> **Historical Accident #2.** *Rising valuation multiples.* Between 1926 and 2001, stocks rose from a valuation level of 18 times dividends to nearly 70 times dividends. This four-fold increase in the value assigned to each dollar of dividends contributes 1.8% to the annual returns over the past 75 years, even though the entire increase occurred in the last 17 years of the period (we last saw 5.1% yields in 1984). This explains fully one-third of the seventy-five year excess return.
>
> **Historical Accident #3.** *Survivor bias.* The U.S. has fought no wars on its own soil, nor have we experienced revolution. Four of the fifteen largest stock markets in the world in 1900 suffered total loss of capital, a -100% return, at some point in the past century: China, Russia, Argentina and Egypt. Two others came close: Germany (twice) and Japan. It bears noting that war or revolution can wipe out bonds as easily as stocks (which makes the concept of "risk premium" less than relevant). U.S. investors in early 1926 would *not* have counted this likelihood as "zero." Nor should today's true long-term investor.
>
> **Historical Accident #4.** *Regulatory reform.* Stocks have gone from passing relatively little economic growth through to the shareholders to passing much of the economic growth through to the shareholders. This shift has led to 1.4% per annum growth in real dividend payments and in real earnings since 1926. This accelerated growth in real dividends and earnings, which no one in 1926 could have anticipated, explains roughly one-fourth of the seventy-five year excess return.[8]

In short, the 1926 equity investor likely expected to earn a real return little different from their 5.1% yield and expected to earn little more than the 1.4% yield differential over bonds. Indeed, an objective investor might even have expected a notch less, due to the greater frequency with which investors encountered dividend cuts in those days.

---

[8] In fairness, growth is now an explicit part of the picture. Dividend payout ratios are substantially lower than in the early 1920s, and the prior century, at least in part in order to finance growth. That said, our own evidence would suggest that internal reinvestment is not necessarily successful: high payout ratios precede higher growth than low payout ratios.

In order to gauge what risk premium an investor might have objectively expected in the longer-run past, we need to (1) estimate the real return that investors might reasonably have expected from stocks, (2) estimate the real return that investors might reasonably have expected from bonds, and (3) take the difference. With this exercise, we can gauge what risk premium an investor might reasonably have expected at any point in history, not just an isolated snapshot like early-1926. While this is the essential heart of our paper, a brief review of the sources of stock returns over the past two centuries should help to lay a foundation for our work on return expectations, and shatter a few widespread misconceptions in the process.

Step I. How Well Does Economic Growth Flow Through into Dividend Growth?

Over the past 131 years, the average earnings yield has been 7.6% and the average real return for stocks has been 7.2%; this close match has persuaded many observers to the view (which is wholly consistent with finance theory) that the best estimate for real returns is, quite simply, the earnings yield. On careful examination, this hypothesis turns out to be wrong. Absent changing valuation levels, real returns are systematically *lower* than earnings yields. Exhibit 1a shows stock market returns since 1802, in a fashion somewhat different from what most of the literature shows.

- The top line shows the familiar cumulative total return for US equities since 1802, in which each $100 invested grows to almost $700 million in 200 years, with reinvestment of dividends.[9]
- To be sure, some of this growth is due to inflation; $700 million won't buy what it would have in 1802, when one could have purchased the entire US GNP for less than that sum.[10] The second line from the top removes inflation, turning attention to real stock returns; our investment of a mere $100 investment grows to "only" $37 million, adjusted for inflation, much diminished but still impressive.
- Few portfolios are constructed without some plans for future spending! Stocks pay dividends, which are often spent. If we look at price appreciation alone, net of inflation and dividends, the bottom line (literally and figuratively) reveals that stocks have risen just 20-fold from the 1802 levels. Put another way, if an investor placed $100 in stocks in 1802, received and spent the average dividend yield of 4.9% for the next 200 years, his or her descendants would today have a portfolio worth $2099, net of inflation. So much for our $700 million portfolio!

Worse, the lion's share of the growth from $100 to $2099 occurred in the massive bull market from 1982 to date; in the 180 years from 1802 to the start of 1982, the real value of our $100 portfolio had grown to a mere $400. If stocks were priced today at the same dividend yields as they were in 1802 and 1982, a yield of 5.4%, our $100 portfolio would

---

[9] We are indebted to Professors G. William Schwert and Jeremy Siegel, for some of the raw data for this analysis. While there are multiple sources of data after 1926, and a handful of sources that begin in 1855 or 1870, Dr. Schwert was very helpful in assembling this difficult early data. We are also indebted to Professor Jeremy Siegel for earnings data back to 1870. We have not found a source for earnings data before 1870.

[10] The Bureau of Labor Statistics maintains GDP data from 1921 to-date; the earlier data is GNP (gross national product) data. Because the two were essentially the same thing until international commerce became the substantial share of the economy that it is today, we used the GNP data from the BLS for the 19th century and the first 20 years of the 20th century.

today be worth just $550, net of inflation and dividends. These data put the lie to the conventional view that equities derive most of their returns from capital appreciation, with income far less important than growth, if not irrelevant.

Exhibits 1b takes a closer look at the linkage between equity price appreciation and economic growth. Here, we find that the growth in share prices is much more closely tied to the growth in real *per capita* GDP, than to real GDP growth per se.

- The top line shows the real growth of the economy itself which, compounding at around 4% in the 1800s and 3% in the 1900s, delivered impressive 1000-fold growth. But, net of inflation and dividend distributions, stock prices (the bottom line on the chart, identical to the lowest line on Exhibit 1a) fell far behind, with cumulative real price appreciation barely one-fiftieth as large as the real growth in the economy itself.
- How can this be? Can't shareholders expect to participate in the growth of the economy? No. Shareholders can expect to participate only *in the growth of the enterprises that they are investing in*. An important engine for economic growth is the creation of new enterprises. The investor in today's enterprises does not own tomorrow's new enterprises – not without making a separate investment in those new enterprises, with new investment capital.
- The middle line in Exhibit 1b shows the growth of the economy, measured net of inflation *and population growth.* This growth in real per capita GDP tracks much more closely with the real price appreciation of stocks (the bottom line on the graph) than does the real GDP itself.

Exhibit 1c goes one step further, showing that the real dividends exhibit *internal growth,* which is very similar to the growth in real per capita GDP. Since the growth in per-capita GDP is a measure of the growth of productivity, it would seem that the internal growth that can be sustained in a diversified market portfolio closely matches the growth of productivity in the economy, not the growth in the economy per se. The top line traces per capita real GDP growth, the second line shows real stock prices, and the third line shows real dividends (times ten, to get the line visually closer to the others; this means that, on those few occasions when the price line and dividend line touch, the dividend yield is 10%). Here, we can also see some remarkable results, which demonstrate that real dividend growth and real per capita GDP growth bear a striking resemblance to one another.

- We can measure the internal growth of real dividends; this is the growth that an index fund would expect to see in its own real dividends, absent additional investments, such as reinvestment of dividends. Real dividends have risen a modest five-fold from 1802 levels (focusing again on the internal growth of dividends in a broad market index, without additional investments). That is, the real dividends for a $100 portfolio invested in 1802, have grown just 0.9% per annum, net of inflation. To be sure, the price assigned to each dollar of dividends has quadrupled, which leads to the 20-fold real price gain in the 200 years.
- While real dividends have tracked remarkably well with real per-capita GDP, there has been a consistent shortfall. Not only do real dividends fail to match real GDP growth (as many equity investors seem to think is a *minimal* future growth

rate for earnings and dividends), they have even had a modest shortfall relative to per capita economic growth, averaging around 0.7% per annum.

- Why do we strip out reinvestment in this measure of real dividend growth? Because we're already receiving the dividend. To include dividends in the real dividend growth would double count these dividends. It is the internal growth in dividends, stemming from reinvestment of the retained earnings, that should be of interest to us.

In short, over 85% of the return on stocks over the past 200 years has come from (1) inflation, (2) the dividend that stocks have paid and (3) the rising valuation levels (rising P/E ratios and falling dividend yields) since 1982, rather than from growth in the underlying fundamentals of real dividends or earnings.

These 0.9% rates of growth for real dividends are much closer to the 1.6% annual growth in real per capita GDP than to the 3.6% annual growth in the economy at large.[11] Furthermore, real dividends and real per capita GDP have both grown faster in the 20th century than in the 19th century. Conversely, GDP grew faster in the 19th century than in the 20th century, *unless* we convert to per-capita GDP.

Many observers think that earnings growth is far more important than dividend growth. We would respectfully disagree. As noted by Hicks [1946], "… any increase in the present value of prospective net receipts must raise profits." In other words, properly stated, earnings should represent a proportional share of the net present value of all future profits. The problem is that reported earnings often do not follow this theoretical definition. Witness the fact that negative earnings should almost never be reported, yet reported operating losses are not uncommon. Furthermore, the quality of earnings reports prior to the advent of the SEC was doubtful, at best; worse, we were unable to find any good source for earnings information prior to 1870. Accordingly, the dividend is the one reliable aspect of stock ownership over the past two centuries. It is the cash income returned to the shareholders; it is the means by which the long-term investor earns his or her IRR. Finally, with earnings growth barely 0.3% faster than dividend growth over the past 131 years, an analysis based on earnings would reach near-identical conclusions to our own analysis.

Finance theory tells us that capital is fungible; Modigliani and Miller earned a Nobel Prize for this insight. That is, equity and debt, retained earnings and dividends, all should flow to the best use of capital, and should produce a similar risk-adjusted return on capital, absent tax-related arbitrages and other non-systematic disruptions. For our purposes, this means that the retained earnings should deliver a return similar to the return an investor could have earned on that capital, had it been paid out as dividends.

Consider an example. If a company has an earnings yield of 5% (corresponding to a price/earnings ratio of 20), then they can pay out all of the earnings, delivering a 5% yield to the shareholder. The real value of the company should not be affected by this full earnings distribution (unless the earnings are themselves being misstated), so the 5%

[11] The fact that growth in real dividends and earnings is closer to per-capita GDP growth than it is to overall GDP growth is intuitively appealing on one fundamental basis. Real per-capita GDP growth measures the growth in productivity. It is sensible to expect real income, real per-share earnings and real per-share dividends to grow with productivity, rather than mirroring overall GDP growth.

earnings yield should also be the expected real return. Now, if the company instead pays a 2% yield and retains earnings worth 3% of the stock price, then the company ought to achieve 3% real growth in earnings; otherwise they should have distributed the cash to the shareholders.

How does this stand up to reality? Over the past 200 years, dividend yields have averaged 4.9%, yet real returns have been far higher, at 6.6%. Over the past 131 years, earnings yields have averaged 7.6%, very close to the real returns of 7.2% over that same span. This is also consistent with the notion of fungible capital, that the return on capital is reinvested in an enterprise ought to match the return an investor might otherwise have earned on that same capital, if it were distributed as a dividend. But, if we take out the changes in valuation levels (regardless whether we use dividend yields or price/earnings ratios) since 1982, this close match between earnings yield and real stock returns evaporates.

With an average earnings yield of 7.6% and an average dividend yield of 4.7% since 1871, the average "retained earnings yield" has been nearly 3%. One would assume that this retained earnings yield, averaging 3%, should have led to real earnings and dividend growth of 3%; otherwise management ought to have paid this money out to the shareholders. Instead, real dividend and earnings grew at annual rates of 1.2% and 1.5%, respectively. Where did the money go? During the era of "pirate capitalism," success often led to dilution: management issued themselves more stock![12]

Furthermore, retained earnings often chase poor internal reinvestment opportunities. Most of the 3.6% economic growth we have enjoyed in the past two centuries has clearly not come from reinvestment in existing enterprises, if those enterprises have seen only 1.2% to 1.5% internal growth of real dividends and earnings. Most of the growth in GDP has stemmed from entrepreneurial capitalism, from the creation of new enterprises. *Indeed, dividends on existing enterprises have fallen relative to GDP growth by approximately 100-fold in the past 200 years.*[13]

The derring-do of the "pirate capitalists" of the 19th and early 20th centuries is not the only or even the most compelling explanation for this phenomenon. All the data we use are from indexes, which are a particular kind of sampling of the market. Old companies, fading from view, lose their market weight while newer and faster growing companies are coming along. These older enterprises often have the highest earnings yield, and the worst internal reinvestment opportunities. But the new companies do not materialize in the indexes the minute they start doing business or even the minute they go public. When they do enter the index, their starting weight is often small.

