18.4.3 Relationship to the Constant-Growth Model

The constant-growth model can be shown to be a special case of the multiple-growth model. In particular, if the time when constant growth is assumed to begin is set equal to zero, then:

$$V_{T-} = \sum_{t=1}^{T} \frac{D_t}{(1 + k)^t} = 0$$

and

$$V_{T+} = \frac{D_{T+1}}{(k - g)(1 + k)^T} = \frac{D_1}{k - g}$$

because $T = 0$ and $(1 + k)^0 = 1$. Given that the multiple-growth model states that $V = V_{T-} + V_{T+}$, it can be seen that setting $T = 0$ results in $V = D_1/(k - g)$, a formula that is equivalent to the formula for the constant-growth model.

18.4.4 Two-Stage and Three-Stage Models

Two dividend discount models that investors sometimes use are the two-stage model and the three-stage model.[8] The two-stage model assumes that a constant growth rate g_1 exists only until some time T, when a different growth rate g_2 is assumed to begin and continue thereafter. The three-stage model assumes that a constant growth rate g_1 exists only until some time T_1, when a second growth rate is assumed to begin and last until a later time T_2, when a third growth rate is assumed to begin and last thereafter. By letting V_{T+} denote the present value of all dividends after the last growth rate has begun and V_{T-} the present value of all the preceding dividends, it can be seen that these models are just special cases of the multiple-growth model.

In applying the capitalization of income method of valuation to common stocks, it might seem appropriate to assume that the stock will be sold at some point in the future. In this case the expected cash flows would consist of the dividends up to that point as well as the expected selling price. Because dividends after the selling date would be ignored, the use of a dividend discount model may seem to be improper. However, as will be shown next, this is not so.

18.5 VALUATION BASED ON A FINITE HOLDING PERIOD

capitalization of income method of valuation involves discounting all divi- that are expected throughout the future. Because the simplified models growth, constant growth, and multiple growth are based on this method, involve a future stream of dividends. Upon reflection it may seem that odels are relevant only for an investor who plans to hold a stock forever, uch an investor would expect to receive this stream of future dividends.

But what about an investor who plans to sell the stock in a year? In this situation, the cash flows that the investor expects to receive from purchasing a share of the stock are equal to the dividend expected to be paid one year from now (for ease of exposition, it is assumed that common stocks pay dividends annually) and the expected selling price of the stock. Thus it would seem appropriate to determine the intrinsic value of the stock to the investor by discounting these two cash flows at the required rate of return as follows:

$$
\begin{aligned}
V &= \frac{D_1 + P_1}{1 + k} \\
&= \frac{D_1}{1 + k} + \frac{P_1}{1 + k} \qquad (18.30)
\end{aligned}
$$

where D_1 and P_1 are the expected dividend and selling price at $t = 1$, respectively.

In order to use Equation (18.30), the expected price of the stock at $t = 1$ must be estimated. The simplest approach assumes that the selling price will be based on the dividends that are expected to be paid after the selling date. Thus the expected selling price at $t = 1$ is:

$$
\begin{aligned}
P_1 &= \frac{D_2}{(1 + k)^1} + \frac{D_3}{(1 + k)^2} + \frac{D_4}{(1 + k)^3} + \cdots \\
&= \sum_{t=2}^{\infty} \frac{D_t}{(1 + k)^{t-1}}. \qquad (18.31)
\end{aligned}
$$

Substituting Equation (18.31) for P_1 in the right-hand side of Equation (18.30) results in:

$$
\begin{aligned}
V &= \frac{D_1}{1 + k} + \left[\frac{D_2}{(1 + k)^1} + \frac{D_3}{(1 + k)^2} + \frac{D_4}{(1 + k)^3} + \cdots\right]\left(\frac{1}{1 + k}\right) \\
&= \frac{D_1}{(1 + k)^1} + \frac{D_2}{(1 + k)^2} + \frac{D_3}{(1 + k)^3} + \frac{D_4}{(1 + k)^4} + \cdots \\
&= \sum_{t=1}^{\infty} \frac{D_t}{(1 + k)^t}
\end{aligned}
$$

which is exactly the same as Equation (18.7). Thus valuing a share of common stock by discounting its dividends up to some point in the future and its expected selling price at that time is equivalent to valuing stock by discounting all future dividends. Simply stated, the two are equivalent because the expected selling price is itself based on dividends to be paid after the selling date. Thus Equation (18.7), as well as the zero-growth, constant-growth, and multiple-growth models that are based on it, is appropriate for determining the intrinsic value of a share of common stock regardless of the length of the investor's planned holding period.

Example

As an example, reconsider the common stock of the Copper Company. Over the past year it was noted that Copper paid dividends of $1.80 per share, with the forecast that the dividends would grow by 5% per year forever. This means that dividends over the next two years (D_1 and D_2) are forecast to be \$1.89 [= \$1.80 × (1 + .05)] and \$1.985 [= \$1.89 × (1 + .05)], respectively. If the investor plans to sell the stock after one year, the selling price could be estimated by noting that at $t = 1$, the forecast of dividends for the forthcoming year would be D_2, or \$1.985. Thus the anticipated selling price at $t = 1$, denoted P_1, would be equal to \$33.08 [= \$1.985/(.11 − .05)]. Accordingly, the intrinsic value of Copper to such an investor would equal the present value of the expected cash flows, which are $D_1 = \$1.89$ and $P_1 = \$33.08$. Using Equation (18.30) and assuming a required rate of 11%, this value is equal to \$31.50 [= (\$1.89 + \$33.08)/(1 + .11)]. Note that this is the same amount that was calculated earlier when all the dividends from now to infinity were discounted using the constant-growth model: $V = D_1/(k - g) = \$1.89/(.11 - .05) = \$31.50$.

18.6 MODELS BASED ON PRICE-EARNINGS RATIOS

Despite the inherent sensibility of DDMs, many security analysts use a much simpler procedure to value common stocks. First, a stock's earnings per share over the forthcoming year E_1 are estimated, and then the analyst (or someone else) specifies a "normal" **price-earnings ratio** for the stock. The product of these two numbers gives the estimated future price P_1. Together with estimated dividends D_1 to be paid during the period and the current price P, the estimated return on the stock over the period can be determined:

$$\text{Expected return} = \frac{(P_1 - P) + D_1}{P} \tag{18.32}$$

where $P_1 = (P_1/E_1) \times E_1$.

Some security analysts expand this procedure, estimating earnings per share and price-earnings ratios for optimistic, most likely, and pessimistic scenarios to produce a rudimentary probability distribution of a security's return. Other ana- ysts determine whether a stock is underpriced or overpriced by comparing the ock's actual price-earnings ratio with its "normal" price-earnings ratio, as will shown next.[10]

In order to make this comparison, Equation (18.7) must be rearranged and new variables introduced. To begin, it should be noted that earnings per E_t are related to dividends per share D_t by the firm's **payout ratio** p_t,

$$D_t = p_t E_t. \tag{18.33}$$

ore, if an analyst has forecast earnings-per-share and payout ratios, she has implicitly forecast dividends.

on (18.33) can be used to restate the various DDMs where the focus is ng what the stock's price-earnings ratio should be instead of on esti- intrinsic value of the stock. In order to do so, $p_t E_t$ is substituted for D_t

in the right-hand side of Equation (18.7), resulting in a general formula for determining a stock's intrinsic value that involves discounting earnings:

$$V = \frac{D_1}{(1+k)^1} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots$$
$$= \frac{p_1E_1}{(1+k)^1} + \frac{p_2E_2}{(1+k)^2} + \frac{p_3E_3}{(1+k)^3} + \cdots$$
$$= \sum_{t=1}^{\infty} \frac{p_tE_t}{(1+k)^t}. \tag{18.34}$$

Earlier it was noted that dividends in adjacent time periods could be viewed as being "linked" to each other by a dividend growth rate g_t. Similarly, earnings per share in any year t can be "linked" to earnings per share in the previous year $t - 1$ by a growth rate in earnings per share, g_{et},

$$E_t = E_{t-1}(1 + g_{et}). \tag{18.35}$$

This implies that

$$E_1 = E_0(1 + g_{e1})$$
$$E_2 = E_1(1 + g_{e2}) = E_0(1 + g_{e1})(1 + g_{e2})$$
$$E_3 = E_2(1 + g_{e3}) = E_0(1 + g_{e1})(1 + g_{e2})(1 + g_{e3})$$

and so on, where E_0 is the actual level of earnings per share over the past year, E_1 is the expected level of earnings per share over the forthcoming year, E_2 is the expected level of earnings per share for the year after E_1, and E_3 is the expected level of earnings per share for the year after E_2.

These equations relating expected future earnings per share to E_0 can be substituted into Equation (18.34), resulting in:

$$V = \frac{p_1[E_0(1 + g_{e1})]}{(1+k)^1} + \frac{p_2[E_0(1 + g_{e1})(1 + g_{e2})]}{(1+k)^2}$$
$$+ \frac{p_3[E_0(1 + g_{e1})(1 + g_{e2})(1 + g_{e3})]}{(1+k)^3} + \cdots. \tag{18.36}$$

As V is the intrinsic value of a share of stock, it represents what the stock would be selling for if it were fairly priced. It follows that V/E_0 represents what the price-earnings ratio would be if the stock were fairly priced, and is sometimes referred to as the stock's "normal" price-earnings ratio. Dividing both sides of Equation (18.36) by E_0 and simplifying results in the formula for determining the "normal" price-earnings ratio:

$$\frac{V}{E_0} = \frac{p_1(1 + g_{e1})}{(1+k)^1} + \frac{p_2(1 + g_{e1})(1 + g_{e2})}{(1+k)^2}$$
$$+ \frac{p_3(1 + g_{e1})(1 + g_{e2})(1 + g_{e3})}{(1+k)^3} + \cdots. \tag{18.37}$$

This shows that, other things being equal, a stock's "normal" price-earnings ratio will be higher:

The *greater* the expected payout ratios (p_1, p_2, p_3, . . .),
The *greater* the expected growth rates in earnings per share (g_{e1}, g_{e2}, g_{e3}, . . .),
The *smaller* the required rate of return (k).

The qualifying phrase "other things being equal" should not be overlooked. For example, a firm cannot increase the value of its shares by simply making greater payouts. This will increase p_1, p_2, p_3, . . ., but will decrease the expected growth rates in earnings per share g_{e1}, g_{e2}, g_{e3}, ... Assuming that the firm's investment policy is not altered, the effects of the reduced growth in its earnings per share will just offset the effects of the increased payouts, leaving its share value unchanged.

Earlier it was noted that a stock was viewed as underpriced if $V > P$ and overpriced if $V < P$. Because dividing both sides of an inequality by a positive constant will not change the direction of the inequality, such a division can be done here to the two inequalities involving V and P, where the positive constant is E_0. The result is that a stock can be viewed as being underpriced if $V/E_0 > P/E_0$ and overpriced if $V/E_0 < P/E_0$. Thus a stock will be underpriced if its "normal" price-earnings ratio is greater than its actual price-earnings ratio, and overpriced if its "normal" price-earnings ratio is less than its actual price-earnings ratio.

Unfortunately, Equation (18.37) is intractable, meaning that it cannot be used to estimate the "normal" price-earnings ratio for any stock. However, simplifying assumptions can be made that result in tractable formulas for estimating "normal" price-earnings ratios. These assumptions, along with the formulas, parallel those made previously regarding dividends and are discussed next.

18.6.1 The Zero-Growth Model

The zero-growth model assumed that dividends per share remained at a fixed dollar amount forever. This is most likely if earnings per share remain at a fixed dollar amount forever, with the firm maintaining a 100% payout ratio. Why 100%? Because if a lesser amount were assumed to be paid out, it would mean that the firm was retaining part of its earnings. These retained earnings would be put to some use, and would thus be expected to increase future earnings and hence dividends per share.