Furthermore, we cannot add a new enterprise to our portfolio without cost. An index changes the divisor, whenever a new enterprise is added; this is mathematically the same as selling a little bit of all other holdings to fund the purchase of a new holding. Nor can a new enterprise enter our own portfolios unless we commit some capital to effect the purchase. Whether through reinvestment of dividends or infusion of new capital, this

---

[12] The cautionary tale with regard to today's stock-option practices is noteworthy, but a distraction that we'll not discuss in this paper.

[13] This is unsurprising when one considers that the enterprises that existed in 1802 probably encompass at most 1% of the economy of 2001. The world has so changed that, at least from the perspective of the dominant stocks of 1802, it would be unrecognizable today.

new enterprise cannot enter our portfolio through the *internal* growth of an existing portfolio of assets. In effect, we must rebalance out of existing stocks to make room for the new stock. This is the natural dilution that takes place as a consequence of the creation of new enterprises in a world of entrepreneurial capitalism: *the same dollar cannot own an existing enterprise and simultaneously fund a new enterprise!*[14]

The dynamic of the capitalist system inevitably leads to these kinds of results. Good business leads to expansion; in a competitive environment, expansion takes place on a wide scale; expansion on a wide scale intensifies the competitive environment; margins begin to decline; earnings growth slows down; in time, earnings begin to decline. Then expansion slows down, profit margins improve, and the whole thing repeats itself. We can see this drama playing itself out in a study of the relationship between payout ratios in any given year and earnings growth: since 1984, the payout ratio explains more than half of the variation in five-year earnings growth rates, with a t statistic of 9.51. [15]

Many observers have failed to notice that much of the difference between stock dividend yields and the real returns on stocks can be traced directly to the upward revaluation of stocks since 1982. The historical data are muddied by this change in valuation levels. This is why we find the current fashion of forecasting the future by extrapolating the past to be so very alarming. The earnings yield is a better estimate of future real stock returns than any extrapolation of the past. And, the dividend yield plus a small premium for real dividend growth is better still, because the earnings yield systematically overstates future real stock returns, absent changes in valuation levels.

If long-term real growth in dividends has been 0.9%, then real stock returns would have been only 0.9% higher than the dividend yield, if it were not for the enormous jump in the Price/Dividend ratio since 1982. Even if we adjust today's 1.4% dividend yield sharply upward to include "dividends by another name" (e.g., stock repurchases), it

[14] Another way to think about our work is to recognize the distinction between a market portfolio and a market index. The market portfolio shows earnings and dividend growth which is wholly consistent with growth in the overall economy [Bernstein, December 15, 2001]. But, if one were to unitize that market portfolio, the unit values would not grow as fast as the total capitalization, and the earnings and dividends per unit (per "share" of the index) will not keep pace with the growth in the aggregate dollar earnings and dividends of the companies that comprise the market portfolio. When one stock is dropped and another added, typically the added stock is larger than the deletion, which increases the divisor for constructing the index. Precisely the same thing would happen in the management of an actual index fund. When a stock is replaced, the proceeds from the deleted stock rarely will suffice to fund the purchase of the added stock. So, all stocks are trimmed slightly to fund that purchase; this is implied consequence of the change in the divisor for an index. It is this mechanism that drives the difference between the growth of the aggregate dollar earnings and dividends for the market portfolio, which will keep pace with GDP growth over time, and the growth of the "per share" growth of earnings and dividends for the market *index* that creates the dilution which we attribute to entrepreneurial capitalism. After all, entrepreneurial capitalism creates the companies that we must add to the market portfolio, changing our divisor and driving a wedge between the growth in market earnings and dividends and the growth in earnings and dividends per share in a market index.

[15] See Economics & Portfolio Strategy, published by Peter L. Bernstein, Inc., May 1, 2001. Over the last 131 years, there has been a 0.39 correlation between payout ratios and subsequent 10-year growth in real earnings; over the past 50 years, this correlation soars to 0.66. It would appear that, the larger the fraction of earnings paid out as dividends, the faster earnings subsequently grow, directly contrary to Miller, Modigliani.

would be a stretch to build a case for real returns higher than the 3.4% currently available in the government-guaranteed inflation-indexed TIPS market.[16]

<u>Step II. Estimating Real Stock returns</u>

In estimating the equity risk premium historically, it is necessary to compare (1) a realistic estimate of the *expected* real stock return that objective analysis might have supported in past years, with (2) the *expected* real bond return available at the time. The real future long-term[17] stock returns is defined as:

(1)	$RSR(t) = DY(t)$	% dividend yield for stocks at time "t"
	$+ RDG(t)$	% real dividend growth rate over the applicable span, starting at time "t"
	$+ \Delta PD(t)$	% change in the price assigned to each dollar of dividends, starting at time "t"
	$+ \varepsilon$	Error term for sources of return not captured by the three key constituents. This will be very small, reflecting only compounding effects.

Viewed from the perspective of forecasting prospective future real returns, the $\Delta PD(t)$ term is a valuation term, which we deliberately exclude from our analysis. If markets exhibit reversion to the mean, then this should be positive when the market is inexpensive and negative when the market is richly priced. If markets are efficient, then this term should be random. We choose not to go down the slippery slope of arguing valuation, *even though we believe that valuation matters*. Rather, we prefer to make the simplifying assumption that market valuations at any stage are "fair," and, therefore, that the real return stems solely from the dividend yield and real growth of dividends.

That said, the estimation process becomes more complex when we consider a sensible estimate for real dividend growth. For example, what real dividend growth rate might an investor in 1814 have expected on the heels of the terrible 1802-1814 bear market and depression, during which time the real per capita GDP, real dividends and real stock prices all contracted 40-50%? How are we going to objectively put ourselves in the position of an investor almost 200 years ago? Here, it makes sense to partition the real growth in dividends into two constituent parts, real economic growth, and the growth of dividends relative to the economy.

Why not simply forecast dividend growth directly? Because countless studies show that analysts' forecasts are too optimistic, especially at market turning points. In fact, dividends (and earnings) in aggregate cannot grow as fast as the economy on a sustainable long-term basis, in large part because of the secular increase in shares outstanding and introduction of new enterprises. So, long-term dividend growth should be equal to long-term economic growth, minus a haircut for dilution or entrepreneurial

[16] In order to produce a 3.4% real return from stocks, merely matching the yield on TIPS, we need 1.9% real growth in dividends, twice the long-term historical real growth rate, and we need valuation levels to remain where they are. Less than twice the historical growth in real dividends or a return to the 3-6% yields of the past won't get us there.

[17] We have made the simplifying assumption that "long-term" is a 10-year horizon. Redefining the long-term returns over a 5-year or 20-year horizon produces similar results.

capitalism (the share of the economic growth that is tied to new enterprises not yet available in the stock market) or plus a premium for hidden dividends, like stock buybacks.

(2)	RDG(t)		Real dividend growth, starting at time "t"
		= RGDP(t)	% real per capita GDP growth over the applicable span, starting at time "t"
		+ DGR(t)	annual % dilution of real GDP growth, as it flows through to real dividends, starting at time "t"
		+ ε	Error term for compounding effects. This will be small.

Basically, we are substituting RGDP(t)+DGR(t) for RDG(t), and rolling the ΔPD(t) term into the error term, to avoid getting into the valuation and regression to the mean debates! With these two changes, and converting to an expectations model, we alter our model for real stock market returns to:

(3)	ERSR(t)		*Expected* real stock returns, at time "t"
		= EDY(t)	*Expected* % dividend yield for stocks at time "t"
		+ ERGDP(t)	*Expected* % real per capita GDP growth over the applicable span, at time "t"
		+ EDGR(t)	*Expected* annual % dilution of real per capita GDP growth, as it flows through to real dividends, at time "t"

One complication in this structure is the impact of recessions. In serious recessions, dividends are cut and GDP growth stops or reverses, possibly leading to a decline in even the long-term GDP growth. This leads to a dividend yield which is artificially depressed, real per capita GDP growth which is artificially depressed, and long-term dividend growth relative to GDP growth which is artificially depressed, all three of which lead to understated expected real stock returns at recessionary troughs. The simplest way to deal with this is to use the last peak in dividends before a business downturn and the last peak in GDP before a business downturn, in computing each of these three constituents of expected real stock returns.[18]

We illustrate how we construct an objective real stock return forecast over the past 192 years in Exhibits 2a (which spans 1810 to 2001) and 2b (which shows the same data after 1945). It's worthwhile to go through this graph, line by line.

- The easiest part of forecasting real stock returns is the dividend yield: it is a known fact. We can, and do, adjust dividends to correct for the artificially depressed dividends during recessions, to get our EDY(t) term, shown as a thick gray line on Exhibits 2a and 2b. This way we can avoid understating the equity risk premium in recessions, when dividends are artificially depressed. This adjustment boosts the expected dividend yield slightly, relative to the raw dividend yield, since the deepest recessions are often deeper than the average

[18] Since this adjusted dividend is always at or above the true dividend, we introduce a positive error into the average dividend yield. We offset this by subtracting the 40-year average difference between the adjusted dividend and the true dividend. This way, EDY(t) is not overstated, on average over time.

recessions of the prior 40 years. Against an average dividend yield of 4.9%, this gives us an average *expected* dividend yield of 5.0%.

- Most long-run forecasts of earnings or dividend growth ignore the simple fact that aggregate earnings and dividends in the economy cannot sustainably grow faster than the economy itself. If new enterprise creation and secondary equity offerings dilute the share of the economy held by the shareholders in existing enterprises,[19] then one sensible way to forecast dividend growth is to forecast economic growth and then forecast how rapidly this dilution will take place. Phrased another way, we want to know how much less rapidly dividends (and earnings) on existing enterprises can grow than the economy at large. The sum of real economic growth, less this shortfall, is the real growth in dividends.

  The bottom line on these two graphs represents the EDGR(t) term in our model. There is a persistent tendency for dividend growth to lag GDP growth: real dividends have grown at 1% per annum over the past 192 years, while the real economy has grown at a much faster 3.8% per annum and even the real per capita GDP has grown at 1.8% per annum. Why should real dividends have grown far more slowly than the economy and slower than even the real per capita GDP?

  First, much of the growth in the economy comes from innovation and entrepreneurial capitalism. Over half of the capitalization of the Russell 3000 today consists of enterprises that did not exist thirty years ago. The 1971 buy-and-hold investor could not participate in this aspect of GDP growth or market growth, because the companies did not exist. So, today's dividends and earnings on the existing companies from 1971 are only part of the dividends and earnings on today's total market.

  Second, as was demonstrated in Bernstein [May 15, 2001], retained earnings are often not reinvested at a return that rivals externally available investments; earnings and dividend growth are faster when payout ratios are high than when they are low, perhaps because management is forced to be more selective about reinvestment alternatives.[20] Finally, as we have emphasized above, corporate growth typically leads to more shares outstanding, which automatically imposes a drag on the growth in dividends *per share*.

  A rational investor might have used the prior 40-year shortfall in dividend growth, relative to per-capita GDP growth, as a sensible estimate of the future dividend/GDP shortfall. Or, he might have chosen to use the cumulative history rather than focusing on only the most recent decades. We chose the simple expedient of averaging the two figures. The history of dividend growth shows no evidence that dividends can ever grow materially faster than per-capita GDP. Indeed, it almost always grows slower.

  This dilution effect, based on 40-year and cumulative data for real dividends and real per capita GDP, averages -0.6%. The past 40 years has seen dilution of

[19] We hasten to acknowledge that stock buybacks increase the share of the economy held by existing shareholders!

[20] A draft paper by Arnott and Asness [2002] shows that, since 1945, the payout ratio has a 77% correlation with subsequent real earnings growth. This means that higher retained earnings has historically led to slower earnings growth, not faster.

dividend growth, relative to per capita GDP growth, almost exactly the same as the long-term average, at -0.8%. It is the steadiest of any of the components of real stock returns or real bond returns, with a standard deviation of just 0.5%. It is never materially positive on a long-term, sustained basis; it never rises above +0.1% for any 40-year span in the entire history since 1810. Suppose real GDP growth in the next 40 years is 3% per annum and population growth is 1% per annum, this would appear to put an *upper limit* on real dividend growth at a modest 2% per annum, far below consensus expectations. If the historical average dilution of dividend growth relative to real per capita GDP growth prevails, then the future real growth in dividends should be only about 1%, even with relatively robust 2.5% to 3% real GDP growth.

- The third part of forecasting real stock returns in this fashion is the forecast of long-term real per-capita GDP growth, ERGDP(t) in our model, which is the second line from the bottom of Exhibits 2a and 2b. How much real per-capita GDP growth would an investor have expected at any time in the past 200 years? One simple answer might be to take the most recent 40 years' growth rate; another might be to use the cumulative record, going back as far as we have dividend and GDP data, to 1802. Again, we chose the simple expedient of averaging the average of the two. This is remarkably stable over the past 200 years, most particularly if we adjust real per capita GDP to correct for temporary dips during recessions. If we focus on truly *long-term* results, the 40-year real growth rate in real per-capita GDP has averaged 1.8% with a standard deviation of only 0.9%.[21]

  It is interesting to note that the total economy grew faster during the 19th century than the 20th century; while stock returns (and the underlying earnings and dividends) grew faster in the 20th century than the 19th century. Why would the rapid growth of the 19th century flow through to the shareholder less than the slower growth of the 20th century? We see two possible answers, though there may well be others. First, the base from which industrial growth started in the 19th century was so much smaller, with much faster new enterprise creation than in the 20th century. Second, with near-3% growth in the population from 1800-1850, the growing talent and labor pool fueled a faster rate of growth than the 1.25% annual population growth rate of the most recent 50 years.

  It is not surprising that the pace of dilution, both from the creation of new enterprises and from secondary equity offerings, is faster when the population is growing faster. When the population is growing faster, there is more growth in human capital, in available labor, and in both demand *and* supply of goods and services. As a result, this pace of dilution of growth in the economy, as it flows through to a shareholder's earnings and dividends, is far more stable relative to real per-capita GDP than relative to real GDP itself.

[21] Throughout this paper, when we refer to 10-year average or 40-year average, we use the available data if less than this amount of data is available. For instance, in 1820, we use the 20-year GDP growth rate, since 40 years of data are unavailable. We follow a convention of requiring *at least* 25% of the intended data; where the analysis seeks a 40-year average, we will tolerate a 10-year average if the data is not available. For this reason, our analysis begins, for the most part, in 1810, since data before 1800 is very, very shaky. To do otherwise would force us to begin our analysis around 1840, losing decades of interesting results.

- This simple framework for estimating real stock returns shows few surprises. As we can see in the darkest line in Exhibits 2a and 2b, the expected real stock return is the sum of the prior three constituent parts. We estimate that expected real stock returns for the past 192 years averaged around 6.1%, with three constituent parts: an expected yield averaging 5.0%, real per-capita GDP growth of 1.7% per annum, less expected *shrinkage* in dividends relative to real per-capita GDP, averaging -0.6%. Meanwhile, investors have actually earned real returns of 6.8%. Most of this 70 basis point difference from the 6.1% rational expectation over the past 192 years can be traced to the rise in valuation levels since 1982; the rest consists of the other happy accidents detailed earlier.

Real stock return expectations soared above 6% often enough. But, many actuaries consider 8% a "normal" real return for equities, even today. Our estimate for real stock returns only exceeds 8% only during the depths of the great depression, in the rebuilding following the War of 1812, the Civil War, World War I and World War II, in the crash of 1877 and during the Great Depression. In the past 50 years, expected real stock returns above 7% have been seen only in the aftermath of World War II, when many investors still feared a return to depression conditions, and in the depths of the 1982 bear market.

The full the 192-year record, when viewed from the vantage point of this formulation for expected real stock returns, shows that the expected real stock returns has fallen below 3.5%, only once before the late-1990s. That was at the end of 1961, just ahead of the difficult span from 1962-1982, during which time real stock prices fell by more than 50%. Since 1997, expected real stock returns have fallen well below the 1961 levels, where they remain at this writing.

This formulation for expected real stock returns reveals the stark paradigm shift that took place in the 1950s. Until the 1950s, the best estimate for real dividend growth was rarely more than 1%, and so the best estimate for real stock returns was approximately the dividend yield plus 1%. This is considerably less than the earnings yield! From the 1950s to date, as we can see in Exhibit 2b, the shortfall of dividends relative to GDP growth improved (perhaps because the presence of the SEC discourages management from ignoring shareholder interests), and the real return that one could objectively expect from stocks finally and persuasively rose above the dividend yield. Today, it stands at almost twice the dividend yield, but this is a still-modest 2.4%.

Exhibit 2c shows the strong correlation between this formulation for expected real stock returns and the actual real returns that stocks deliver over the subsequent 10-year span. The correlation is good, at 0.62 during the "modern markets" era after World War II and 0.46 over the full 182 years.[22] If we test the correlation between this simple metric of expected real stock returns and the actual subsequent 20-year real stock returns (not shown), instead of 10-year results, the correlations grow to 0.95 and 0.60, for the post-1945 period and the full 182 years, respectively.

Exhibit 2d also shows that the coefficient in the regression is larger than 1.00. This means that 100 basis points increase in the expected real stock return (ERSR) is worth

[22] Keep in mind that we lose the last 10 years of our data, since we cannot know the 10-year returns from starting dates after 1991. So, 192 years of expected real stock returns data leads to 182 years of correlation with subsequent 10-year actual real stock returns. Hence, the references to 182-year correlations throughout.

more than 100 basis points in the subsequent ten-year actual real stock return (RSR). This would suggest that there is some tendency for "reversion to the mean" that will magnify the effects of unusually high or low expected real stock returns. This has worrisome implications for the recent record-low levels for the expected real stock return.

Because rolling 10-year returns (and our model for Expected Real Stock Returns) are highly serially correlated, the t-statistics are not particularly meaningful. One way to deal with serially correlated data is to test correlations of differenced data. Over the full span, the R-square actually *rises* if we use differenced variables, in order to eliminate the lofty serial correlation associated with overlapping ten-year returns; since 1945, the differenced results show a still-impressive 46% correlation.

Another way to deal with overlapping data is to eliminate the overlap by, in this case, looking at only our nineteen non-overlapping samples, beginning December, 1810. Again, results are confirmed (and approach statistical significance, even with only seventeen degrees of freedom), with a coefficient larger than 1.00. One worrisome fact, given recent large real stock returns, is that the non-overlapping real stock returns, by decades, have a -31% serial correlation. While this is not a statistically significant correlation, it is large enough to be interesting: it suggests that spectacular decades or wretched decades may be moderately more likely to reverse than to repeat.

Evaluating the real returns on stocks is clearly a useful exercise, if the metric of success is subsequent actual real returns. But, we live in a relative world. The future real returns on all assets will rise and fall; so, this is an insufficient metric of success. What is of greater import is whether this metric of prospective real stock returns helps us to identify the attractiveness of stocks, *relative to other assets.*

Step III. Estimating Future Bond Real Returns

On the bond side, real realized returns are equal to the nominal yield, less inflation (or plus deflation), plus or minus yield change times duration.

(4) RBR(t)

= BY(t)	% bond yield at time "t"
- INFL(t)	% inflation over the applicable span, starting at time "t"
+ ΔBY(t)*DUR(t)	annual change in yield over the applicable span, times duration at time "t," assuming that rolling reinvestment is in similar duration bonds
+ ε	Compounding effects lead to a small error term in this simple formulation.

As with the stocks, we do not want to get into the reversion to the mean or valuation debate; we prefer to take current yields as a fair estimate of future bond yields. This eliminates the variable that focuses on changes in yields, ΔBY(t)*DUR(t). We also need to shift our focus from measuring past real bond returns to forecasting future real bond returns.

(5) ERBR(t) Expected Real Return on Bonds at time "t"

= BY(t) % bond yield at time "t"

- EINFL(t) Expected % inflation over the applicable span, starting at time "t"

This formulation is difficult only in the sense that expectations for inflation in past economic environs are difficult to estimate objectively. How, for example, are we to gauge how much inflation an investor in February of 1864 would have expected, at a time when inflation had averaged 20% over the prior 3 years, due to war-time shortages? Expectations would depend strongly on the outcome of the war: a victory by the North would have been expected to result in a restoration of the purchasing power of the dollar, as wartime shortages disappeared, while a victory by the South could have had severe consequences on the ultimate purchasing power of the North's dollar as a consequence of debt that could no longer be serviced. A rational expectation might have been for inflation greater than zero (reflecting the *possibility* of victory by the South), but less than the 20% 3-year inflation rate (reflecting the *probability* of victory by the North).

The only uncertain component of this estimate for real bond returns is our estimate of expected future inflation. We base this estimate on an ex-ante[23] regression forecast of 10-year future inflation, based on recent 3-year inflation. Exhibit 3a shows how the expected rate of inflation has steadily become more closely tied to recent actual inflation in recent decades, as compared to the weaker linkage in the 19th century. Bond yields responded weakly to bursts of inflation up until the time of the Great Depression, then more strongly as inflation became a structural component of the economy in the past four decades.

Until the last 40 years, inflation was generally associated with wars and virtually nonexistent – or even negative – in peacetime. In Exhibit 3a, we see a burst of double-digit inflation on the heels of the War of 1812, in the late stages of the Civil War, during World War I and in the rebuilding following World War II. More recently, we saw double digit inflation during the "stagflation" of 1978-1981, following on the heels of Vietnam and the oil shocks of the 1970s. The most notable changes since the Great Depression, and especially since World War II, have involved a major change in the magnitude and perceived role of government, combined with the abandonment of the automatic brakes once applied by the gold standard. Indeed, from the end of World War II up to the great inflationary crisis at the end of the 1970s, the nightmare of unemployment, inherited from the Great Depression, was the driving factor in both fiscal and monetary policy.

Following the introduction of Treasury Inflation Protected Securities (TIPS), in January, 1997, we finally have a US government bond that pays a real return. This allows us to simplify the calculation of expected real bond returns to be the TIPS yield itself, from that date forward:

(6) ERBR(t) *Expected* Real Return on Bonds at time "t"

= YTIPS(t) % TIPS yield at time "t"

[23] In an ex-ante regression, the model is respecified for each monthly forecast, using all *previously available* data only.

Exhibit 3b shows how the current government bond yield (the thin black line), less the expected inflation (the gray line), leads to an estimate of the real bond return, hence the long-term expected real bond return[24] (the thick black line), through March of 1998 and the TIPS yield thereafter. With this formulation, expected real bond returns average 3.7%, a very respectable real yield given the limited risk of government bonds, and good recompense for an investor's willingness to bear some bond price volatility. That said, investors may not always have viewed government debt as the rock-solid investment that it is generally viewed as today.

This 3.7% real bond return consists of an average nominal bond yield of 4.9%, less an expected inflation rate of 1.2%. For comparison, the average actual inflation rate has been 1.4%. In the years after World War II, the rate of peacetime inflation embedded in investors' memory bank was essentially zero, perhaps even slightly negative. Consequently, bond investors kept expecting inflation to go away, despite its persistence at a modest rate in the 1950s and early 1960s and an accelerating rate thereafter. Bonds, as a result, were badly priced for reality during most of these two decades; they turned out to be certificates of confiscation for their holders, until people finally woke up in the 1970s and 1980s. Actual inflation exceeded expected inflation, with few exceptions, from the start of World War II until roughly 1982; this is captured by our model, which shows lower expectations than the actual outcome during this span, as can be seen in Exhibit 3a.

Exhibit 3b also shows several regimes of real yield, with distinct structural change from one regime to the next.

- When our nation was in its infancy, until the end of Reconstruction in the late-1870s, investors did *not* see US Government bonds as a secure investment. They priced these bonds to deliver a 5-7% real yield, except during times of war, when patriotic fervor prompted continuing investment, even as inflation eroded the real yield to zero or less. The overall stability of the yields is impressive: the surprise elements were small, as opposed to the history of stock prices.
- Once the nation had survived the Civil War,[25] and had demonstrated repeatedly that US government debt is secure, investors began to price government debt at a 3-5% real yield, a level which held, with a brief interruption in World War I, until we went off the gold standard in 1933. This is remarkable in view of the high rate of economic growth. But, revolutionary technological change in those days, especially in transportation and agriculture, led to such stunning reductions in product costs that inflation was kept at bay except for very brief intervals of time.
- For the next 20-25 years, the nation struggled with depression and with World War II and its aftermath. Investors slowly began to realize that deflationary price drops did not rebound fully after the trough of the depression and inflationary price increases did not retreat after the end of the war. The changed role and participation of government plus the end of the gold standard had changed things,

[24] We have made the simplifying assumption that "long-term" is a 10-year horizon. Redefining the long-term returns over a 5-year or 20-year horizon produces similar results.

[25] The nation's survival was very much in question. Over 25% of the adult male population of the South, and over 10% in the North, was dead or disabled as a consequence of this war.

perhaps irrevocably. During this span, investors priced bonds to offer 2-4% *notional* yields, but a rocky –3% to +3% real yield. Bond investors woke up late to the fact that inflation was now a normal part of life; they had relied excessively on all the past history to reassure them about inflation.