Accordingly, the zero-growth model can be interpreted as assuming $p_t = 1$ for all time periods and $E_0 = E_1 = E_2 = E_3$ and so on. This means that $D_0 = E_0$ = $D_1 = E_1 = D_2 = E_2$ and so on, allowing valuation Equation (18.13) to be restated as:

$$V = \frac{E_0}{k}. \qquad (18.38)$$

Dividing Equation (18.38) by E_0 results in the formula for the "normal" price-earnings ratio for a stock having zero growth:

$$\frac{V}{E_0} = \frac{1}{k}. \qquad (18.39)$$

Example

Earlier it was assumed that the Zinc Company was a zero-growth firm
idends of $8 per share, selling for $65 a share, and having a required
turn of 10%. Because Zinc is a zero-growth company, it will be assum
has a 100% payout ratio which, in turn, means that E_0 = $8. At this po
tion (18.38) can be used to note that a "normal" price-earnings ratio for
1/.10 = 10. As Zinc has an actual price-earnings ratio of $65/$8 = 8.1,
cause $V/E_0 = 10 > P/E_0 = 8.1$, it can be seen that Zinc stock is underpric

18.6.2 The Constant-Growth Model

Earlier it was noted that dividends in adjacent time periods could be viewed being connected to each other by a dividend growth rate g_t. Similarly, it noted that earnings per share can be connected by an earnings growth rate The constant-growth model assumes that the growth rate in dividends per share will be the same throughout the future. An equivalent assumption is that earnings per share will grow at a constant rate g_e throughout the future, with the payout ratio remaining at a constant level p. This means that:

$$E_1 = E_0(1 + g_e) = E_0(1 + g_e)^1$$
$$E_2 = E_1(1 + g_e) = E_0(1 + g_e)(1 + g_e) = E_0(1 + g_e)^2$$
$$E_3 = E_2(1 + g_e) = E_0(1 + g_e)(1 + g_e)(1 + g_e) = E_0(1 + g_e)^3$$

and so on. In general, earnings in year t can be connected to E_0 as follows:

$$E_t = E_0(1 + g_e)^t. \tag{18.40}$$

Substituting Equation (18.40) into the numerator of Equation (18.34) and recognizing that $p_t = p$ results in:

$$V = \sum_{t=1}^{\infty} \frac{pE_0(1 + g_e)^t}{(1 + k)^t}$$
$$= pE_0\left[\sum_{t=1}^{\infty} \frac{(1 + g_e)^t}{(1 + k)^t}\right]. \tag{18.41}$$

The same mathematical property of infinite series given in Equation (18.19) can be applied to Equation (18.41), resulting in:

$$V = pE_0\left(\frac{1 + g_e}{k - g_e}\right). \tag{18.42}$$

It can be noted that the earnings-based constant-growth model has a numerator that is identical to the numerator of the dividend-based constant-growth model, because $pE_0 = D_0$. Furthermore, the denominators of the two models are identical. Both assertions require that the growth rates in earnings and dividends be the same (that is, $g_e = g$). Examination of the assumptions of the models reveals that these growth rates must be equal. This can be seen by recalling that constant earnings growth means:

$$E_t = E_{t-1}(1 + g_e).$$

Now when both sides of this equation are multiplied by the constant payout ratio, the result is:

$$pE_t = pE_{t-1}(1 + g_e).$$

Because $pE_t = D_t$ and $pE_{t-1} = D_{t-1}$, this equation reduces to:

$$D_t = D_{t-1}(1 + g_e)$$

which indicates that dividends in any period $t - 1$ will grow by the earnings growth rate, g_e. Because the dividend-based constant-growth model assumed that dividends in any period $t - 1$ would grow by the dividend growth rate g, it can be seen that the two growth rates must be equal for the two models to be equivalent.

Equation (18.42) can be restated by dividing each side by E_0, resulting in the following formula for determining the "normal" price-earnings ratio for a stock with constant growth:

$$\frac{V}{E_0} = p\left(\frac{1 + g_e}{k + g_e}\right). \tag{18.43}$$

Example

Earlier it was assumed that the Copper Company had paid dividends of $1.80 per share over the past year, with a forecast that dividends would grow by 5% per year forever. Furthermore, it was assumed that the required rate of return on Copper was 11%, and the current stock price was $40 per share. Now assuming that E_0 was $2.70, it can be seen that the payout ratio was equal to 66⅔% (= $1.80/$2.70). This means that the "normal" price-earnings ratio for Copper, according to Equation (18.43), is equal to 11.7 [= .6667 × (1 + .05) /(.11 −.05)]. Because this is less than Copper's actual price-earnings ratio of 14.8 (= $40/$2.70), it follows that the stock of Copper Company is overpriced.

18.6.3 The Multiple-Growth Model

Earlier it was noted that the most general DDM is the multiple-growth model, where dividends are allowed to grow at varying rates until some point in time T, after which they are assumed to grow at a constant rate. In this situation the present value of all the dividends is found by adding the present value of all dividends up to and including T, denoted by V_{T-}, and the present value of all dividends after T, denoted by V_{T+}:

$$V = V_{T-} + V_{T+}$$
$$= \sum_{t=1}^{T} \frac{D_t}{(1 + k)^t} + \frac{D_{T+1}}{(k - g)(1 + k)^T}. \tag{18.27}$$

In general, earnings per share in any period t can be expressed as equal to E_0 times the product of all the earnings growth rates from time zero to time t:

$$E_t = E_0(1 + g_{e1})(1 + g_{e2}) \cdots (1 + g_{et}). \quad (18.44)$$

Because dividends per share in any period t are equal to the payout ratio for that period times the earnings per share, it follows from Equation (18.44) that:

$$\begin{aligned} D_t &= p_t E_t \\ &= p_t E_0(1 + g_{e1})(1 + g_{e2}) \cdots (1 + g_{et}). \end{aligned} \quad (18.45)$$

Replacing the numerator in Equation (18.37) with the right-hand side of Equation (18.45) and then dividing both sides by E_0 gives the following formula for determining a stock's "normal" price-earnings ratio with the multiple-growth model:

$$\begin{aligned} \frac{V}{E_0} &= \frac{p_1(1 + g_{e1})}{(1 + k)^1} + \frac{p_2(1 + g_{e1})(1 + g_{e2})}{(1 + k)^2} + \cdots \\ &+ \frac{p_T(1 + g_{e1})(1 + g_{e2}) \cdots (1 + g_{eT})}{(1 + k)^T} \\ &+ \frac{p(1 + g_{e1})(1 + g_{e2}) \cdots (1 + g_{eT})(1 + g)}{(k - g)(1 + k)^T}. \end{aligned} \quad (18.46)$$

Example

Consider the Magnesium Company again. Its share price is currently \$55, and per share earnings and dividends over the past year were \$3 and \$.75, respectively. For the next two years, forecast earnings and dividends, along with the earnings growth rates and payout ratios, are:

$$\begin{array}{llll} D_1 = \$2.00 & E_1 = \$5.00 & g_{e1} = 67\% & p_1 = 40\% \\ D_2 = \$3.00 & E_2 = \$6.00 & g_{e2} = 20\% & p_2 = 50\%. \end{array}$$

Constant growth in dividends and earnings of 10% per year is forecast to begin at $T = 2$, which means that $D_3 = \$3.30$, $E_3 = \$6.60$, $g = 10\%$, and $p = 50\%$.

Given a required return of 15%, Equation (18.46) can be used as follows to estimate a "normal" price-earnings ratio for Magnesium:

$$\begin{aligned} \frac{V}{E_0} &= \frac{.40(1 + .67)}{(1 + .15)^1} + \frac{.50(1 + .67)(1 + .20)}{(1 + .15)^2} + \frac{.50(1 + .67)(1 + .20)(1 + .10)}{(.15 - .10)(1 + .15)^2} \\ &= .58 + .76 + 16.67 \\ &= 18.01. \end{aligned}$$

Because the actual price-earnings ratio of 18.33 (= \$55/\$3) is close to the "normal" ratio of 18.01, the stock of the Magnesium Company can be viewed as fairly priced.

18.7 SOURCES OF EARNINGS GROWTH

So far no explanation has been given as to why earnings or dividends will be expected to grow in the future. One way of providing such an explanation uses the constant-growth model. Assuming that no new capital is obtained externally and no shares are repurchased (meaning that the number of shares outstanding does not increase or decrease), the portion of earnings not paid to stockholders as dividends will be used to pay for the firm's new investments. Given that p_t denotes the payout ratio in year t, then $(1 - p_t)$ will be equal to the portion of earnings not paid out, known as the **retention ratio.** Furthermore, the firm's new investments, stated on a per-share basis and denoted by I_t, will be:

$$I_t = (1 - p_t)E_t. \tag{18.47}$$

If these new investments have an average return on equity of r_t in period t and every year thereafter, they will add r_tI_t to earnings per share in year $t + 1$ and every year thereafter. If all previous investments also produce perpetual earnings at a constant rate of return, next year's earnings will equal this year's earnings plus the new earnings resulting from this year's new investments:

$$\begin{aligned} E_{t+1} &= E_t + r_tI_t \\ &= E_t + r_t(1 - p_t)E_t \\ &= E_t[1 + r_t(1 - p_t)]. \end{aligned} \tag{18.48}$$

Because it was shown earlier that the growth rate in earnings per share is:

$$E_t = E_{t-1}(1 + g_{et}) \tag{18.35}$$

it follows that:

$$E_{t+1} = E_t(1 + g_{et+1}). \tag{18.49}$$

A comparison of Equations (18.48) and (18.49) indicates that:

$$g_{et+1} = r_t(1 - p_t). \tag{18.50}$$

If the growth rate in earnings per share g_{et+1} is to be constant over time, then the average return on equity for new investments r_t and the payout ratio p_t must also be constant over time. In this situation Equation (18.50) can be simplified by removing the time subscripts:

$$g_e = r(1 - p). \tag{18.51a}$$

Because the growth rate in dividends per share g is equal to the growth rate in earnings per share g_e, this equation can be rewritten as:

$$g = r(1 - p). \tag{18.51b}$$

m this equation it can be seen that the growth rate g depends on (1) the proportion of earnings that is retained $1 - p$, and (2) the average return on equity he earnings that are retained r.

The constant-growth valuation formula given in Equation (18.20) can be ied by replacing g with the expression on the right-hand side of Equation 1b), resulting in:

$$V = D_0\left(\frac{1 + g}{k - g}\right)$$

$$= D_0\left[\frac{1 + r(1 - p)}{k - r(1 - p)}\right].$$

$$= D_1\left[\frac{1}{k - r(1 - p)}\right].$$

(1

Under these assumptions, a stock's value (and hence its price) should be greater, the greater its average return on equity for new investments, other things being equal.

Example

Continuing with the Copper Company, recall that $E_0 = \$2.70$ and $p = 66⅔\%$. This means that 33⅓% of earnings per share over the past year were retained and reinvested, an amount equal to \$.90 (= .3333 × \$2.70). The earnings per share in the forthcoming year E_1 are expected to be \$2.835 [= \$2.70 × (1 + .05)] because the growth rate g for Copper is 5%.

The source of the increase in earnings per share of \$.135 (= \$2.835 − \$2.70) is the \$.90 per share that was reinvested at $t = 0$. The average return on equity for new investments r is 15%, because \$.135/\$.90 = 15%. That is, the reinvested earnings of \$.90 per share can be viewed as having generated an annual increase in earnings per share of \$.135. This increase will occur not only at $t = 1$, but also at $t = 2$, $t = 3$, and so on. Equivalently, a \$.90 investment at $t = 0$ will generate a perpetual annual cash inflow of \$.135 beginning at $t = 1$.

Expected dividends at $t = 1$ can be calculated by multiplying the expected payout ratio p of 66⅔% times the expected earnings per share E_1 of \$2.835, or .6667 × \$2.835 = \$1.89. It can also be calculated by multiplying 1 plus the growth rate g of 5% times the past amount of dividends per share D_0 of \$1.80, or 1.05 × \$1.80 = \$1.89.

It can be seen that the growth rate in dividends per share of 5% is equal to the product of the retention rate (33⅓%) and the average return on equity for new investments (15%), an amount equal to 5% (= .3333 × .15).

Two years from now ($t = 2$), earnings per share are anticipated to be \$2.977 [= \$2.835 × (1 + .05)], a further increase of \$.142 (= \$2.977 − \$2.835) that is due to the retention and reinvestment of \$.945 (= .3333 × \$2.835) per share at $t = 1$. This expected increase in earnings per share of \$.142 is the result of earning (15%) on the reinvestment (\$.945), because .15 × \$.945 = \$.142.

The expected earnings per share at $t = 2$ can be viewed as having three components. The first is the earnings attributable to the assets held at $t = 0$, an amount equal to \$2.70. The second is the earnings attributable to the reinvestment of \$.90 at $t = 0$, earning \$.135. The third is the earnings attributable to the reinvestment of \$.945 at $t = 1$, earning \$.142. These three components, when summed, can be seen to equal $E_2 = \$2.977$ (= \$2.70 + \$.135 + \$.142).

Dividends at $t = 2$ are expected to be 5% larger than at $t = 1$, or \$1.985 (= 1.05 × \$1.89) per share. This amount corresponds to the amount calculated by multiplying the payout ratio times the expected earnings per share at $t = 2$, or \$1.985 (= .6667 × \$2.977). Figure 18.2 summarizes the example.

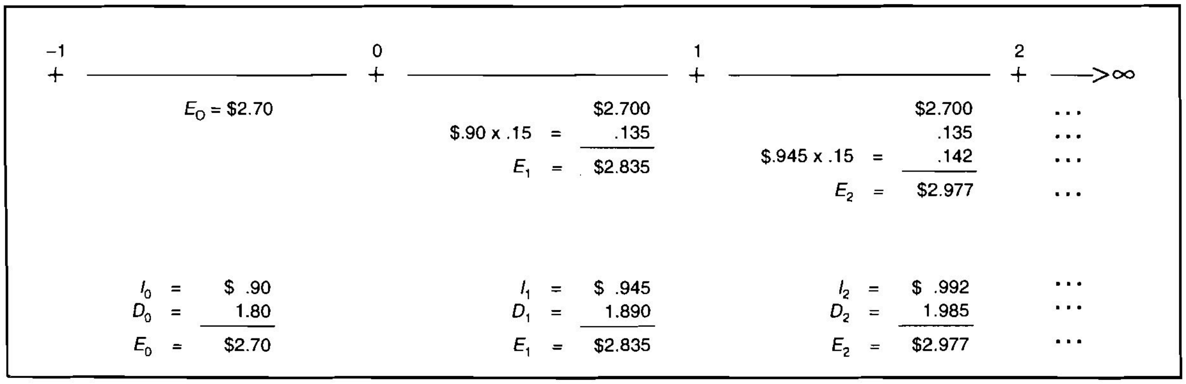


Figure 18.2
Growth in Earnings for Copper Company

18.8 A THREE-STAGE DDM

As this chapter's Institutional Issues discusses, the three-stage DDM is the most widely applied form of the general multiple-growth DDM. Consider analyzing the *ABC* Company.

18.8.1 Making Forecasts

Over the past year, *ABC* has had earnings per share of $1.67 and dividends per share of $.40. After carefully studying ABC, the security analyst has made the following forecasts of earnings per share and dividends per share for the next five years:

$$E_1 = \$2.67 \quad E_2 = \$4.00 \quad E_3 = \$6.00 \quad E_4 = \$8.00 \quad E_5 = \$10.00$$
$$D_1 = \$\ .60 \quad D_2 = \$1.60 \quad D_3 = \$2.40 \quad D_4 = \$3.20 \quad D_5 = \$\ 5.00.$$

These forecasts imply the following payout ratios and earnings-per-share growth rates:

$$p_1 = 22\% \quad p_2 = 40\% \quad p_3 = 40\% \quad p_4 = 40\% \quad p_5 = 50\%$$
$$g_{e1} = 60\% \quad g_{e2} = 50\% \quad g_{e3} = 50\% \quad g_{e4} = 33\% \quad g_{e5} = 25\%.$$

Furthermore, the analyst believes that *ABC* will enter a transition stage at the [illegible] of the fifth year (that is, the sixth year will be the first year of the transition [illegible]), and that the transition stage will last three years. Earnings per share and payout ratio for year 6 are forecast to be $E_6 = \$11.90$ and $p_6 = 55\%$. {Thus [illegible] 19% [= ($11.90 − $10.00)/$10.00] and $D_6 = \$6.55$ (= .55 × $11.90)}.

[illegible] last stage, known as the maturity stage, is forecast to have an earnings-[illegible] growth rate of 4% and a payout ratio of 70%. Now it was shown in [illegible] (18.51b) that with the constant-growth model, $g = r(1 - p)$, where r is [illegible] return on equity for new investment and p is the payout ratio. Given

Applying Dividend Discount Models

Over the last 30 years, dividend discount models (DDMs) have achieved broad acceptance among professional common stock investors. Although few investment managers rely solely on DDMs to select stocks, many have integrated DDMs into their security valuation procedures.

The reasons for the popularity of DDMs are twofold. First, DDMs are based on a simple, widely understood concept: The fair value of any security should equal the discounted value of the cash flows expected to be produced by that security. Second, the basic inputs for DDMs are standard outputs for many large investment management firms—that is, these firms employ security analysts who are responsible for projecting corporate earnings.

Valuing common stocks with a DDM technically requires an estimate of future dividends over an infinite time horizon. Given that accurately forecasting dividends three years from today, let alone 20 years in the future, is a difficult proposition, how do investment firms actually go about implementing DDMs?

One approach is to use constant or two-stage dividend growth models, as described in the text. However, although such models are relatively easy to apply, institutional investors typically view the assumed dividend growth assumptions as overly simplistic. Instead, these investors generally prefer three-stage models, believing that they provide the best combination of realism and ease of application.

Whereas many variations of the three-stage DDM exist, in general, the model is based on the assumption that companies evolve through three stages during their lifetimes. (Figure 18.3 portrays these stages.)

1. **Growth stage:** Characterized by rapidly expanding sales, high profit margins, and abnormally high growth in earnings per share. Because of highly profitable expected investment opportunities, the payout ratio is low. Competitors are attracted by the unusually high earnings, leading to a decline in the growth rate.
2. **Transition stage:** In later years, increased competition reduces profit margins and earnings growth slows. With fewer new investment opportunities, the company begins to pay out a larger percentage of earnings.

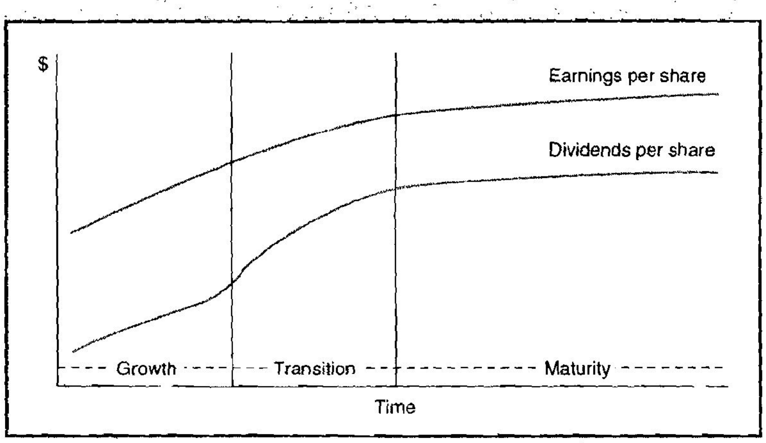


Figure 18.3
The Three Stages of the Multiple-Growth Model
Source: Adapted from Carmine J. Grigoli, "Demystifying Dividend Discount Models," *Merrill Lynch Quantitative Research*, April 1982.

3. **Maturity (steady-state) stage:** Eventually the company reaches a position where its new investment opportunities offer, on average, only slightly attractive returns on equity. At that time its earnings growth rate, payout ratio, and return on equity stabilize for the remainder of its life.

The forecasting process of the three-stage DDM involves specifying earnings and dividend growth rates in each of the three stages. Although one cannot expect a security analyst to be omniscient in his or her growth forecast for a particular company, one can hope that the forecast pattern of growth—in terms of magnitude and duration—resembles that actually realized by the company, particularly in the short run.

Investment firms attempt to structure their DDMs to make maximum use of their analysts' forecasting capabilities. Thus the models emphasize specific forecasts in the near term, when it is realistic to expect security analysts to project earnings and dividends more accurately. Conversely, the models emphasize more general forecasts over the longer term, when distinctions between companies' growth rates become less discernible. Typically, analysts are required to supply the following for their assigned companies:

1. expected annual earnings and dividends for the next several years;
2. after these specific annual forecasts end, earnings growth and the payout ratio forecasts until the end of the growth stage;
3. the number of years until the transition stage is reached;
4. the duration (in years) of the transition stage—that is, once abnormally high growth ends, the number of years until the maturity stage is reached.

Most three-stage DDMs assume that during the transition stage, earnings growth declines and payout ratios rise linearly to the maturity-stage steady-state levels. (For example, if the transition stage is ten years long, earnings growth at the maturity stage is 5% per year, and earnings growth at the end of the growth stage is 25%, then earnings growth will decline 2% in each year of the transition stage.) Finally, most three-stage DDMs make standard assumptions that all companies in the maturity stage have the same growth rates, payout ratios, and return on equity.

With analysts' inputs, plus an appropriate required rate of return for each security, all the necessary information for the three-stage DDM is available. The last step involves merely calculating the discounted value of the estimated dividends to determine the stock's "fair" value.

The seeming simplicity of the three-stage DDM should not lead one to believe that it is without its implementation problems. Investment firms must strive to achieve consistency across their analysts' forecasts. The long-term nature of the estimates involved, the substantial training required to make even short-term earnings forecasts accurately, and the coordination of a number of analysts covering many companies severely complicate the problem. Considerable discipline is required if the DDM valuations generated by a firm's analysts are to be sufficiently comparable and reliable to guide investment decisions. Despite these complexities, if successfully implemented, DDMs can combine the creative insights of security analysts with the rigor and discipline of quantitative investment techniques.

that the maturity stage has constant growth, this equation can be reformulated and used to determine r:

$$r = g/(1 - p).$$

Thus r for *ABC* has an implied value of 13.33% [= 4%/(100% − 70%)], which is assumed to be consistent with the long-run growth forecasts for similar companies.

At this point there are only two missing pieces of information that are needed to determine the value of *ABC*—the earnings-per-share growth rates and the payout ratios for the transition stage. Taking earnings per share fir... forecast that $g_{e6} = 19\%$ and $g_{e9} = 4\%$. One method of determining h... "decay" to 4% is to note that there are three years between the sixth ... years, and 15% between 19% and 4%. A "linear decay" rate would be d... by noting that 15%/3 years = 5% per year. This rate of 5% would be ... from 19% to get g_{e7}, resulting in 14% (= 19% − 5%). Then it would be ... ed from 14% to get g_{e8}, resulting in 9% (= 14% − 5%). Finally, as a check ... be noted that 4% (= 9% − 5%) is the value that was forecast for g_{e9}.

A similar procedure can be used to determine how the payout ratio ... in year 6 will grow to 70% in year 9. The "linear growth" rate will be (70... 55%)/3 years = 15%/3 years = 5% per year, indicating that $p_7 = 60\%$ (= ... + 5%) and $p_8 = 65\%$ (= 60% + 5%). Again a check indicates that 70% (... 65% + 5%) is the value that was forecast for p_9.

With these forecasts of earnings-per-share growth rates and payout ratios ... hand, forecasts of dividends per share can now be made:

$$
\begin{aligned}
D_7 &= p_7E_7 \\
&= p_7E_6(1 + g_{e7}) \\
&= .60 \times \$11.90 \times (1 + .14) \\
&= .60 \times \$13.57 \\
&= \$8.14 \\
D_8 &= p_8E_8 \\
&= p_8E_6(1 + g_{e7})(1 + g_{e8}) \\
&= .65 \times \$11.90 \times (1 + .14) \times (1 + .09) \\
&= .65 \times \$14.79 \\
&= \$9.61 \\
D_9 &= p_9E_9 \\
&= p_9E_6(1 + g_{e7})(1 + g_{e8})(1 + g_{e9}) \\
&= .70 \times \$11.90 \times (1 + .14) \times (1 + .09) \times (1 + .04) \\
&= .70 \times \$15.38 \\
&= \$10.76.
\end{aligned}
$$

18.8.2 Estimating the Intrinsic Value

Given a required rate of return on *ABC* of 12.4%, all the necessary inputs for the multiple-growth model have been determined. Hence it is now possible to estimate *ABC*'s intrinsic (or fair) value. To begin, it can be seen that $T = 8$, indicating that V_{T-} involves determining the present value of D_1 through D_8,

$$
\begin{aligned}
V_{T-} &= \left[\frac{\$.60}{(1 + .124)^1}\right] + \left[\frac{\$1.60}{(1 + .124)^2}\right] + \left[\frac{\$2.40}{(1 + .124)^3}\right] \\
&+ \left[\frac{\$3.20}{(1 + .124)^4}\right] + \left[\frac{\$5.00}{(1 + .124)^5}\right] + \left[\frac{\$6.55}{(1 + .124)^6}\right] \\
&+ \left[\frac{\$8.14}{(1 + .124)^7}\right] + \left[\frac{\$9.61}{(1 + .124)^8}\right] \\
&= \$18.89.
\end{aligned}
$$

Then V_{T+} can be determined using D_9:

$$V_{T+} = \frac{\$10.76}{(.124 - .04)(1 + .124)^8}$$

$$= \$50.28.$$

Combining V_{T-} and V_{T+} results in the intrinsic value of *ABC:*

$$\begin{aligned} V &= V_{T-} + V_{T+} \\ &= \$18.89 + \$50.28 \\ &= \$69.17. \end{aligned}$$

Given a current market price for *ABC* of \$50, it can be seen that its stock is underpriced by \$19.17 (= \$69.17 − \$50) per share. Equivalently, it can be noted that the actual price-earnings ratio for *ABC* is 29.9 (= \$50/\$1.67) but that a "normal" price-earnings ratio would be higher, equal to 41.4 (= \$69.17/\$1.67), again indicating that *ABC* is underpriced.

18.8.3 Implied Returns

As shown with the previous example, once the analyst has made certain forecasts, it is relatively straightforward to determine a company's expected dividends for each year up through the first year of the maturity stage. Then the present value of these predicted dividends can be calculated for a given required rate of return. However, many investment firms use a computerized trial-and-error procedure to determine the discount rate that equates the present value of the stock's expected dividends with its current price. Sometimes this long-run internal rate of return is referred to as the security's **implied return.** In the case of *ABC*, its implied return is 14.8%.

18.8.4 The Security Market Line

After implied returns have been estimated for a number of stocks, the associated beta for each stock can be estimated. Then for all the stocks analyzed, this information can be plotted on a graph that has implied returns on the vertical axis and estimated betas on the horizontal axis.

At this point there are alternative methods for estimating the security market line (SML).[11] One method involves determining a line of best fit for this graph by using a statistical procedure known as simple regression (as discussed in Chapter 17). That is, the values of an intercept term and a slope term are determined from the data, thereby indicating the location of the straight line that best describes the relationship between implied returns and betas.[12]

Figure 18.4 provides an example of the estimated SML. In this case the SML has been determined to have an intercept of 8% and a slope of 4%, indicating that, in general, securities with higher betas are expected to have higher implied returns in the forthcoming period. Depending on the sizes of the implied returns, such lines can have steeper or flatter slopes, or even negative slopes.