- From the mid-1950s to date, investors struggled with more structural inflation and more inflation uncertainty than they had ever seen before. Although investors sought to price bonds to deliver a real yield, inflation consistently exceeded their expectations. It was only during the down cycle of the inflation roller coaster from 1980 to 1985 that bonds finally provided real yields to their owners. After this experience, bond investors developed an anxiety about inflation far greater than objective evidence would support. This led to a brief spike in real bond returns in 1984, with bond yields still hovering at 13.8%, even as 3-year inflation had fallen to 4.7% (and our regression model for future inflation would have suggested expected inflation of 4.6%). The "expected" real yield was a most unusual 9.2%, because investors were not yet prepared to believe that double-digit inflation was a thing of the past.

There is another interesting fact evident in Exhibit 3c. This formulation for expected real bond returns is highly correlated with the actual real returns earned over the subsequent decade. From 1810 to 1991, the expected real bond return has a 0.52 correlation with the actual real bond return earned over the next ten years; from 1945 to date, the correlation rises to an impressive 0.63. Exhibit 3d shows us that the coefficient is reliably positive, but not reliably over 1.00. This suggests that, unlike expected real stock returns, there is *not* a powerful tendency for "reversion to the mean" in real bond yields.

Even when we take successive differences, to eliminate the huge serial correlation of real bond yields and of 10-year real bond returns, the result from 1945 to date winds up identical to the raw data, with a correlation of 0.63. Using the nineteen available non-overlapping samples, we find a correlation of 0.64, which is statistically significant relationship, despite the paltry seventeen degrees of freedom. The 182-year differenced result is also identical to its raw form, with a correlation of 0.52.

Why is the bond model a better predictor, using raw data, than the stock model over the two-century history? Two reasons seem evident. Stocks have been more volatile than bonds over almost all of our 200 years of data. This volatility means that any model for expected real returns should have a much larger error term. Secondly, stocks are longer-term, by their very nature, than bonds. A 10-year bond expires in 10 years; stocks have no maturity date.

These bond market correlations would be better still, were it not for the negative real yields during times of war, when people tend to consider the inflation a temporary phenomenon. These episodes show up as the "loops" to the left of the body of the scatter plot in Exhibit 3c. At these times, it would appear that many investors subsume their own interests in a strong real yield in favor of the needs of the nation: Long Treasury rates were essentially pegged in the war years and up to 1951, but that did not stop investors from buying them.

Step IV. Estimating the Equity Risk Premium

If we now take the difference between the expected real stock return and the expected real bond return, we are left with the expected equity risk premium.

(7)	ERP(t)		Expected Equity Risk Premium, starting at time "t"
		= ERSR(t)	Expected Real Stock Return, starting at time "t"
		- ERBR(t)	Expected Real Bond Return, starting at time "t"

Exhibit 4a shows this simple framework for estimating the risk premium over the past 192 years. The estimated real return for stocks and for bonds is shown on the left scale (the two top lines), with the difference between the two, the estimated equity risk premium, as the bottom line, on the right scale. Many observers may be startled to see that this estimate of the forward-looking risk premium for stocks has rarely been above 5% over the past 200 years, except during war and its aftermath, and during the Great Depression. The historical average risk premium was a much more modest 2.4%, albeit with a rather wide range. The wide range is due far more to the volatility of real bond returns than the volatility of expected real stock returns, which are surprisingly steady except in times of crisis.[26]

Over the past 192 years, our model suggests that an objective evaluation would have pegged expected real stock returns at around 6.1%, on average, just 1.2% higher than the average dividend yield. Investors have earned fully 0.7% more than this, but they did not have objective reason to expect to earn as much as they did. Our model would suggest that an objective evaluation would have pegged expected real bond returns at around 3.7%. Investors have earned 0.2% less than this, due to the inflationary shocks of the 1960s to 1980s; they expected more than they got.

The difference between the expected real returns for stocks and bonds reveals a stark reality. An objective estimate of the expected risk premium would have averaged 2.4% (6.1% expected real stock returns, less 3.7% expected real bond returns), not the oft-cited 5% realized excess return that much of the investment world depends upon. Even over the past 192 years, investors have *earned* a higher 3.3% excess return for stocks (6.8% actual real stock returns, less 3.5% for bonds); but this was due to an array of happy accidents for stocks and one extended unhappy accident for bonds.

All of this is of mere academic interest, unless there is a linkage with the actual subsequent relative returns. Indeed, there is such a linkage. Our formulation for the equity risk premium has a 0.79 correlation with the actual 10-year excess return for stocks over bonds since 1945, and a 0.66 correlation over the full span. This strong linkage is seen graphically in Exhibit 4b and in the tables in Exhibit 4d (where for convenience we define the 10-year excess return of stocks relative to bonds as "ERSB"); each 100 basis point change in the equity risk premium is worth modestly more than 100 basis points in subsequent annual excess returns, for stocks relative to bonds, over the next ten years. As with the expected stock return model, the linkage with 20-year results

[26] For investors accustomed to the notion that stock returns are uncertain and bond returns are assured over the life of the bond, this may come as a surprise. But, conventional bonds are *not* real return assets; their expected real returns therefore should be highly uncertain. Stocks do, in a fashion, pass inflation through to the shareholder. So, even though nominal returns for stocks may be volatile and uncertain, expected real stock returns are much more tightly defined that expected real bond returns.

is stronger, with correlations over the full span and since 1945 of 0.64 and 0.95, respectively.

This strong linkage between objective measures of the risk premium, and subsequent stock/bond excess returns, is also clear in Exhibit 4c, in which every wiggle of our estimate for the risk premium is matched by a similar wiggle in the subsequent 10-year excess return that stockholders earned relative to bondholders. Here, we can see that the excess returns on stocks relative to bonds dipped negative in the late-1960s, on a 10-year basis, following the low point in the risk premium, and again touched zero the 10 years after the 1981 peak in bond yields.

We can also see in this graph how the gap in 10-year results opened up sharply for the 10 years of the 1990s, to unprecedented levels, even wider than was seen in the early 1960s. Prior to this gap opening, the fit between risk premium and subsequent excess returns is remarkably tight. The question is whether this anomaly is sustainable or is destined to be "corrected." While it is always possible that "things are different this time," history suggests that such anomalies are typically corrected, especially when the theoretical case to support them is so weak. This should be sobering to any investors who are depending on a large equity risk premium.

As with the models for real stock returns and for real bond returns, we can use differencing to take out the effect of using overlapping 10-year data and to take out the impact of the strong serial correlation in the Estimated Risk Premium. When we do so, most of this effectiveness remains. For the full 182-year span, Exhibit 4d shows that the correlation falls from 0.66 to 0.61 and for the more recent span following World War II, the correlation falls from 0.79 to 0.48. But, for the nineteen non-overlapping spans, the correlation jumps to 0.70, with a highly significant t-statistic of 4.0.

What if we are wrong about today's low equity risk premium? Maybe real yields on bonds are lower than they seem. This is a frail reed to rely upon for support. At this writing, at the end of 2001, an investor can buy TIPS, which provided government-guaranteed inflation-indexed yields around 3.4%. But inflation indexed bond yields are a relatively recent phenomenon in the U.S., not available prior to their launch in 1998. As a result, we could not estimate historical real yields directly for prior years, only through a model such as this one. If we compare our model for real stock returns, at 2.4% in mid-2001, with a TIPS yield of 3.4%, we get an estimate for the equity risk premium of -1.0%.

Perhaps real earnings and dividend growth will exceed economic growth in the years ahead, or economic growth will sharply exceed the historical 1.6% real per capita GDP growth rate. These scenarios are certainly possible, but they represent the dreams of the "new paradigm" advocates. We think these scenarios are unlikely. Even if they prove correct, it will be in the context of unprecedented entrepreneurial capitalism, unprecedented new enterprise creation and hence unprecedented dilution of shareholders in existing enterprises.

History has shown a recurring pattern in which exceptionally poor or exceptionally rapid economic growth is never sustained for long. The best performance that dividend growth has ever managed, relative to real *per capita* GDP, was a scant 0.1% outperformance. This, the best 40-year real dividend growth *ever seen* fell far short of real GDP growth: real dividend growth was some 2% per annum below the real GDP growth during those same 40 year spans. So, history does not support those who hope that dividend growth can exceed GDP growth. This is not encouraging evidence for those who wish to see a 1.4% dividend yield somehow transformed into a 5% (or higher) real stock return.

The negative risk premium that precipitated the writing of *"The Death of the Risk Premium"* [Arnott/Ryan, 2001] in early-2000 was not without precedent, though most of the precedents are found in the 19th century, until recently. In 1984 and again just before the 1987 market crash, real bond yields rose materially above the estimated real return on stocks. How well did this predict subsequent relative returns? Phrased more provocatively, why *didn't* our model work – why *didn't* bonds beat stocks in the past decade? After all, with the 1984 peak in real bond returns and again shortly before the 1987 crash, the risk premium dipped even lower than the levels seen at the market peak in early 2000. Yet, stocks subsequently outpaced bonds. It is important to recall that this was in the context of stock valuations, whether measured in P/B ratios, P/E ratios or price/dividend ratios, more than doubling. If valuation multiples had held constant, the bonds would have prevailed.[27] Such is the power of New Paradigms like the late 1920s and the early 1960s, when some towering idea takes over and leaves standard measurements in the dust. These episodes are seldom predictable but, at least in the past, they have never been permanent.

During the span covered by Ibbotson, the excess return of stocks relative to government bonds has been 5.7%, shaping many common current perceptions and expectations. The excess returns that stocks have delivered over bonds during most of the 10-year spans ending over the past dozen years has been in much the same ballpark, which is actually a remarkably uninspired outcome for stocks (relative to bonds), considering the near-tripling in Price/Earnings ratios during the 1990s.

Despite a bear market, current conditions are not encouraging, even though, at this writing, stock prices are below their peaks reached in 2000. Our measure of the risk premium is around -1.0%. This is troubling, unless an investor accepts the notion of rates of economic growth, earnings growth and dividend growth without historical precedent.

Conclusions

We have advanced several provocative assertions.

- The observed real stock returns, and the excess return for stocks relative to bonds, over the last 75 years has been extraordinary, due largely to important nonrecurring developments.
- It is dangerous to shape future expectations based on extrapolating these lofty historical returns. In so doing, an investor is tacitly assuming that valuation levels

[27] Consider the ten years starting just ahead of the stock market crash, in September, 1987. This span began with near-double-digit bond yields. The bond yield of 9.8%, less a regression-based inflation expectation of 3.6%, led to an expected real bond return of 6.2%. The stock yield of 2.9%, plus expected real per capita GDP growth of 1.6%, less an expected dividend shortfall relative to per capita GDP of 0.4%, led to an expected real stock return of 4.0%. The risk premium was –2.0%. But, stocks beat bonds by 4.9% per annum over the next ten years, ending September, 1997. What happened? The dividend yield plunged to 1.7%. This plunge in yields contributed 5.8% per annum to stock returns; absent this revaluation stocks would have underperformed bonds by -0.9%. So, the –2.0% forecast was not bad; dividends rose a notch faster than normal and, more importantly, the price that the market was willing to pay for each dollar of dividends nearly doubled.

that have doubled, tripled and quadrupled, *relative to the underlying earnings and dividends,* can be expected to do so again.

- The investors of 75 years ago would not have had an objective basis for expecting the 8% real returns or 5% excess returns that stocks subsequently delivered. That said, the estimated equity risk premium at the time was above average, which makes 1926 a better-than-average starting point for the historical risk premium.
- Investors would rarely have had an objective basis for expecting lofty real returns or excess returns, such as those that we have had the good fortune to earn from stocks over the past 75 years.
- The real internal growth that companies can generate in their dividends and earnings, absent the influence of additional investment capital, averaging about 0.9% to 1.4% per annum, respectively, is slower than the increase in real per capita GDP, which averaged 1.6%-2% over those same spans. This is far less than the consensus expectations for future earnings and dividend growth.
- This leads to a historical average equity risk premium of around 2.4%, measured relative to 10-year government bonds, when we seek to measure what investors might objectively have expected on their equity investments.
- The "normal" risk premium might well be a notch lower still, since the 2.4% objective *expectation* preceded *actual* excess return for stocks relative to bonds that were nearly 100 basis points higher, at 3.3% per annum.
- The current risk premium is approximately zero and a sensible expectation for the future real return for *both* stocks and bonds is around 2%-4%, far lower than the actuarial assumptions on which most investors are basing their planning and spending. [28]
- On the hopeful side, we have also demonstrated, that the "normal" level of the risk premium is modest (around 2.4%, and quite possibly less). This means that current market valuations need not return to levels that can deliver the 5% "risk premium" (excess return) that the Ibbotson data would suggest. If there is reversion to the mean, then the difference between 2% and zero still requires nearly a halving of stocks (relative to bonds) to restore a 2% risk premium, or a 2% drop in real bond yields. Either scenario is a less daunting picture than would be required to facilitate a reversion to a 5% "risk premium" that many observers believe is normal.
- It is also possible that the modest difference between a 2.4% "normal" risk premium, and the negative risk premiums that have prevailed in recent quarters, permitted the bubble. It is possible that "reversion to the mean" might not ever happen, in which case we should see stocks sputter along delivering bond-like returns, at a higher risk than bonds, for a long time to come.