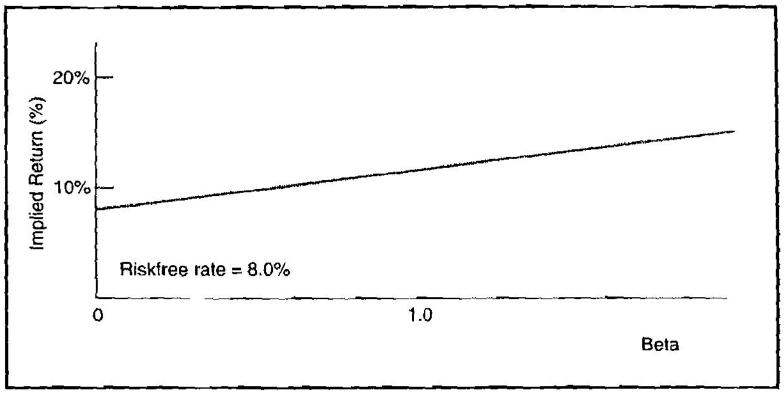


Figure 18.4
A Security Market Line Estimated from Implied Returns

The second method of estimating the SML involves calculating the implied return for a portfolio of common stocks. This is done by taking a value-weighted average of the implied returns of the stocks in the portfolio, with the resulting return being an estimate of the implied return on the market portfolio. Given this return and a beta of 1, the "market" portfolio can be plotted on a graph having implied returns on the vertical axis and betas on the horizontal axis. Next the riskfree rate, having a beta of 0, can be plotted on the same graph. Finally, the SML is determined by simply connecting these two points with a straight line.

Either of these SMLs can be used to determine the required return on a stock. However, they will most likely result in different numbers, as the two lines will most likely have different intercepts and slopes. For example, note that in the first method the SML may not go through the riskfree rate, whereas the second method forces the SML to go through this rate.

18.8.5 Required Returns and Alphas

Once a security's beta has been estimated, its required return can be determined from the estimated SML. For example, the equation for the SML shown in Figure 18.4 is:

$$k_i = 8 + 4\beta_i.$$

Thus if *ABC* has an estimated beta of 1.1, then it would have a required return equal to 12.4% [= 8 + (4 × 1.1)].

Once the required return on a stock has been determined, the difference between the stock's implied return (from the DDM) and this required return can be calculated. This difference is then viewed as an estimate of the stock's *alpha* and represents "... the degree to which a stock is mispriced. Positive alphas indicate undervalued securities and negative alphas indicate overvalued securities."[13] In the case of *ABC*, its implied and required returns were 14.8% and 12.4%, respectively. Thus its estimated alpha would be 2.4% (= 14.8% − 12.4%). Because this is a positive number, *ABC* can be viewed as being underpriced.

18.8.6 The Implied Return on the Stock Market

Another product of this analysis is that the implied return for a portfolio of stocks can be compared with the expected return on bonds. (The latter is typically represented by the current yield-to-maturity on long-term Treasury bonds.) Specifically, the difference between stock and bond returns can be used as an input for recommendations concerning asset allocation between stocks and bonds. That is, it can be used to form recommendations regarding what percent of an investor's money should go into stocks and what percent should go into bonds. For example, the greater the implied return on stocks relative to bonds, the larger the percentage of the investor's money that should be placed in common stocks.

18.9 DIVIDEND DISCOUNT MODELS AND EXPECTED RETURNS

The procedures described here are similar to those employed by a number of brokerage firms and portfolio managers.[14] A security's implied return, obtained from a DDM, is often treated as an expected return, which in turn can be divided into two components—the security's required return and alpha.

However, the expected return on a stock over a given holding period may differ from its DDM-based implied rate k^*. A simple set of examples will indicate why this difference can exist.

Assume that a security analyst predicts that a stock will pay a dividend of \$1.10 per year forever. On the other hand, the consensus opinion of "the market" (most other investors) is that the dividend will equal \$1.00 per year forever. This suggests that the analyst's prediction is a deviant or nonconsensus one.

Assume that both the analyst and other investors agree that the required rate of return for a stock of this type is 10%. Using the formula for the zero-growth model, the value of the stock is $D_1/.10 = 10D_1$, meaning that the stock should sell for ten times its expected dividend. Because other investors expect to receive \$1.00 per year, the stock has a current price P of \$10 per share. The analyst feels that the stock has a value of $\$1.10/.10 = \$11$ and thus feels that it is underpriced by $\$11 - \$10 = \$1$ per share.

18.9.1 Rate of Convergence of Investors' Predictions

[illegible] this situation the implied return according to the analyst is $\$1.10/\$10 = 11\%$. [illegible] the analyst buys a share now with a plan to sell it a year later, what rate of re[illegible] might the analyst expect to earn? The answer depends on what assumption [illegible]de regarding the *rate of convergence of investors' predictions*—that is, the an[illegible] depends on the expected market reaction to the mispricing that the analyst [illegible] currently exists.

[illegible] cases shown in Table 18.1 are based on an assumption that the analyst is [illegible] that his or her forecast of future dividends is correct. That is, in all of [illegible] the analyst expects that at the end of the year, the stock will pay the [illegible] dividend of \$1.10.

TABLE 18.1
ALPHA AND THE CONVERGENCE OF PREDICTIONS

	Expected Amount of Convergence		
	0% (A)	100% (B)	50% (C)
Dividend predictions D_2			
Consensus of other investors	1.00	1.10	1.05
Analyst	1.10	1.10	1.10
Expected stock price P_1	10.00	11.00	10.50
Expected return:			
Dividence yield D_1/P	11%	11%	11%
Capital gain $(P_1 - P)/P$	0	10	5
Total expected return	11%	21%	16%
Less required return	10	10	10
Alpha	1%	11%	6%

Note: P_1 is equal to the consensus dividend prediction at $t = 1$ divided by the required return of 10%. The example assumes that the current stock price P is \$10, and dividends are forecast by the consensus at $t = 0$ to remain constant at \$1.00 per share, whereas the analyst forecasts the dividends at $t = 0$ to remain constant at \$1.10 per share.

No Convergence

In column (A), it is assumed that other investors will regard the higher dividend as a fluke and steadfastly refuse to alter their projections of subsequent dividends from their initial estimate of \$1.00. As a result, the security's price at $t = 1$ can be expected to remain at \$10 (= \$1.00/.10). In this case the analyst's total return is expected to be 11% (= \$1.10/\$10), which will be attributed entirely to dividends as no capital gains are expected.

The 11% expected return can also be viewed as consisting of the required return of 10% plus an alpha of 1% that is equal to the portion of the dividend unanticipated by other investors, \$.10/\$10. Accordingly, if it is assumed that there will be no convergence of predictions, the expected return would be set at the implied rate of 11% and the alpha would be set at 1%.

Complete Convergence

Column (B) shows a very different situation. Here it is assumed that the other investors will recognize their error and completely revise their predictions. At the end of the year, it is expected that they too will predict future dividends of \$1.10 per year thereafter; thus the stock is expected to be selling for \$11 (= \$1.10/.10) at $t = 1$. Under these conditions, the analyst can expect to achieve a total return of 21% by selling the stock at the end of the year for \$11, obtaining 11% (= \$1.10/\$10) in dividend yield and 10% (= \$1/\$10) in capital gains.

The 10% expected capital gains result directly from the expected repricing of the security because of the complete convergence of predictions. In this case the fruits of the analyst's superior prediction are expected to be obtained all in one year. Instead of 1% "extra" per year forever, as in column (A), the analyst expects to obtain 1% (= \$.10/\$10) in extra dividend yield plus 10% (= \$1/\$10) in capital gains this year. By continuing to hold the stock in subsequent years, the analyst would expect to earn only the required return of 10% over those years. Accordingly, the expected return is 21% and the alpha is 11% when it is assumed that there is complete convergence of predictions.

Partial Convergence

Column (C) shows an intermediate case. Here the predictions of the other investors are expected to converge only halfway toward those of the analyst (that is, from \$1.00 to \$1.05 instead of to \$1.10). Total return in the first year is expected to be 16%, consisting of 11% (= \$1.10/\$10) in dividend yield plus 5% (= \$.50/\$10) in capital gains.

Since the stock is expected to be selling for \$10.50 (= \$1.05/.10) at $t = 1$, the analyst will still feel that it is underpriced at $t = 1$ because it will have an intrinsic value of \$11 (= \$1.10/.10) at that time. To obtain the remainder of the "extra return" owing to this underpricing, the stock would have to be held past $t = 1$. Accordingly, the expected return would be set at 16% and the alpha would be set at 6% when it is assumed that there is halfway convergence of predictions.

In general, a security's expected return and alpha will be larger, the faster the assumed rate of convergence of predictions.[15] Many investors use the implied rate (that is, the internal rate of return k^*) as a surrogate for a relatively short-term (for example, one year) expected return, as in column (A). In doing so, they are assuming that the dividend forecast is completely accurate, but that there is no convergence. Alternatively, investors could assume that there is some degree of convergence, thereby raising their estimate of the security's expected return. Indeed, investors could further alter their estimate of the security's expected return by assuming that the security analyst's deviant prediction is less than perfectly accurate, as will be seen next.[16]

18.9.2 Predicted versus Actual Returns

An alternative approach does not simply use outputs from a model "as is," but *adjusts* them, based on relationships between previous predictions and actual outcomes. Panels (a) and (b) of Figure 18.5 provide examples.

Each point in Figure 18.5(a) plots a *predicted return* on the stock market as a whole (on the horizontal axis) and the subsequent *actual return* for that period (on the vertical axis). The line of best fit (determined by simple regression) through the points indicates the general relationship between prediction and outcome. If the current prediction is 14%, history suggests that an estimate of 16% would be superior.

Each point in Figure 18.5(b) plots a predicted alpha value for a security (on the horizontal axis) and the subsequent "abnormal return" for that period (on the vertical axis). Such a diagram can be made for a given security, or for all the securities that a particular analyst makes predictions about, or for all the securities that the investment firm makes predictions about. Again a line of best fit can be drawn through the points. In this case, if the current prediction of a security's

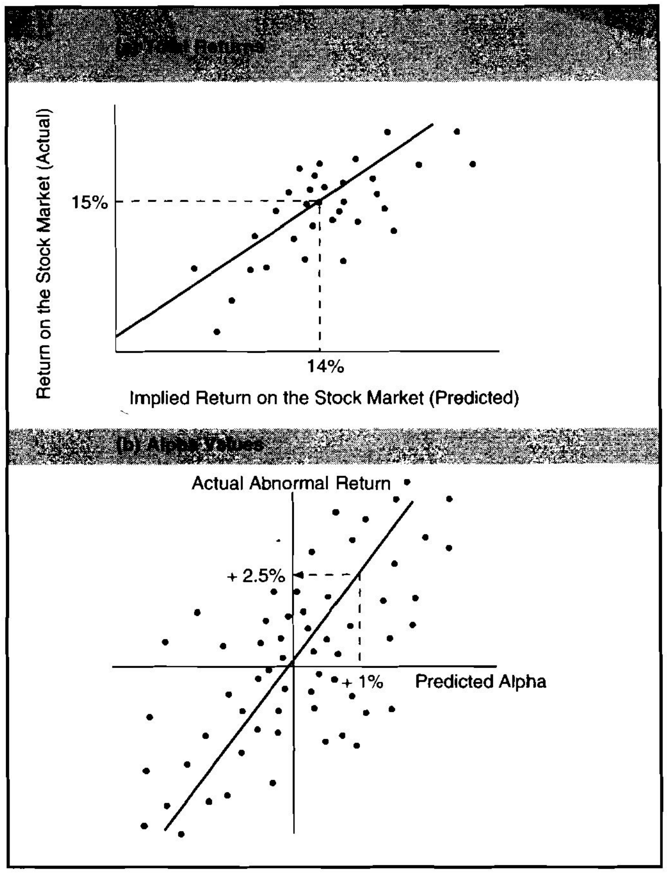


Figure 18.5
Adjusting Predictions

alpha is +1%, this relationship suggests that an "adjusted" estimate of +2.5% would be superior.

An important by-product of this type of analysis is the measure of correlation between predicted and actual outcomes, indicating the nearness of the points to the line. This **information coefficient** (IC) can serve as a measure of predictive accuracy. If it is too small to be significantly different from zero in a statistical sense, the value of the predictions is subject to considerable question.[17]

18.10 SUMMARY

1. The capitalization of income method of valuation states that the intrinsic value of any asset is equal to the sum of the discounted cash flows investors expect to receive from that asset.

2. Dividend discount models (DDMs) are a specific application of the capitalization of income method of valuation to common stocks.
3. To use a DDM, the investor must implicitly or explicitly supply a forecast of all future dividends expected to be generated by a security.
4. Investors typically make certain simplifying assumptions about the growth of common stock dividends. For example, a common stock's dividends may be assumed to exhibit zero growth or growth at a constant rate. More complex assumptions may allow for multiple growth rates over time.
5. Instead of applying DDMs, many security analysts use a simpler method of security valuation that involves estimating a stock's "normal" price-earnings ratio and comparing it with the stock's actual price-earnings ratio.
6. The growth rate in a firm's earnings and dividends depends on its earnings retention rate and its average return on equity for new investments.
7. Determining whether a security is mispriced using a DDM can be done in one of two ways. First, the discounted value of expected dividends can be compared with the stock's current price. Second, the discount rate that equates the stock's current price to the present value of forecast dividends can be compared with the required return for stocks of similar risk.
8. The rate of return that an analyst with accurate non-consensus dividend forecasts can expect to earn depends on the rate of convergence of other investors' predictions to the predictions of the analyst.

Questions and Problems

1. Consider five annual cash flows (the first occurring one year from today):

Year	Cash Flow
1	$5
2	$6
3	$7
4	$8
5	$9

Given a discount rate of 10%, what is the present value of this stream of cash flows?

2. Alta Cohen is considering buying a machine to produce baseballs. The machine costs $10,000. With the machine, Alta expects to produce and sell 1,000 baseballs per year for $3 per baseball, net of all costs. The machine's life is five years (with no salvage value). Based on these assumptions and an 8% discount rate, what is the net present value of Alta's investment?
3. Hub Collins has invested in a project that promised to pay $100, $200, and $300, respectively, at the end of the next three years. If Hub paid $513.04 for this investment, what is the project's internal rate of return?
4. Alton Products currently pays a dividend of $4 per share on its common stock.

Explaining Market-to-Book

The relative impact of firm performance, growth, and risk

By Anurag Sharma, Ben Branch, Chgetan Chgawla, and Liping Qiu

Peer Reviewed

Anurag Sharma sharma@isenberg.umass.edu is an Associate Professor of Management, Ben Branch is a Professor of Finance, Chetan Chawla is a Ph.D. Candidate in Strategic Management, and Liping Qiu is a Ph.D. Candidate in Finance, Isenberg School of Management, University of Massachusetts, Amherst.

ABSTRACT

The Market-to-Book ratio, as a rough proxy for Tobin's q, has been a common measure of firm value for over two decades. The ratio has, however, had two distinct interpretations. One emphasizes it as reflecting efficiency and growth, and the other as proxy for risk. Herein we explore these interpretations in light of the constant growth discount model. We argue that both perspectives are theoretically sound. Upon testing these interpretations, we find that efficiency and growth variables explain the bulk of the variance in the MB ratio, and the contribution of risk is both mixed and limited. Our results suggest that the MB ratio largely reflects the success of managers in delivering strong operating performance and growth in the net assets of the firm.

The relation between the firm's market price and book equity has long been of interest to researchers. The Market-to-Book (MB) ratio is widely used in the literature but in two very distinct ways. On the one hand, it is taken to indicate the value that the market places on the common equity or net assets of a company (Ceccagnoli, 2009; Lee & Makhija, 2009), or as a reflection of the ability of managers to use assets effectively and to grow the firm; on the other hand, the market-to-book ratio is linked to risk (Griffin & Lemmon, 2002; Liew & Vassalou, 2000). These two interpretations are embedded in the literatures of strategy and finance, respectively, and their use in research is driven by questions particular to the two disciplines. The drivers of both profit and risk are important for strategy scholars, of course, as managers' actions to maximize the one and control the other are considered central to creating value (Bettis, 1983; Schendel & Hofer, 1979).

Herein we explore and empirically evaluate the two interpretations of the MB ratio. First we briefly review prior research in the two traditions and then discuss the relationship in light of the constant growth dividend discount model of valuation (cf. Varaiya, Kerin & Weeks, 1987). Finally, we report the results of our empirical study where we test relative effects that various measures of risk and accounting performance have on the Market-to-Book (MB) ratio.

Background & Literature

In a seminal paper, Tobin (1969) theorized that the economy-wide rate of capital goods investment was related to the ratio (q) of the market value of assets to the replacement costs of those assets. The changes in the rate of return brought about by a changing market value in relation to replacement cost, Tobin argued, regulated the rate of investment in durable goods. Conversely, increases in the marginal efficiency of capital (rate of return) pulled up its valuation in relation to cost.

Quickly coined Tobin's q in honor of the author, this ratio of market value to reproduction cost was adapted from macroeconomics to the industry and firm level of analysis. Different authors have used slightly different formulations of Tobin's q, all in an effort to capture the theoretical argument that relates market value to the cost of replacing those assets. Yet, the literature has shown equivalence among many of the formulations generally used. In a study of 400 industrial firms from 1978 to 1983, for instance, Varaiya, Kerin and Weeks (1987) showed that market-price to book-value ratio and Tobin's q are equivalent measures of value creation both theoretically and empirically. In a study of 90 metal mining companies from 1989 through 1996, Adam and Goyal (2008) found a correlation of 0.70 between market to book-assets ratio and market to book-equity ratio.

Yet, the interpretations tended to differ in the strategy and finance literatures. In the strategy literature, for instance, the ratio is largely used to indicate the premium that the market pays for the net assets; a high MB ratio is taken to indicate a high marginal efficiency of capital (rate of return) and reflects high value-add by the management over the replacement cost of net assets. In the finance literature, where the relationship is operationalized in reverse, the Book-to-Market (BM) ratio is mainly seen as a proxy for bankruptcy risk; high BM ratio (or low MB ratio) is taken to indicate high risk to equity investors and, hence, higher the expected returns. Each is discussed below.

The earliest adaptations of Tobin's insights were in industrial organization and in the merger literature in the banking industry. Notwithstanding the significant problems in measuring the replacement costs of assets, Lindenberg and Ross (1981) used the q ratio as a proxy for the presumed monopoly rents earned by firms. Similarly, Smirlock, Gilligan, and Marshall (1984) used market-to-book to examine the structure-conduct-performance paradigm. In a different vein, the studies in banking used market-to-book as a proxy for the premium paid in mergers (Rogowski & Simonson, 1987; Cheng, Gup & Wall, 1989).

Strategy Literature

That the MB ratio incorporates both historical accounting and forward-looking market indicators of firm performance provides a theoretical rationale for using the MB ratio as a measure of performance (Lee & Makhija, 2009; Ceccagnoli, 2009; Bharadwaj, Bharadwaj, & Konsynski, 1999). Earnings manipulation and other distortions, when present, usually affect the income statement and create errors in the earnings-based accounting measures of performance (Fisher & McGowan, 1983; Amit & Wernerfelt, 1990). Book value – a balance sheet variable – mitigates that problem because it is a cumulative variable and therefore somewhat less susceptible to manipulation by managers who are usually more concerned about the bottom line reported earnings. Because of its cumulative nature, the book value is also relatively more stable than annual earnings and cash flows. Clearly, being a residual computed as net of assets and liabilities, book value too is susceptible to measurement errors in the balance sheet.[1] Yet, to the extent that such errors are not systematic, they tend to cancel out in large samples.

The MB ratio is also an attractive measure of performance because it indicates the differential between net assets of the firm and the valuation that the market assigns to them. That is, the ratio reflects the premium (or discount) that the market gives to the firm on its net assets and, as such, reflects the efficiency with which the market views the firm as being managed. High premiums suggest that every additional dollar invested in the net assets of the firm would yield attractive returns for the investors; conversely, low premiums indicate that the returns on additional investments are unlikely to be attractive. As such, consistent with the logic in Tobin's original paper, the MB ratio reflects the incentives for additional capitalinvestments to grow the firm (Goranova, Dharwadkar, & Brandes, 2010; Lenox, Rockart & Lewin, 2010; Tong & Ruer, 2006). Consequently, Market-to-Book is indicative not only of efficiency in asset utilization but also of future growth potential.

The literature on the use of MB ratio as a dependent variable has burgeoned since the mid-1980s. The tradition in the strategy literature is now well-established to use market measures and especially market-to-book ratio as a measure of firm performance (for example, (Amit & Livnat, 1988; Amit & Wernerfelt, 1990; Anand & Singh, 1997; Barton, 1988; Becker & Gerhart, 1996; Chang, 2003; Cheng, Gup, & Wall, 1989; Cho & Pucik, 2005; Dushnitsky & Lenox, 2006; Dutta, Narasimhan, & Rajiv, 1999, 2005; Fombrun & Shanley, 1990; Huselid, 1995; Huselid, Jackson, & Schuler, 1997; Kor & Mahoney, 2005; Lu & Beamish, 2004; McDonald, Khanna, & Westphal, 2008; Montgomery & Wernerfelt, 1988; Morck, Shleifer, & Vishny, 1989; Murray, 1989; Nayyar, 1992, 1993; Rogowski & Simonson, 1989; Short, Ketchen Jr, Palmer, & Hult, 2007; Tanriverdi & Venkatraman, 2005; Varaiya, Kerin, & Weeks, 1987; Welbourne & Andrews, 1996; Wiggins & Ruefli, 2002).

Numerous studies on corporate diversification have used market-to-book as a measure of firm performance (e.g., Amit & Livnat, 1988; Anand & Singh 1997; Barton, 1988; David, O'Brien, & Yoshikawa, 2008; Kumar, 2010; Lu & Beamish, 2004; Montgomery & Wernerfelt, 1988; Nayyar, 1993; Tanriverdi & Venkatraman, 2005; Wernerfelt & Montgomery, 1988). The literature on organizational slack, for instance, has often used market-to-book as a measure of firm performance (Chakravarthy, 1986; Combs & Ketchen Jr, 1999; Davis & Stout, 1992; Gibbs, 1993; Iyer & Miller, 2008; O'Brien, 2003; Pitcher & Smith, 2001; Surroca, Tribo, & Waddock, 2010; Wang, Choi, & Li, 2008; Wang, He, & Mahoney, 2009). The relationship between market price and book value of the firm has also been extensively used in the literature on top management teams (e.g., Murray, 1989; Morck, Shleifer & Vishny, 1989), and on work practices (e.g., (Becker & Gerhart, 1996; Huselid, 1995; Huselid *et al.*, 1997; Welbourne & Andrews, 1996)).

[1] Because of accounting differences across industry and firms, book value is at best an approximate measure of contributions to equity by the shareholders of the firm. See Fruhan (1979) and Vairaya et.al. (1987).

Strategy scholars have, in short, frequently used the ratio of market-to-book value as a key measure of firm performance – in terms of both efficiency and growth. For theoretical reasons as above and because of empirical precedence, along with our derivation in the section below, we expect that the market to book ratio correlates systematically with efficiency and growth measures of firm performance

Finance Literature

Scholars in Finance have seen the relationship of market-to-book value mostly as a proxy for risk and as correlating with the cross-section of returns to common equity holders. Note that, in the finance literature, the relationship is operationalized as the reciprocal of the MB ratio – as Book-to-Market (or BM ratio) – where book is the common equity or net assets. Yet, the two variables of interest, book value and market value, remain the same in the two traditions.

A few early efforts notwithstanding, it was not until the 1990s that a series of Fama and French papers spurred interest in the relationship between market and book value of the firm. In an early paper, the authors highlighted "several empirical contradictions" (1992a: 427) to the presumed sufficiency of beta (β) in explaining portfolio cross-sectional returns. Ever since, they have continued to highlight the prevailing anomalies as reflected in the disconnect between average cross-section of returns on equities and the market βs of the Sharpe (1964) and Lintner (1965) asset pricing model. The disconnect appears to hold true when using the consumption βs of the inter-temporal asset pricing model (Breeden, 1979; Reinganum, 1981; Breeden, Gibbons and Litzenberger, 1989). Furthermore, invoking Banz (1981), Bhandari (1988), Basu (1983) and Rosenberg, Reid and Lanstein (1985), Fama and French (1993) claimed that variables which aren't part of the capital asset pricing theory, such as size, leverage, earnings-to-price, and book-to-market had reliable power to explain the cross section of average returns. Of these, size and book–to-market, in particular, absorbed the roles of leverage and earnings to price, and they "proxy for common risk factors in stock returns" 1993, p. 5). They argue in effect that, to the extent that assets are priced rationally, high book-to-market reflects high risk.

The initial reaction to Fama and French (1992a, 1993) was one of skepticism, with concern that the relationship observed between book-to-market and average returns was an artifact of the sample chosen (Black, 1993; MacKinlay, 1995). Contrary out-of-sample evidence was then presented by Chan, Hamao and Lakonishok (1991), Capaul, Rowley and Sharpe (1993). In a 1998 paper, Fama and French presented data from thirteen major markets (including the U.S.) and showed return premium for value (high book-to-market) stocks in 12 of 13 of those markets. Barber and Lyon (1997) found similar value premium for financial firms. Davis (1994) presented evidence of the value premium for U.S. stocks extending back to 1941. Davis, Fama and French (2000) extend this result back to 1926 and include the whole population of NYSE industrial firms. Taken altogether, this research generally supports Fama and French (1992a, 1993).

Researchers have argued that the relationship between book-to-market and equity returns reflects a reasonable trade-off between risk and return. Assuming that the markets are efficient, they argue, the fact that high book-to-market empirically correlates with higher returns *must* mean that the book-to-market ratio reflects risk. Starting with the assumption of efficient markets, in other words, high book-to-market is argued to be a proxy for greater risk. Vassalou and Xing (2004) further support the risk-based interpretation for the book-to- market. Even though behavior finance scholars have objected (e.g., Lakonishok, Shleifer & Vishny, 1994), the proponents of the rational pricing/efficient market hypothesis have continued to defend the risk-reward linkage in the excess returns for high book-to-market stocks (Davis et.al. 2000; Malkiel, 2003; Fama & French 2006). As such, given the empirically-driven assertions in the finance literature we expect that the market-to-book ratio will correlate with alternate measures of risk.