The consensus, that a "normal" risk premium is around 5%, was shaped by a deeply rooted naivete in the investment community, where most participants have a career span

[28] For the taxable investor, the picture is worse, of course. In the US, investors are even taxed on the inflation component of returns. From valuation levels that are well above historic norms, a negative real after-tax return is not at all improbable.

reaching no further back than the monumental 25-year bull market from 1975 to 1999. This kind of mindset is a mirror image to the attitudes of the chronically bearish veterans of the 1930s. Today, investors are loathe to recall that the real total returns on stocks were negative over most 10-year spans during the two decades from 1963 to 1983, or that the excess return of stocks relative to bonds was negative as recently as the ten years ended August 1993.[29] When reminded of such experiences, today's investors retreat behind the mantra that things will be different this time. But no one can genuflect before the notion of the long run and deny that there will again be such circumstances in the decades ahead. Indeed, these crises are more likely than most of us would like to believe.

All of the evidence we have gathered here demonstrates that the normal risk premium is not 5%, but has been much closer to a modest 2.4%. A 2.4% risk premium has historically served to entice investors to accept equity market risk. A negative risk premium, as appears to prevail today, is a symptom of irrational valuation. As a consequence, investors greedy enough or naïve enough to expect a 5% risk premium, and overweight equities accordingly, may well be doomed to deep disappointments in the future as the realized risk premium falls far below this inflated expectation.

[29] This was also true in the decade ended September 1991, November 1990, most spans ending August 1977 to June 1979, and the spans ending September 1974 to January 1975.

Appendix. Estimating the constituents of return

An analysis of historical data is only as good as the data itself. Accordingly, we availed ourselves of multiple data sources wherever possible. We were encouraged by the fact that the discrepancies between the various sources led to compounded rates of return that were no more than 0.2% different from one another.

BY(t), long government bond yields.

There are multiple sources of bond yields. Our data was drawn from:
January, 1800 to May, 2001, Global Financial Data; National Bureau of Economic Research, 10-year government bond yields. Note: Annual until 1843; interpolated for monthly estimates.
June, 2001 to December, 2001, Bloomberg.
January, 1926 to Dec, 2000, Ibbotson Associates, Long-Term Government Bond Yields and returns.
In cases of differences, we (1) averaged the yields data and (2) recomputed monthly total returns based on an assumed 10-year maturity standard.

INF(t)

We used two sources of inflation and CPI data. Our data was drawn from:
January, 1801 to May, 2001, National Bureau of Economic Research. Note: Annual until 1950; interpolated for monthly estimates.
June, 2001 to December, 2001, Bloomberg.
January, 1926 to December, 2000, Ibbotson Associates
In cases of differences, we averaged the available data. Ibbotson data was given primary (two-thirds) weighting from 1926 to 1950, since our NBER data was annual through 1950.

GDP(t)

January, 1800 to September, 2001, National Bureau of Economic Research
Gross National Product, annually through 1920, interpolated July-to-July
Gross Domestic Product, quarterly from 1921-2001
December, 2001, Wall Street Journal consensus estimate.

DY(t), Dividend Yield, and RS(t), Return on stocks, in month "t"

There are multiple sources of dividend yield and stock total return data. Our data was drawn from:
January, 1802 to December, 1925, G. William Schwert.
February, 1871 to March, 2001, Robert Shiller (see detail below).
January, 1926 to December, 2000, Ibbotson Associates.
April, 2001 to December 2001, Bloomberg.

In cases of differences, we averaged the available data. These led to compounded differences which were no more than 0.2% apart, and no more than 0.12% away from the averaged series that we employed. With regard to Shiller's data, monthly dividend and earnings data are computed from the S&P four-quarter tools for the quarter since 1926, with linear interpolation to monthly figures. Dividend and earnings data before 1926 are from Cowles and associates (*Common Stock Indexes*, 2nd ed. [Bloomington, Ind.: Principia Press, 1939]), interpolated from annual data.

Exhibit 1a. How Much Return Comes from Inflation and Dividends? (1802 – 2001)

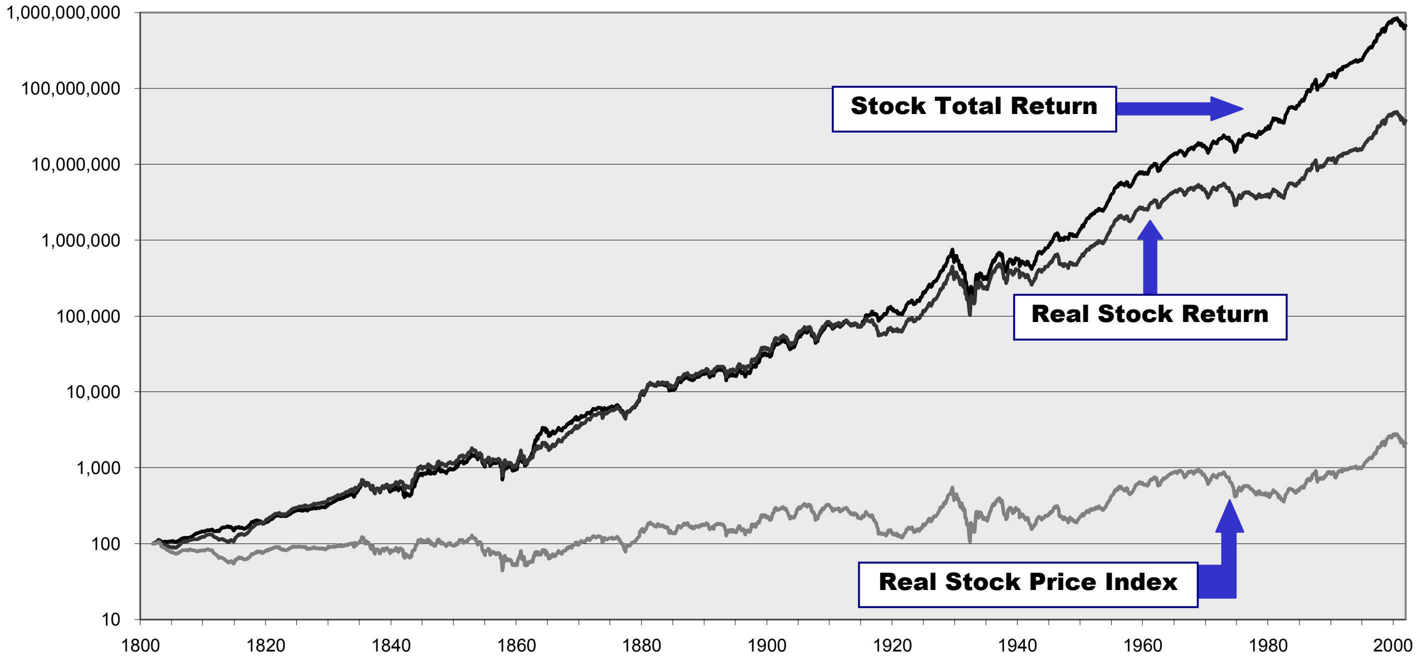

Exhibit 1b. How Strong is the Linkage With Economic Growth? (1802 – 2001)

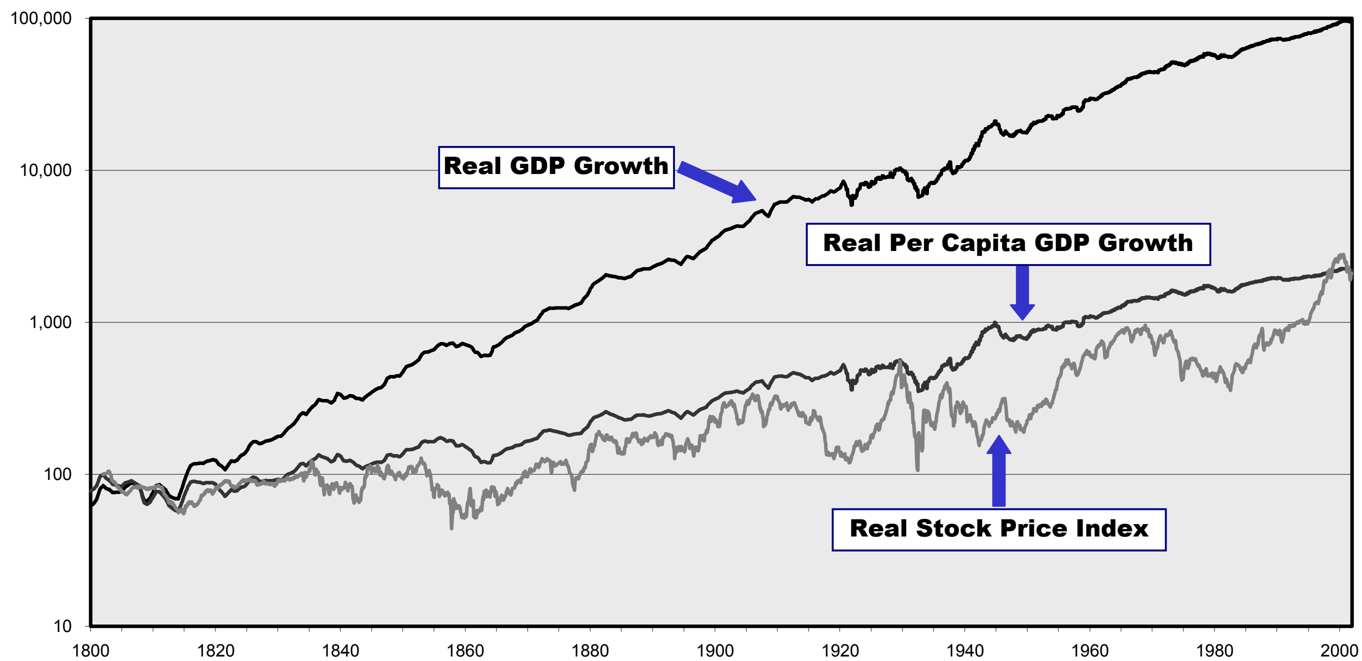

Exhibit 1c. How Well Do Dividends Track Economic Growth? 1802 - 2001

Exhibit 2a. Estimating Real Stock Returns, 1810 – 2001 Real Stock Return = Dividend Yield + Per Capita GDP Growth - Dividend/GDP Dilution

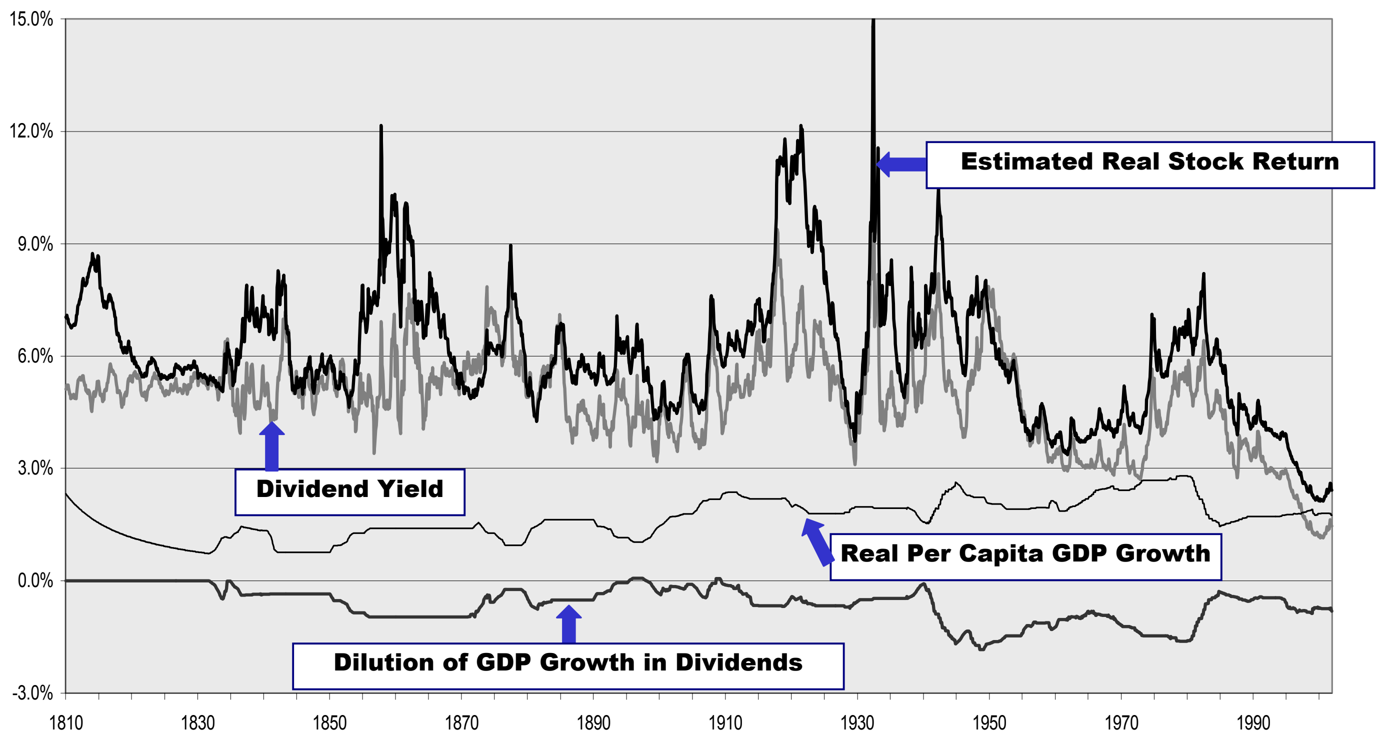

Exhibit 2b. Estimating Real Stock Returns, 1945-2001 Real Stock Return = Dividend Yield + Per Capita GDP Growth - Dividend/GDP Dilution

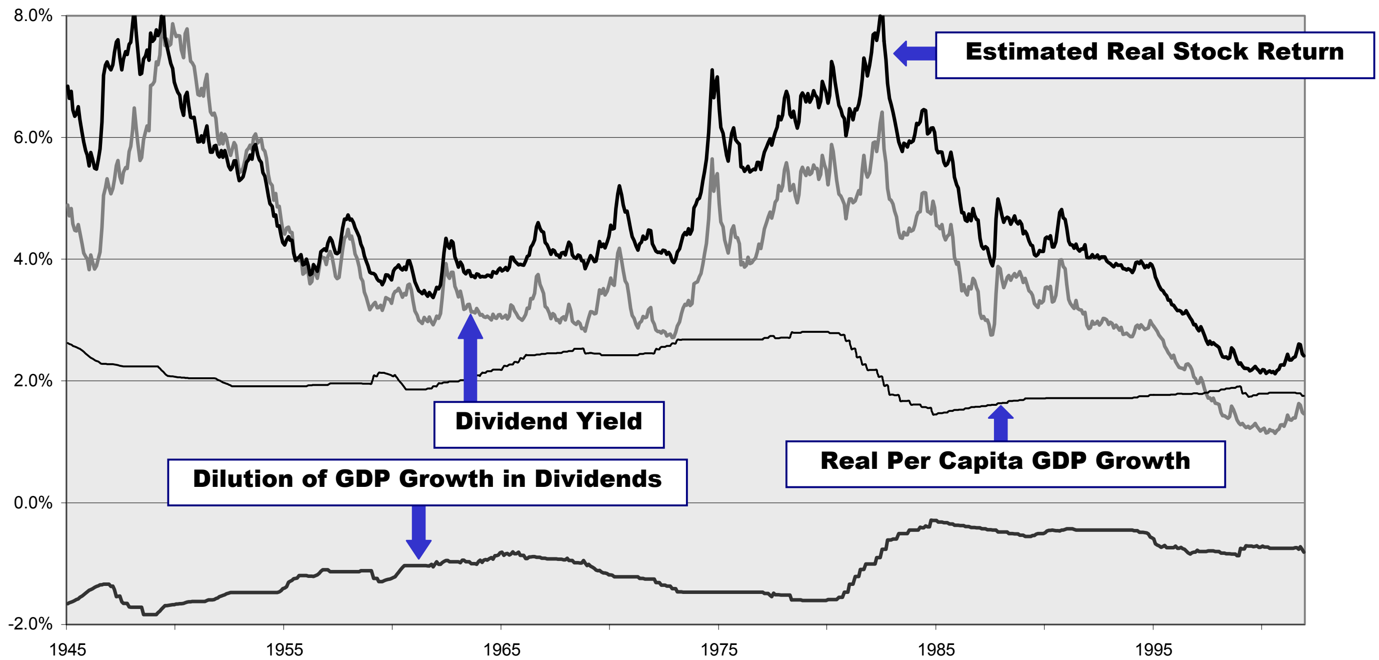

Exhibit 2c. Estimated Real Stock Returns and Subsequent Actual Real Stock Returns

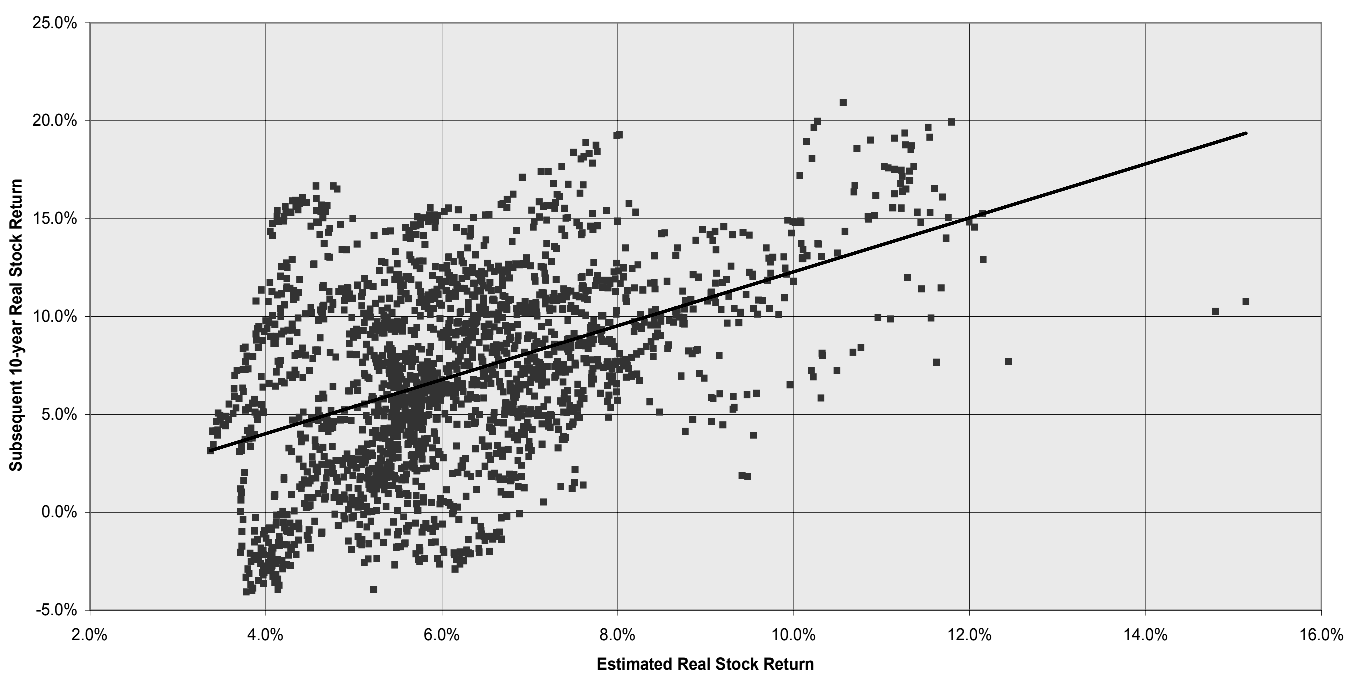

Exhibit 2d. Regression Results.
Estimated Real Stock Return versus Actual 10-Year Real Stock Return
Coefficients (t-stats), R^2, Correlation, Serial Correlation (RSR, ERSR)

Raw Data RSR(t) = a + b*ERSR(t-120)

	a	b	R^2, Correlation	Serial Correlation
1810-2001	-1.51% (-4.2)	1.38 (24.4)	0.214, 0.46	0.992, 0.990
1945-2001	-7.80% (-8.8)	3.15 (19.0)	0.391, 0.62	0.996, 0.995
Using 19 non-overlapping samples, beginning 12/1810:				
1810-2000	-0.35% (-0.1)	1.22 (1.9)	0.182, 0.43	-0.315, 0.021

Differenced RSR(t)-RSR(t-1) = b*(ERSR(t-120)-ERSR(t-121))

	b	R^2, Correlation	Serial Correlation
1810-2001	1.56 (41.9)	0.446, 0.47	0.270, 0.279
1945-2001	2.32 (20.8)	0.435, 0.46	0.314, 0.311

Exhibit 3a. Estimating Future Inflation 1810-2001

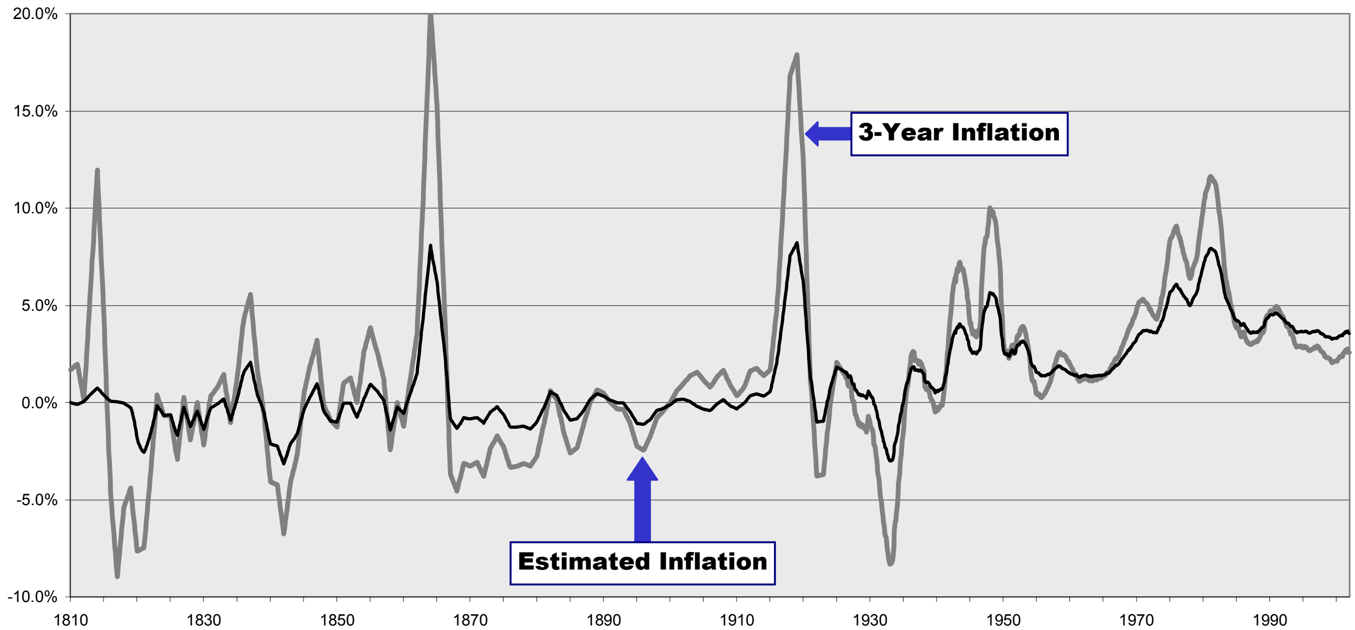

Exhibit 3b. Estimating Real Bond Yields, 1810-2001 Real Bond Yield = Bond Yield - Estimated Future Inflation