Conceptualizing Risk

Even though book-to-market continues to be used as an important indicator of risk in the finance literature, the nature of that risk and how it ought to be measured remains unclear. Strategy scholars usually go beyond market risk to other forms of risk that a firm faces. The concern in strategy has been broadly with the risk-return tradeoff and the influence that risk may have on firm performance which is usually indicated by accounting measures. Amit and Wernerfelt (1990) may be one of the few papers in which the relationship between MB ratio (Tobin's q) and risk is directly evaluated. Following the argument in Bettis (1983) that managing business risk is at the heart of strategic management, the authors outline the motivations that firms usually have for wanting to do so. They distinguish business or unsystematic risk from systematic or market risk, and found in their empirical analysis that Tobin's q was negatively associated with business risk. That is, the lower the business risk, the higher was the market premium for the net assets.

Recognizing that firms have multiple stakeholders, scholars have disaggregated and measured risk differently in order to capture its different dimensions. For instance, widely used are variance-based measures such as the standard deviations of return on equity and return on assets (Armour & Teece, 1978; Miller & Bromiley, 1990). Cootner and Holland were among the first to advocate such measures, arguing that "the dispersion of company rates of return around the average rate of return for the industry in which they belong is an indication of the riskiness of an investment in that industry… [and] the standard deviation of such rates of return indicates to an investor the likelihood that he would fare differently from the industry average" (1963: 4).

In their analysis of alternative measures of risk, Miller & Bromiley (1990) factor analyzed nine measures and parceled risk into three broad categories. What they called income stream risk was indicated by measures such as the standard deviation of ROE. Following finance theory, they used beta to indicate market risk, and operationalized strategic risk by measures such as capital intensity. Other authors have also pursued the notion that risk is a multi-dimensional construct, as different stakeholders may be interested in different conceptions and measures of it. In this vein, Ruefli, Collins and Lacugna (1999), who conducted a survey of more than 100 papers over a 16-year period, discussed risk in two broad categories, the variance based measures and beta, both incorporated in Miller & Bromiley (1990) paper (Bloom & Milkovich, 1998).

Except for Amit and Wernerfelt (1990), research in strategy has for the most part not tried to relate risk to the market-to-book ratio. The concern has mostly been with alternative indicators of risk and with the risk-return tradeoff as in the stream spawned by Bowman (1980).

Our concern here is with using appropriate measures of risk as discussed in the literature to evaluate the extent to which the MB ratio may be an indicator of firm performance (efficiency and growth) as opposed to risk. The two distinct conceptions of the market-to-book ratio – efficiency and growth (performance) on the one hand and risk on the other – raise the question as to their relative merits. Where strategy scholars view the MB ratio as indicating managerial efficiency and future growth prospects, finance scholars emphasize the role of the MB ratio in capturing some unknown risk that is already efficiently incorporated in the cross-section of returns. To what extent, then, is the MB ratio reflective of firm performance and to what extent does it reflect risk? We address this question empirically, but guide our analysis by first discussing the relationship in light of the dividend discount model.

A Theoretical Reconciliation & Hypotheses

The relationship between the ratio of market and book value and firm level variables can be derived from the steady state constant growth dividend discount model[2] as follows:

$$\mathrm{M} = \frac{\mathrm{D} * (1+\mathrm{g})}{(\mathrm{r}-\mathrm{g})}$$

Where,

M = Market Value of Equity
D = Cash Dividends at the beginning of the year
g = Growth rate
r = Required rate of return or discount rate

As per the Capital Asset Pricing Model, the discount rate is proportional to market risk, β. Yet, as discussed above, risk is a multi-dimensional construct. Accordingly, the appropriate discount rate may reflect a broader set of risks. Later in the paper, we follow Miller and Bromiley (1990) to operationalize three risk categories as: market risk, business risk, and strategic risk.

Given that the dividend paid can be re-written as payout ratio of earnings, equation 1 yields,

$$\mathrm{M} = \frac{\mathrm{e} * \mathrm{PO} * (1+\mathrm{g})}{(\mathrm{r}-\mathrm{g})}$$

Where,

e = Total Net Earnings
PO = Payout ratio (= Cash Dividend/Total Net Earnings)

Assuming that all earnings are dividends whether disbursed or retained, and dividing both sides by book value (B), we get

$$\frac{\mathrm{M}}{\mathrm{B}} = \frac{\mathrm{ROE} * (1+\mathrm{g})}{(\mathrm{r}-\mathrm{g})}$$

Thus theoretically the market-to-book ratio incorporates both performance and risk factors. The equation above shows that the (M/B) ratio is a *positive* function of performance as indicated by return on equity[3] and growth, and also a positive function of the dividend payout ratio. Similarly, as indicated, the MB ratio is also a *negative* function of risk, as incorporated in the discount rate.

As such, based on the discount model formulation as above, we hypothesize as follows:

H1a: MB ratio will be *positively* associated with efficiency as measured by Return on Equity.

---

[2] The standard assumption embedded in the dividend discount model is that market price reflects the value of the firm as measured by appropriately discounting a growing stream of future dividends into perpetuity. In deriving their formulation, Vairaya et. al. (1987) also begin with the dividend discount model but break the discount stream into 2 components, one through period and the other up into perpetuity. In our formulation, we combine those 2 components into one.

[3] Using the standard DuPont formulation, ROE can be further broken down into 3 components as (Total Earnings/Revenues) * (Revenues/Total Assets) * (Total Assets/Common Equity) Or (Net Profit Margin * Asset Efficiency * Financial Leverage).

H1b: MB ratio will be *positively* associated with the growth rate of the firm.
H2: MB ratio will be *negatively* associated with risk.

While the steady state constant growth discount model implies that the MB ratio should vary as indicated, the relative impacts of efficiency, growth and risk are less clear. As with any ratio, the MB ratio could be raised by increasing the positive numerator (ROE) and the negative denominator (growth) or, conversely, it could be increased by decreasing its (positive) denominator (risk). Aside from this straightforward arithmetic relationship, we are not aware of any readily available theoretical guidance as to the relative impact on the MB ratio of efficiency and growth on the one hand and of risk on the other. Mathematically, at least, a decrease in risk can have the same quantitative effect on the ratio as an increase in efficiency or growth.

How much control managers have over the independent variables is important, therefore, to understanding their significance for strategic management. Managers' choices on a range of issues such as resource allocation have a direct effect on their firm's efficiency and growth (cf. Penrose, 1959). Managers are also thought to have a good deal of incentive to control business risk (cf. Amit & Wernerfelt, 1990). How much risk managers can actually control is, however, less clear – depending of course on how risk is defined and measured. Market risk measured as beta is likely to be mostly outside the direct control of the managers as is the risk associated with the fundamental nature of the business (e.g., capital intensity). The risk that the managers are likely to be able to control is the variability in the returns, although that too may be influenced to a large degree by industry and economy-wide forces of supply and demand and, as such, outside the direct control of the managers.

In effect, managerial action may have more impact on efficiency and growth than on risk. As such, to the extent that the market valuations capture value-add by managers rather than risk factors outside their control, we would expect the MB ratio to be more strongly associated with the efficiency and growth variables in the constant growth discount model. Consequently, our third set of testable hypotheses are:

H3a: MB ratio will be more strongly associated with firm profitability than with risk.

H3b: MB ratio will be more strongly associated with firm growth rate than with risk.

The empirical model with which we test the above hypotheses is as follows:[4]

$$\frac{M}{B} = \alpha + \beta_1 * \text{ROE} + \beta_2 * \text{Growth Rate} + \beta_3 * \text{Risk} + \varepsilon$$

As such, our hypotheses can be expressed as the following statistical inequalities. H1a: $\beta 1>0$ and H1b:$\beta 2>0$; H2: $\beta 3<0$; H3a: $|\beta 1|>|\beta 3|$ and H3b: $|\beta 2|>|\beta 3|$. We test the hypotheses using the methods described below.

Data & Analysis

[4] Our formulation is very similar to that of Varaiya et.al. (1987), who combined ROE and required rate of equity return (risk) into a single spread (ROE-r). In effect, they restricted the coefficients on both variables. We test these separately.

We begin our empirical testing of the three hypotheses by constructing a database (from COMPUSTAT) consisting of the S&P 500 companies, for the period 2000-2009. The mid-sized and large companies contained in the index represent about two-thirds of the market valuation in the United States. Each year after 2000, the membership of our sample was revised to reflect changes in the index's composition. Periodic updates maintain the index's basic character as reflecting the overall domestic equities market. By following the S&P's membership over time, we were able to work with a set of companies which S&P selected in order to track the overall economy and, as such, minimize the risk of selection bias in our sample. Accordingly our dataset is a well-structured representative sample of large to midsized U.S. companies.

Operationalization of Variables

Market-to-Book, the dependent variable, was computed as the market value of the firm divided by the total common equity of the firm as of the end of its fiscal year.

Independent Variables

Return on Equity (ROE)[5]: Total Net Income divided by Total Common Equity as of the end of the fiscal year. As discussed above, we also used the DuPont formulation to decompose ROE into its 3 components, Profitability, Asset Efficiency, and Financial Leverage.

Dividend Payout Ratio (PO): Annual Cash Dividends divided by Total Net Income as of the end of the fiscal year.

Growth Rate (GR): Rate of the growth of book value per share for the firm over a 7 year period leading up to the year of analysis.

Risk (Multiple Measures): Given the multiple formulations of risk in the literature, we used different measures for different definitions of risk. We also tested our empirical analysis for robustness by using different computations for the same definition. For instance, we computed systematic or market risk, beta, using both CAPM and the market model. The main results did not change from using alternate measures. Appendix 1 shows the different formulations of risk.

Control Variables

Firm size, overall MB ratios of the market and industry sectors may potentially influence the dependent variable, therefore the following control variables were incorporated in the regression equations.

Size (MVAL): Company size was operationalized as the market valuation of the common equity of the firm, computed as price per share multiplied by total common shares outstanding as of the end of the fiscal year.

Market Level (Sample MB): The overall level of the market in any given year during the period of analysis was the average Market-to-Book ratio for that year.

---

[5] We also computed the three components of ROE as in the DuPont model. *Profitability (ROS)*: Total Net income divided by Revenues as of the end of the fiscal year. *Asset Turnover (ATO)*: Revenues divided by Total Assets as of the end of the fiscal year. *Leverage (LEV)*: Total Assets divided by Common Equity as of the end of the fiscal year. Each was standardized and windsorized for inclusion in a separate regression model, the results of which are reported later in the paper.

Industry (Financial Sector): This is a dummy variable coded as 1 if the firm was in the financial services sector (2-digid SIC or Major Group 60-69)

In order to be able to compare the relative effects on the Market-to-Book ratio, all variables

(except the overall Market Level and the dummy for the Financial Sector) were standardized and windsorized by each year to within 3 standard deviations of the mean.

Analysis & Results

The average Market-to-Book (MB) ratio during the study period varied from a high of 5.54 in 2004 to a low of 2.36 in 2008 (Table 1). The trends in these numbers also reflect the first recession in the study period when the ratio fell from 5.26 in 2001 to 2.76 in 2003; and then the second recession when the ratio fell from 5.54 in 2004 to 2.36 in 2008. The variation in the medians was less pronounced but was similar to the average. To capture the cyclical nature of MB, its average value for each year was included as a control variable in our regressions.[6]

The last column in Table 1 shows the GDP growth rates for the period of our study. According to the Bureau of Economic Analysis, the U.S. economy grew at the rate of 4.1% in 2000, but dropped to 1.1% in 2001 and then grew at the rates of 1.8%, 2.5% and 3.5% the following three years. The growth rate slowed to 3.1% in 2005 and was 2.7%, 1.0%, -0.3% and -3.5 percent during the following four years. As such, we divided the sample into 2 periods: Up Cycle (2001-2004) and Down Cycle (2005-2009) to reflect the growing and slowing periods in the overall economy. We also created a subsample Recession (2007-2009) for the period when the growth rate fell particularly sharply. The regression analysis for each of the three periods is reported later in this section.

[6] These data reflect historical trends as in two other studies that have analyzed the changes in market-to-book ratios over the years. Branch and Gale (1983) show that the average MB value for the largest 600 industrial companies declined from about 2.3 in 1968 to about 1.0 in 1981. Branch, Sharma, Gale, Chichirau, & Proy (2005) show that the average MB for their S&P 500 sample rose from about 1.0 at the end of 1980 to about 5.0 by 2000.

Table 1

Profit or Risk?