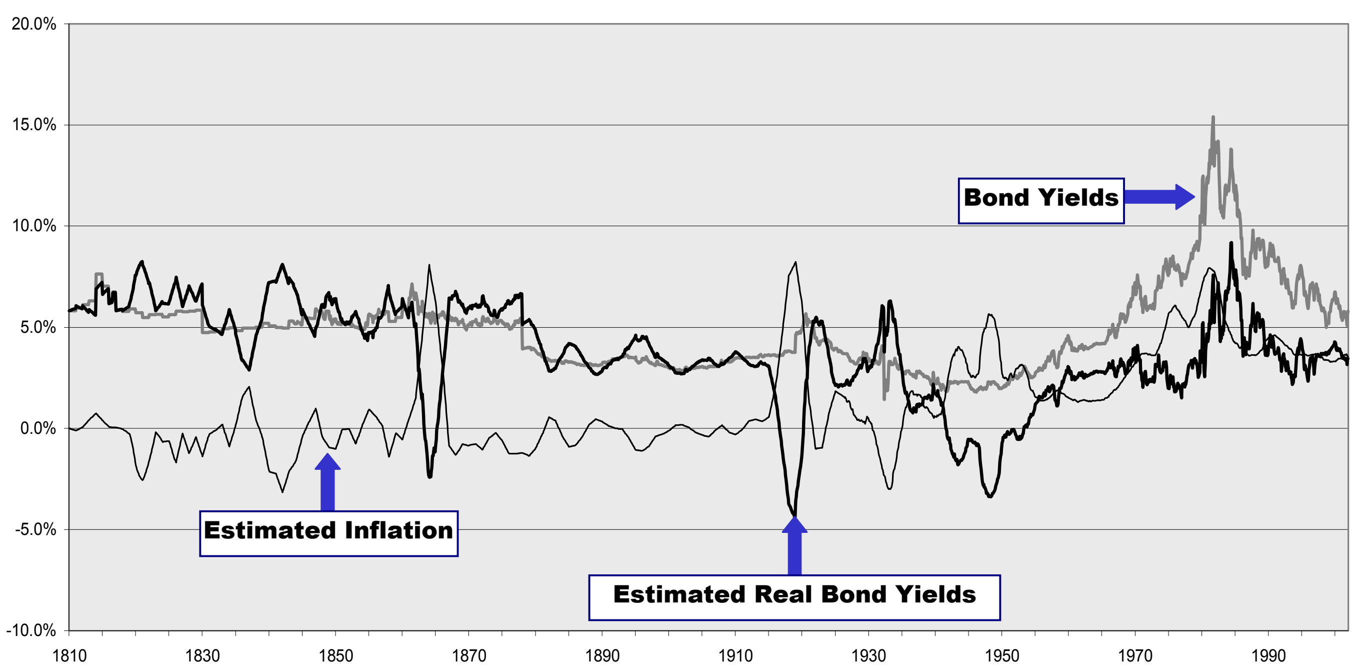

Exhibit 3c. Estimated Real Bond Yields and Subsequent Real Bond Returns

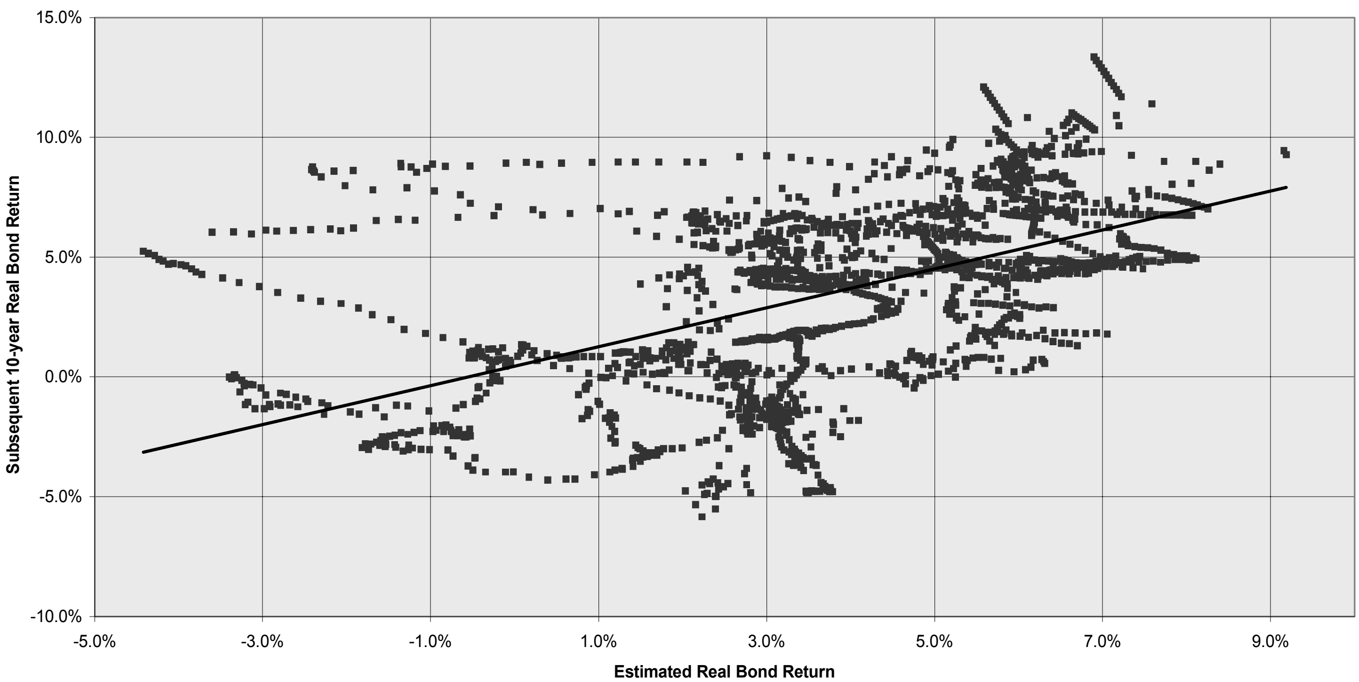

Exhibit 3d. Regression Results.
Estimated Real Bond Return versus Actual 10-Year Real Bond Return
Coefficients (t-stats), R^2, Correlation, Serial Correlation (RBR, ERBR)

Raw Data RBR(t)= a + b*ERBR(t-120)

	a	b	R^2, Correlation	Serial Correlation
1810-2001	0.45% (3.5)	0.81 (28.1)	0.266, 0.52	0.999, 0.997
1945-2001	-0.74% (-4.0)	1.05 (19.3)	0.399, 0.63	0.997, 0.980
Using 19 non-overlapping samples, beginning 12/1810:				
1810-2001	-1.81% (-1.1)	1.31 (3.5)	0.4120, 0.64	0.182, 0.677

Differenced RBR(t)-RBR(t-1) = b*(ERBR(t-120)-ERBR(t-121))

	b	R^2, Correlation	Serial Correlation
1810-2001	0.52 (28.4)	0.270, 0.52	0.154, 0.226
1945-2001	0.62 (19.0)	0.391, 0.63	0.148, 0.124