Market-to-Book Ratio[1] and GDP Growth Rate

Year	Med	Avg	Stdev	GDP GR[2]		
2000	3.00	5.26	12.50	4.10%		
2001	2.74	4.13	11.28	1.10%	UpCycle	
2002	2.24	2.80	11.06	1.80%		
2003	2.66	2.76	14.59	2.50%		
2004	2.74	5.54	37.45	3.50%		
2005	2.69	3.76	8.08	3.10%	DownCycle	
2006	2.77	4.09	12.05	2.70%		
2007	2.82	4.45	18.08	1.90%		Recession
2008	1.71	2.36	5.05	-0.30%		
2009	2.09	3.80	19.38	-3.10%		

1. Market Value of Equity / Book Value of Equity

2. Annual growth rate from the Bureau of Economic Analysis (bea.gov)> Revision December 2012. Subsequent growth rates are : 2.4% (2010) & 1.8% (2011).

Full sample correlations among the variables are shown in Table 2. All the regressions were checked for autocorrelation using the Durbin-Watson statistic, which are reported in the regression tables. All the regressions were also found to be free of multicollinearity, when checked using the correct option in the SAS regression codes.

TABLE 2
Profit or Risk?
Full Sample Correlations

		1	2	3	4	5	6	7	8	9	10
1	MB Ratio	1	-0.02	0.11***	-0.09***	0.02	0.42***	0.05***	0.03**	0.08***	-0.06***
2	Market Level		1	0.00	-0.05***	-0.02	0.00	0.00	-0.01	0.00	0.00
3	Firm Size			1	0.05***	0.05***	0.05***	0.05***	-0.03**	-0.08***	0.04***
4	Financial Sector				1	0.03*	-0.02	0.04***	0.04***	-0.10***	-0.15***
5	Payout Ratio					1	0.05***	0.02	-0.09***	-0.06***	0.01
6	Return on Equity						1	-0.10***	0.01	0.12***	-0.02
7	Firm Growth Rate							1	-0.01	-0.39***	0.06***
8	Market Risk								1	0.04**	-0.01
9	Business Risk									1	-0.02
10	Strategic Risk										1

***Significant at 1% level
**Significant at 5% level
*Significant at 10% level

Table 3 contains the results of regression analysis for the full sample in three parts, with different combinations of variables. All regressions used Overall Market MB ratio, Firm Size, and a dummy variable for the financial sector as control variables. Table 3a contains a regression with only the firm performance variables as measured by return on equity and firm growth. As shown, the model has an adjusted R-Square of 21.11% and is highly significant with F-Statistic of over 214. Return on Equity and Firm Growth Rate were both highly and positively significant, as expected, as were the control variables of Firm Size and Financial Sector dummy.

Table 3b shows a regression with the control and risk variables only. As shown, the model has an adjusted R-Square of 3.36% and is statistically significant (F-Statistic of over 27). All three risk measures are significant at the 5% level or better. As expected in accordance with the discount model, Strategic Risk was negatively related to MB ratio; however, Market Risk and Business Risk were both positively associated with the dependent variable. The positive sign of Market Risk is surprising as it suggests that market valuation of net assets is higher for firms with higher variability in returns vis-à-vis benchmark returns. Business Risk, measured by the standard deviation of historical ROE, is also a surprise and suggests that the market valuation of equity is higher for firms with higher variation in their performance as measured by the accounting metric of ROE. Both of these results were obtained repeatedly in our different regression models and suggest that the market assigns a premium to the variance in relative returns and variance in accounting performance – perhaps because of the option value such variance may reflect. We discuss these surprising findings later in the paper.

Table 3c contains regression results for the full model that incorporates both performance and risk variables in the previous 2 tables. As shown, the model has an adjusted R-Square of 21.27% and is statistically significant (F-Statistic of nearly 138). Once again, both Return on Equity and Firm Growth Rate are highly significant, as are all three measures of risk. Market risk is positive and significant with a t-statistic of 2.33 and Business Risk is also positive and highly significant (t-statistic of 6.14); Strategic Risk, on the other hand, has a negative t-statistic of 5.70 and is therefore highly significant in the expected direction. Note also that the adjusted R-Square for the full model (Table 3c) is not much higher than the model that includes only the performance variables (Table 3a); the marginal increase in explanatory power is 0.16 percent. Clearly, the inclusion of risk variables improved the performance model only marginally.[7]

[7] We also ran the full model with ROE decomposed into its 3 components as in the DuPont formulation. The adjusted R-Square increased to 27 percent, and the results of the previous regressions were unchanged. The three components of ROE were all positive and highly significant and in the same direction as in the previous regressions; Return on Sales (t-statistic 12.95), Asset Efficiency (t-statistic 12.77), and Leverage (t-statistic 34.86). Moreover, firm growth rate was positive and significant (t-statistic 4.09); and the risk variables were all significant and in the same direction as in the previous regressions. Finally, the marginal impact of the three risk variables was 1.48 percent.

TABLE 3

Profit or Risk?

Full Sample Regressions

Table 3a

Eff & Growth Model

	Coeff	T-Stat	
Intercept	0.0573	1.90	**
Overall Market	-0.0132	-1.60	
Firm Size	0.0511	6.57	***
Financial Sector	-0.1132	-7.35	***
Payout Ratio	-0.0024	-0.23	
Return on Equity	0.4752	33.79	***
Growth Rate	0.0622	6.89	***
R Square	21.21%		
Adj. R-Square	21.11%		
Durbin-Watson	1.9350		
F - Statistic	214.45		

Table 3b

Risk Model

	Coeff	T-Stat	
Intercept	0.0633	1.86	*
Overall Market	-0.0169	-1.80	*
Firm Size	0.0739	8.47	***
Financial Sector	-0.1187	-6.70	***
Market Risk	0.0138	2.03	**
Income Risk	0.0811	5.53	***
Strategic Risk	-0.0659	-5.17	***
R Square	3.49%		
Adj. R-Square	3.36%		
Durbin-Watson	1.948		
F - Statistic	27.45		

Table 3c

Full Model

	Coeff	T-Stat	
Intercept	0.0647	2.10	**
Overall Market	-0.0157	-1.85	*
Firm Size	0.0581	7.38	***
Financial Sector	-0.1162	-7.24	***
Payout Ratio	0.0090	0.84	
Return on Equity	0.4577	31.13	***
Growth Rate	0.0942	8.89	***
Market Risk	0.0144	2.33	**
Income Risk	0.0901	6.14	***
Strategic Risk	-0.0655	-5.70	***
R Square	21.43%		
Adj. R-Square	21.27%		
Durbin-Watson	1.925		
F - Statistic	136.65		
Marginal Impact of Risk Vas on Adj R-Sq	0.16%		

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

In addition to regressions on the full sample, we also undertook subsample analysis along 2 lines. First, we ran the full model (Table 3c) within 3 sectors: manufacturing, non-financial services, and all services. As shown in Table 4a, the previous results of the full sample were replicated for the most part within the manufacturing sector. That is, the performance variables dominated the regressions and the risk variables had a marginal impact in explaining variance in the model. The total variance (adjusted R^2) explained by the model (Table 4a) was 30.38% and the F-statistic for the model was 113; the marginal impact of the risk variables on explained variance was 3.01 percent. Once again, Return on Equity and Growth Rate were positive and highly significant. Market Risk was not statistically significant, Business Risk was positive and significant and Strategic Risk was negative and significant.

The full model for non-financial services companies is shown in Table 4b. The total variance explained by the model was 11.08% and F-statistic for the model was 25; the marginal impact of the risk variables on explained variance was 1.73 percent. Return on Equity was positive and highly significant but Growth Rate was not statistically significant; dividend Payout Ratio was negative and statistically significant. Among the risk variables, Market Risk was positive and significant whereas both Business Risk and Strategic Risk were statistically significant and negative.

The full model for all services firms is shown in Table 4c. The total variance explained by the model was 7.42% and the F-statistic for the model was 23; the marginal impact of the risk variables on explained variance was 0.63 percent. Return on Equity was positive and highly significant but Growth Rate was not statistically significant; dividend Payout Ratio was negative and statistically significant. Among the risk variables, Market Risk was positive and significant and Strategic Risk was negative and statistically significant. Business Risk was not significant.

Overall, our regression model explained over 30 percent of the variance in the sample of manufacturing firms as opposed to just above 11 percent for non-financial service firms and under 7.5 percent for all service firm sample. This difference in the model fit could be attributed the greater diversity of firms in the non-manufacturing sector.

TABLE 4

Profit or Risk?

Regressions by Sector

	Table 4a Manufacturing			Table 4b Non-Fin Services			Table 4c All Services		
	Coeff	**T-Stat**		**Coeff**	**T-Stat**		**Coeff**	**T-Stat**	
Intercept	0.0621	1.18		0.07928	1.59		0.0133	0.36	
Overall Market	-0.0108	-0.75		-0.02855	-2.07	**	-0.0180	-1.76	*
Firm Size	0.0839	6.42	***	0.04478	3.44	***	0.0289	3.04	***
Payout Ratio	0.0246	1.40		-0.04611	-2.47	**	-0.0268	-2.03	**
Return on Equity	0.5170	25.63	***	0.31202	11.65	***	0.2773	12.00	***
Growth Rate	0.2082	11.59	***	0.01665	1.03		0.0066	0.51	
Market Risk	0.0058	0.54		0.03571	3.72	***	0.0220	3.09	***
Income Risk	0.2039	9.14	***	-0.06248	-2.79	***	-0.0243	-1.29	
Strategic Risk	-0.0893	-2.60	***	-0.0667	-3.31	***	-0.0421	-2.49	**
R Square	30.65%			11.54%			7.75%		
Adjusted R Square	30.38%			11.08%			7.42%		
Durbin-Watson	1.939			1.792			1.833		
F - Statistic	112.69			25.02			23.47		
Marg Impact of Risk Vars on Adj RSq	3.01%			1.73%			0.63%		

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

In the second subsample analysis, the full sample was divided on the basis of business cycles. As shown in Table 5a for the Up Cycle (2001-2004), the total variance explained by the model was 30% and (F-statistic for the model was 89); the marginal impact of the risk variables on explained variance was 1.84 percent. As in the other regressions, both ROE and Growth Rate were positive and highly significant. Also as in most other regressions, Strategic Risk was significant and negative, whereas, again, Business Risk was positive and significant.

As shown in Table 5b for the Down Cycle (2005-2009), the total variance explained by the model was 13.66 % and the F-statistic for the model was 40; the marginal impact of the risk variables on explained variance was 0.62 percent. Again, both ROE and Growth Rate were positive and highly significant. Market Risk was not significant, Business risk was significant and positive, and Strategic Risk was.

We evaluated a sub-period of Recession (2007-2009) within the Down Cycle and the results for that analysis are shown in Table 5c. The total variance explained by the model was 12.35% and (F-statistic for the model was 21); the marginal impact of the risk variables on explained variance was 0.23 percent. Again, both ROE and Growth Rate were positive and highly significant. Market Risk and Business Risk were both insignificant and positive, and Strategic Risk was negative and significant.

Overall, across the regressions, we found strong and consistent relationships in the expected directions for performance variables: Return on Equity was strongly positive in all of the regressions and the Growth Rate was strongly positive in all the regressions except those focused on the service sector. Moreover, Return on Equity dominated the regressions, producing by far the largest effect size of all the variables in the equation (producing, for instance, almost 5 times the effect size of growth rate in the full sample model). As such, Hypothesis 1a is strongly supported and Hypothesis 1b is supported outside of the service sector.

We found that risk variables added only marginally (3.01% or less) to explained variance in the dependent variable. Among the risk variables, Strategic Risk was consistently negative and significant across all regressions; Market Risk was positive and significant in the full model and in the service sector but not in the other regressions; Business Risk was positive and significant in the full model and in the Up Cycle and Down Cycle regressions as well as in the manufacturing sector but negative in the non-financial service sector. As such, Hypothesis 2 is partially supported in our regression analyses.

TABLE 5

Profit or Risk?

Regressions by Stage of Business Cycle

	Table 5a			Table 5b			Table 5c		
	UpCycle: 2001-2004			DownCycle: 2005-2009			Recession: 2007-2009		
	Coeff	**T-Stat**		**Coeff**	**T-Stat**		**Coeff**	**T-Stat**	
Intercept	0.2514	4.29	***	0.0205	0.40		0.0204	0.37	
Overall Market	-0.0620	-3.86	***	-0.0087	-0.57		-0.0119	-0.67	
Firm Size	0.0540	5.02	***	0.0349	2.87	***	0.0434	2.70	***
Financial Sector	-0.1175	-5.63	***	-0.1204	-4.62	***	-0.0907	-2.38	**
Payout Ratio	0.0038	0.27		0.0337	1.86	*	0.0416	1.35	
Return on Equity	0.4590	26.09	***	0.4257	15.68	***	0.4208	11.82	***
Growth Rate	0.1022	7.04	***	0.1052	6.44	***	0.0908	4.20	***
Market Risk	0.0137	1.64		0.0131	1.35		0.0064	0.52	
Income Risk	0.0839	4.76	***	0.0638	2.31	**	0.0320	0.87	
Strategic Risk	-0.0815	-5.13	***	-0.0582	-3.37	***	-0.0500	-2.29	**
R Square	30.33%			14.01%			12.96%		
Adjusted R Square	29.99%			13.66%			12.35%		
Durbin-Watson	1.923			1.930			1.88		
F - Statistic	89.15			40.01			21.26		
Marg Impact of Risk Vars on Adj RSq	1.84%			0.62%			0.23%		

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

Finally, in order to test Hypothesis 3, we compared the standardized coefficients of key variables in the equation. As shown in Table 6, we found that the coefficient for Return on Equity was statistically larger (at levels $p<0.001$ or higher) than those of each of the 3 risk variables. Hence, our analysis strongly supports Hypothesis H3a. The coefficient for Growth rate was statistically larger than the risk variables in 11 of 21 instances as shown in Table 6. Hence, our analysis partially supports Hypothesis h3b.