Exhibit 4a. Estimating the Equity Risk Premium 1810-2001

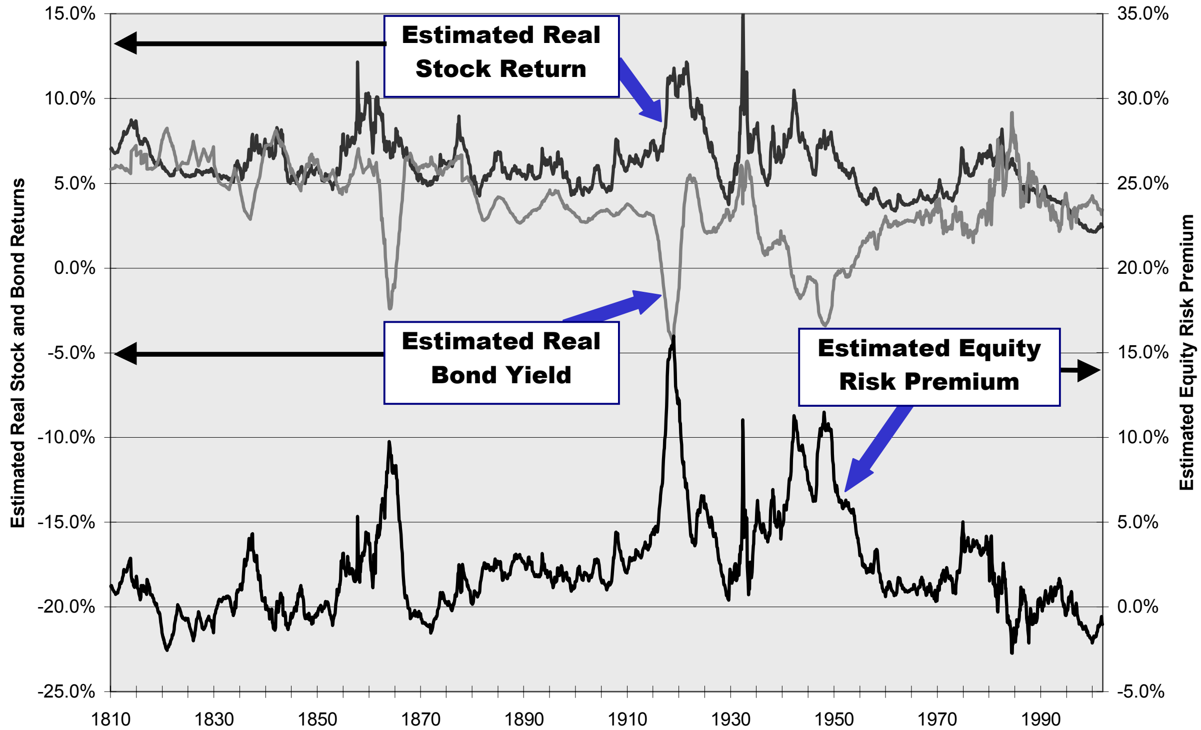

Exhibit 4b. Risk Premium and *Subsequent* 10-Year Excess Returns, 1810-1991

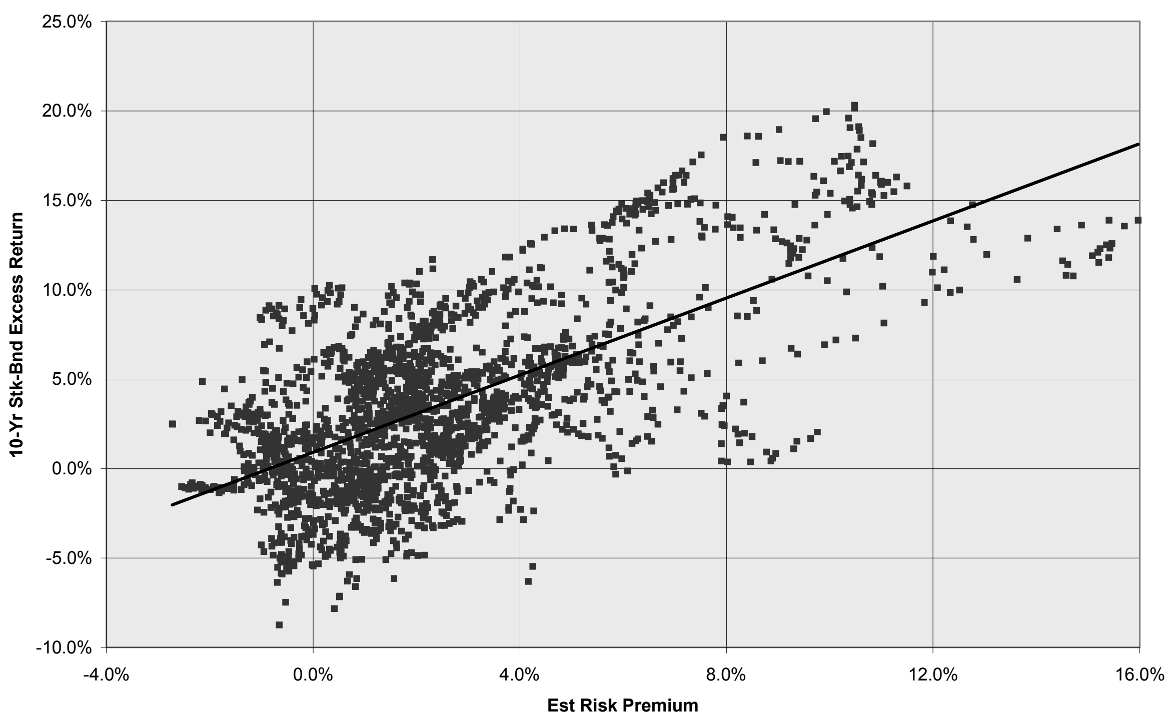

Exhibit 4c. Risk Premium and *Subsequent* 10-Year Excess Returns, 1945-2001

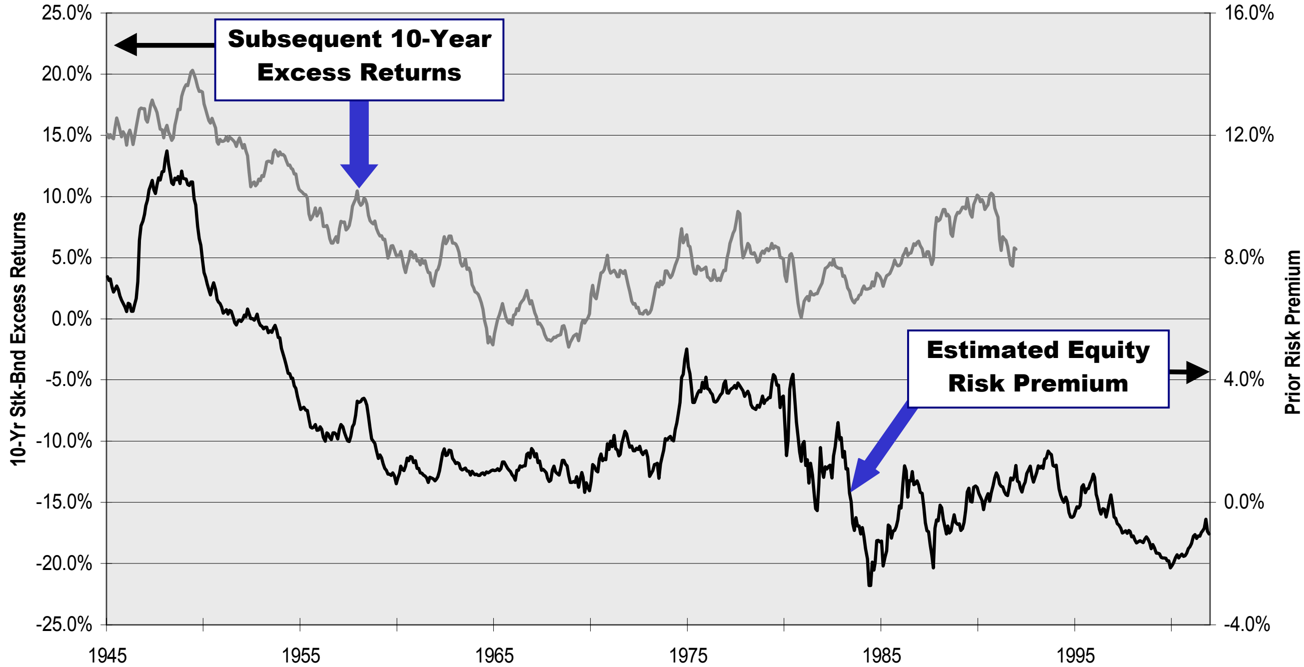

Exhibit 4d. Regression Results.
Estimated Equity Risk Premium (ERP) versus
Actual 10-Year Excess Return of Stocks versus Bonds (ERSB)
Coefficients (t-stats), R^2, Correlation, Serial Correlation (ERP, ERSB)

Raw Data ERSB(t) = a + b*ERP(t-120)

	a	b	R^2, Correlation	Serial Correlation
1810-2001	0.91% (8.8)	1.08 (40.6)	0.430, 0.66	0.993, 0.995
1945-2001	2.85% (15.4)	1.41 (30.4)	0.621, 0.79	0.995, 0.996
Using 19 non-overlapping samples, beginning 12/1810:				
1810-2001	0.84% (0.8)	1.36 (4.0)	0.490, 0.70	0.055, 0.371

Differenced ERSB(t)-ERSB(t-1) = b*(ERP(t-120)-ERP(t-121))

	b	R^2, Correlation	Serial Correlation
1810-2001	1.16 (35.5)	0.366, 0.61	0.249, 0.265
1945-2001	0.84 (12.9)	0.227, 0.48	0.307, 0.177

References and recommended reading:

Ambachtsheer, Keith P., “Investing Without an Equity Risk Premium: A Brave New World?” *The Ambachtsheer Letter*, #180, January, 2001.

Arnott, Robert D., “The Use and Misuse of Consensus Estimates,” *Journal of Portfolio Management,* Spring 1985.

Arnott, Robert D., “The Globalization of Asset Allocation,” *Topics in Global Management,* Probus Publishing, 1990.

Arnott, Robert D., “Managing the Asset Allocation Process,” *Sponsor Perspectives on Asset Management,* Probus Publishing, 1990.

Arnott, Robert D. and Clifford S. Asness, “Does Dividend Policy Foretell Earnings Growth?” Working Paper, January, 2002.

Arnott, Robert D. and Peter L. Bernstein, “Bull Market? Bear Market? Should You Really Care?” *Journal of Portfolio Management,* Fall 1997.

Arnott, Robert D. and Frank J. Fabozzi, *Asset Allocation*, Probus Publishing, 1988.

Arnott, Robert D. and Frank J. Fabozzi, *Active Asset Allocation*, Probus Publishing, 1992.

Arnott, Robert D. and Roy D. Henriksson, “A Disciplined Approach to Global Asset Allocation,” *Financial Analysts Journal*, March/April 1989.

Arnott, Robert D. and Erik H. Sorensen, “The Equity Risk Premium and Stock Market Performance,” *Journal of Portfolio Management,* Summer 1988.

Arnott, Robert D., and Ronald Ryan, “The Death of the Risk Premium: Consequences of the 1990s,” *Journal of Portfolio Management*, Spring 2001.

Arnott, Robert D. and James N von Germeten, “Systematic Asset Allocation,” with J.N. von Germeten, *Financial Analysts Journal,* November/December 1983.

Asness, Cliff, “Bubble Logic or How to Learn to Stop Worrying and Love the Bull,” *AQR working paper*, June 2000.

Bernstein, Peter L. “What Prompts Paradigm Shifts?” *Financial Analysts Journal*, November/December 1996.

Bernstein, Peter L., “How Long Can You Run – And Where Are You Running?” *Economics & Portfolio Strategy*, Peter L. Bernstein, Inc., February 15, 1997.

Bernstein, Peter L., “What Rate of Return Can You Reasonably Expect . . . or What Can the Long Run Tell Us about the Short Run?” *Financial Analysts Journal*, vol. 53, no. 2, March/April 1997.

Bernstein, Peter L., “Ending Endism,” *Economics & Portfolio Strategy*, Peter L. Bernstein, Inc., April 15, 2001.

Bernstein, Peter L., “The Real Economy and the Unreal Economy”, *Economics & Portfolio Strategy*, Peter L. Bernstein, Inc., May 1, 2001

Black, Fisher, “Studies of stock price volatility changes,” *Proceedings of the 1976 Meetings of the American Statistical Society, Business and Economics Statistics Section.* 1976

Campbell, John Y., and Robert J. Shiller, “Valuation ratios and the long-run stock market outlook,” *Journal of Portfolio Management* 24, 1998.

Chancellor, Edward, *Devil Take the Hindmost*, Farrar, Straus,and Giroux, 1999.

Claus, James and Jacob Thomas, "Equity premia as low as three percent? Evidence from analysts' earnings forecasts for domestic and international stocks," *Journal of Finance,* October, 2001.

Cochrane, John H., "Permanent and transitory components of GNP and stock prices," *Quarterly Journal of Economics* 109, 1994.

Cornell, Bradford. *Corporate Valuation.* New York: Business One Irwin, 1993.

Cornell, Bradford, *The Equity Risk Premium*, Wiley Frontiers in Finance, 1999.

Cornell, Bradford, John I. Hirshleifer, and Elizabeth P. James, "Estimating the cost of equity capital," *Contemporary Finance Digest 1* (autumn): 5-26, 1997.

Cowles, Alfred. *Common Stock Indexes: 1871-1937.* Bloomington, IN: Principia Press, 1939.

Dimson, Elroy, Paul Marsh and Mike Staunton, *The Millennium Book: A Century of Investment Returns*, ABN-Amro and London Business School, 2000.

Fama, Eugene F., and Kenneth R. French, "Dividend yields and expected stock returns," *Journal of Financial Economics, 22,* 1988.

Fama, Eugene E, and Kenneth R. French. "The cross-section of expected stock returns," *Journal of Finance* 47(2), 1992.

Fama, Eugene E, and Kenneth R. French. *The Equity Risk Premium*. Working paper, June 2000.

Fama, Eugene, F., and G. William Schwert, "Asset returns and inflation," *Journal of Financial Economics* 5(2), 1977.

Fisher, Irving, *The Theory of Interest*, MacMillan, 1930.

French, Kenneth R. G. William Schwert, and Robert F. Stambaugh, "Expected stock returns and variance," *Journal of Financial Economics* 17(l), 1987.

French, Kenneth R., and James M. Poterba, "Were Japanese stock prices too high?" *Journal of Financial Economics* 29(2), 1991.

Glassman, James K., and Kevin A. Hassett, *Dow 36,000?* Times Business, Random House, 1999.

Goetzmann, William N., and Philippe Jorion, "A century of global stock markets," Working paper 5901. New York: National Bureau of Economic Research, 1997.

Gordon, Myron, *The Investment, Financing and Valuation of the Corporation*. Irwin, Homewood, IL, 1962.

Hicks, Sir John Richard, *Value and Capital: An Inquiry into Some Fundamental Principles of Economic Theory.* Oxford University Press, 1946.

Ibbotson, Roger, and Rex A. Sinquefield, "Stocks, bonds, bills and inflation: Year-by-year historical returns (1926-74)," *Journal of Business* 49(1), 1976.

Ibbotson, Roger, and Rex A. Sinquefield, "Stocks, bonds, bills and inflation: simulations of future (1976-2000)," The Journal of Business 49, No. 3, July 1976.

Ibbotson Associates. *Stocks, Bonds, Bills and Inflation: 2000 Yearbook.* Chicago: Ibbotson Associates, 2001.

Jagannathan, Ravi, Ellen R. McGrattan, and Anna Scherbina, "The Declining US Equity Premium", Federal Reserve Bank of Minneapolis, Quarterly Review, Fall 2000.

Keynes, John Maynard, *7he General Theory of Employment, Interest and Money.* New York: Harcourt Brace and World, 1936.

Lamont, Owen, "Earnings and expected returns," *Journal of Finance* 53, 1998.

Leibowitz, Martin and Robert D. Arnott, "Mounting Pressures for a Shift to Conservatism," *Financial Analysts Journal,* November/December 1988.

Leibowitz, Martin, Robert D. Arnott, Lawrence Bader and Roy Henriksson, "Reappraising the Asset Allocation Decision," *Journal of Portfolio Management,* Spring 1990.

Leibowitz, Martin, Robert D. Arnott, Eric Sorensen, Nicholas Hanson, "A Total Differential Approach to Equity Duration," *Financial Analysts Journal,* September/October 1989.

Macaulay, Frederick R., *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States Since 1856*, National Bureau of Economic Research, 1938.

Markowitz, Harry. "Portfolio Selection," *Journal of Finance* 7(l), 1952.

McGrattan, Ellen R. and Edward C. Prescott, "Is the Stock Market Overvalued?", Federal Reserve Bank of Minneapolis, Quarterly Review, Fall 2000.

Miller, Merton, and Franco Modigliani, *Dividend Policy, Growth and the Valuation of Shares*. Journal of Business, October 1961.

Modigliani, Franco and Merton H. Miller, "The Cost of Capital, Corporation Finance, and the Theory of Investment," *American Economic Review*, Vol. 48, No. 3.

Schwert, G William, "Indexes of United States Stock Prices from 1802 to 1987," *Journal of Business*, 63, July 1990.

Sharpe, William F., "Capital asset prices: a theory of market equilibrium under conditions of risk," *Journal of Finance* 19(3), 1964.

Sharpe, William F., Gordon J. Alexander, and Jeffery V. Bailey, *Investments (5th ed.).* Englewood Cliffs, NJ: Prentice Hall, 1995.

Shiller, Robert J., "Do stock prices move too much to be justified by subsequent changes in dividends?" *American Economic Review* 73(3), 1981.

Shiller, Robert J., *Irrational Exuberance*. Princeton University Press, Princeton, NJ, 2000.

Siegel, Jeremy J., *Stocks for the Long Run*, Second Edition, McGraw Hill, 1998.

Smith, Edgar Lawrence, *Common Stocks as Long-Term Investments,* MacMillan, 1924.

Welch, Ivo, "Views of Financial Economists on the Equity Premium and on Financial Controversies," Journal of Business, October, 2000, Volume 73-4, pages 501-537, Copyright 2000 by the University of Chicago.

Wilkie, A. D., "The Risk Premium on Ordinary Shares," Institute of Actuaries and Faculty of Actuaries, November, 1994.