Table 6

Profit or Risk?

Comparison of Coefficients by Table*

	Table 3c	Table 4a	Table 4b	Table 4c	Table 5a	Table 5b	Table 5c
H3a: |β 1| > |β 3|							
Return on Eauity vs. Market Risk	769.78***	504.99***	92.09***	109.11***	516.73***	203.49***	121.10***
Return on Eauity vs. Business Risk	289.03***	99.68***	56.92***	78.53***	235.42***	70.04***	51.05***
Return on Equity vs.Strategic Risk	435.22***	112.77***	52.05***	65.35***	250.17***	129.56***	76.99***
H 3a: |β 2| > |β 3|							
Firm Growth Rate vs. Market Risk	42.19***	91.38***	1.04	1.08	27.54***	23.88***	11.89***
Firm Growth Rate vs. Business Risk	0.08	0.04	2.05	0.45	1.06	2.50	2.89*
Firm Growth Rate vs.Strategic Risk	3.60*	9.69***	3.82*	2.82*	0.99	4.12**	1.87

* The table reports the results of comparing the absolute values of the coefficients. Cells contain F-Values

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

Table 7

Profit or Risk?

Summary of Results

	Exp. Sign	Table 3a	Table 3b	Table 3c	Table 4a	Table 4b	Table 4c	Table 5a	Table 5b	Table 5c	**Results**
H1a: β 1 > 0											
Return on Equity (ROE)	(+)	(+) ***	na	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	Full Support
H1b: β 2 > 0											
Growth Rate	(+)	(+) ***	na	(+) ***	(+) ***	x	x	(+) ***	(+) ***	(+) ***	Full Support
H2: β 3 <0											
Market Risk	(-)	na	(+) **	(+) **	x	(+) ***	(+) ***	x	x	x	Reject
Business Risk	(-)	na	(+) ***	(+) ***	(+) ***	(-) ***	x	(+) ***	(+) **	x	Reject
Strategic risk	(-)	na	(-) ***	(-) ***	(-) ***	(-) ***	(-) **	(-) ***	(-) ***	(-) **	Full Support
H3a: |β 1| > |β 3|											
ROE vs Market Risk	(+)	na	na	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	Full Support
ROE vs Business Risk	(+)	na	na	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	Full Support
ROE vs Strategic Risk	(+)	na	na	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	(+) ***	Full Support
H 3a: |β 2| > |β 3|											
Growth Rate vs Market Risk	(+)	na	na	(+) ***	(+) ***	x	x	(+) ***	(+) ***	(+) ***	Part Support
Growth Rate vs Business Risk	(+)	na	na	x	x	x	x	x	x	(+) *	Part Support
Growth Rate vs Strategic Risk	(+)	na	na	(+) *	(+) ***	(+) *	(+) *	x	(+) **	x	Part Support

***Significant at 1% level

**Significant at 5% level

*Significant at 10% level

Discussion & Conclusion

The Market-to-Book ratio, an imperfect proxy for Tobin's q, has been used as a key variable in various studies for well over two decades. The ratio has, however, been subject to two distinct interpretations, with one emphasizing its use as a measure of efficiency and growth and the other its use as a proxy for a type of risk. We have explored these interpretations in light of the steady state constant growth discount model. We submit that the MB ratio is a theoretically sound construct that derives from the discount model which is theoretically associated with efficiency, growth and risk. We find that the relationship between market value and book equity reflects managerial value-add as indicated by the return on equity and growth rate: the more effective the use of book equity and the faster the growth rate of the firm, the higher was the MB ratio in our sample. Similarly, we found that the MB ratio is negatively associated with strategic risk: the higher this risk, the lower was the MB ratio for the firm.

To our surprise, however, both Market Risk, measured as β, and Business Risk, measured as standard deviation of ROE, tended to be positively associated with the MB ratio. This positive association was strong and consistent across several different regression models, including the full model using the full sample (Table 3c). Contrary to our expectation that the MB ratio would be negatively associated with risk (here measured as β and variability of return on equity), this result suggests that the market rewarded companies with high variance in market and accounting returns: the higher the variability, the higher the MB ratio.

To explore this result further, we regressed ROE against Business Risk, and found strong positive association between the two in all cases. That is, firms with higher variability in their accounting performance were also more profitable. The variance explained in these regressions was very small, however, ranging from just 1.10% when controlling for non-financial services to 1.21% when controlling for the manufacturing sector. Even so, the positive association between variability of returns is the same directionally as the positive association between variability and market valuation.

One potential explanation for this result is that, if cast as an option, equity valuations may be bid up by risk-seeking equity investors. That is, higher variability may be attractive to equity investors because of the potential for higher returns and, therefore, may lead to higher market valuations.

The above explanation is not consistent with Bowman's paradox, which suggests a negative relationship between standard deviation and mean values of ROE. The difference in results may be because Bowman operationalized performance as the mean of historical ROE figures and computed the variance around that mean, whereas we measure ROE in the year of analysis and the variance is based on historical ROE over 7 years. Note that Bowman's paradox remains controversial, as some have found support for it (Wiseman & Bromiley, 1991; Andersen, Denrell & Bettis, 2007), while others have objected to it on methodological grounds (Marsh & Swanson, 1984; Ruefli, 1990; Henkel, 2009). Given that the issue is not the focus of our research, we leave it to be fleshed out systematically by other researchers. Our analysis suggests that consistent with the discount model our measure of strategic risk is appropriately negatively associated with the MB ratio. The positive signs on Market and Business Risk is intriguing and needs to be investigated further.

Overall, our results also indicate that efficiency and growth account for the bulk of the explained variance in the MB ratio. The variance explained by our measures of risk is only marginal. This is an intriguing result indicating that the MB ratio mostly reflects the success of managers in delivering strong operating performance and growth in the net assets of the firm. In this sense, strategy scholars are perhaps justified in using the MB ratio as a measure of firm performance.

The result that the risk variables, while significant for the most part (15 of 21 instances), only marginally explain variance in the MB ratio is surprising as are the signs for Market Risk and Business Risk as defined.

Our empirical analysis explains about 20% of the variance in the MB ratio, with the remainder unaccounted for. Clearly, important variables may not be included in our simple model. Moreover, the market based MB ratio is forward looking whereas our variables are all historical given our intent to tease out the relative effects of efficiency and growth on one hand and of risk on the other. Perhaps future research would improve upon our results by incorporating future oriented measures.

The measures we have used may not fully capture the risk relationships. Future research should extend the analysis to samples that include smaller firms and perhaps to samples of firms in other geographic regions. Additional variables implied by the discount model and alternate ways of operationalizing efficiency, growth and risk may also improve research in this area.

Such extension possibilities notwithstanding, our research addresses an important issue that has been in two distinct literatures for well over two decades. Using the parsimonious steady state constant growth discount model from corporate finance, we have explored two distinct conceptions of the relationship between market price and book equity. In addition, we have provided empirical evidence with respect to the relative significance for the MB ratio of efficiency and growth measures on the one hand and risk on the other. We hope future efforts in this area will shed further light on the relative importance of these relationships.

REFERENCES

Adam, T., and V. K. Goyal. "The Investment Opportunity Set and Its Proxy Variables." *Journal of Financial Research* 31.1 (2008): 41. Print.

Amit, R., and J. Livnat. "Diversification and the Risk-Return Trade-Off." *Academy of Management Journal* 31.1 (1988): 154-66. Print.

Amit, R., and B. Wernerfelt. "Why Do Firms Reduce Business Risk?" *Academy of Management Journal*.Journal Article (1990): 520-33. Print.

Anand, J., and H. Singh. "Asset Redeployment, Acquisitions and Corporate Strategy in Declining Industries." *Strategic Management Journal* 18.Journal Article (1997): 99-118. Print.

Andersen, T. J., J. Denrell, and R. A. Bettis. "Strategic Responsiveness and Bowman's Risk-Return Paradox." *Strategic Management Journal* 28.4 (2007): 407-29. Print.

Armour, H. O., and D. J. Teece. "Organizational Structure and Economic Performance: A Test of the Multidivisional Hypothesis." *The Bell Journal of Economics* 9.1 (1978): 106-22. Print.

Banz, R. W. "The Relationship between Return and Market Value of Common Stocks." *Journal of Financial Economics* 9.1 (1981): 3-18. Print.

Barber, B. M., and J. D. Lyon. "Firm Size, Book-to-Market Ratio, and Security Returns: A Holdout Sample of Financial Firms." *Journal of Finance* 52.2 (1997): 875-83. Print.

Barton, S. L. "Diversification Strategy and Systematic Risk: Another Look." *Academy of Management Journal* 31.1 (1988): 166-75. Print.

Basu, S. "The Relationship between Earnings' Yield, Market Value and Return for Nyse Common Stocks: Further Evidence." *Journal of Financial Economics* 12.1 (1983): 129-56. Print.

Becker, B., and B. Gerhart. "The Impact of Human Resource Management on Organizational Performance: Progress and Prospects." *Academy of Management Journal* 39.4 (1996): 779-801. Print.

Bettis, R. A. "Performance Differences in Related and Unrelated Diversified Firms." *Strategic Management Journal* 2.4 (1981): 379-93. Print.

Bhandari, L. C. "Debt/Equity Ratio and Expected Common Stock Returns: Empirical Evidence." *Journal of Finance*.Journal Article (1988): 507-28. Print.

Bharadwaj, A. S., S. G. Bharadwaj, and B. R. Konsynski. "Information Technology Effects on Firm Performance as Measured by Tobin's Q." *Management Science* (1999): 1008-24. Print.

Black, F. "Return and Beta." *Journal of Portfolio Management* 20.Journal Article (1993): 8-8. Print.

Bloom, M., and G. T. Milkovich. "Relationships among Risk, Incentive Pay, and Organizational Performance." *Academy of Management Journal* 41.3 (1998): 283-97. Print.

Bowman, E. "A Risk/Return Paradox for Strategic Management." *Sloan management review* (1980): 17-3. Print.

Branch, B., and B. Gale. "Linking Corporate Stock Price Performance to Strategy Formulation." *Journal of Business Strategy* 4.1 (1983): 40-50. Print.

Branch, B., et al. "Explaining Price to Book." *Business Quest* (2005). <westga.edu/~bquest/2005/Model.pdf >.

Breeden, D. T. "An Intertemporal Asset Pricing Model with Stochastic Consumption and Investment Opportunities." *Journal of Financial Economics* 7.3 (1979): 265-96. Print.

Breeden, D. T., M. R. Gibbons, and R. H. Litzenberger. "Empirical Test of the Consumption-Oriented Capm." *Journal of Finance* (1989): 231-62. Print.

Capaul, C., I. Rowley, and W. F. Sharpe. "International Value and Growth Stock Returns." *Financial Analysts Journal* 49.1 (1993): 27-36. Print.

Ceccagnoli, M. "Appropriability, Preemption, and Firm Performance." *Strategic Management Journal* 30.1 (2009): 81-98. Print.

Chakravarthy, B. S. "Measuring Strategic Performance." *Strategic Management Journal* 7.5 (1986): 437-58. Print.

Chan, L. K. C., Y. Hamao, and J. Lakonishok. "Fundamentals and Stock Returns in Japan." *Journal of Finance*.Journal Article (1991): 1739-64. Print.

Chang, S. J. "Ownership Structure, Expropriation, and Performance of Group-Affiliated Companies in Korea." *The Academy of Management Journal* 46.2 (2003): 238-53. Print.

Cheng, D. C., B. E. Gup, and L. D. Wall. "Financial Determinants of Bank Takeovers." *Journal of Money, Credit & Banking* 21.4 (1989). Print.

Cho, H. J., and V. Pucik. "Relationship between Innovativeness, Quality, Growth, Profitability, and Market Value." *Strategic Management Journal* 26.6 (2005): 555-75. Print.

Combs, J. G., and D. J. Ketchen Jr. "Explaining Interfirm Cooperation and Performance: Toward a Reconciliation of Predictions from the Resource-Based View and Organizational Economics." *Strategic Management Journal* 20.9 (1999): 867-88. Print.

Cootner, P. J., and D. Holland. "Risk and Rate of Return." *Massachusetts Institute of Technology, DSR Project* 9565 (1963). Print.

Daniel, K., and S. Titman. "Evidence on the Characteristics of Cross Sectional Variation in Stock Returns." *Journal of Finance* 52.1 (1997): 1-33. Print.

David, P., J. P. O'Brien, and T. Yoshikawa. "The Implications of Debt Heterogeneity for R&D Investment and Firm Performance." *The Academy of Management Journal* 51.1 (2008): 165-81. Print.

Davis, G. F., and S. K. Stout. "Organization Theory and the Market for Corporate Control: A Dynamic Analysis of the Characteristics of Large Takeover Targets, 1980-1990." *Administrative Science Quarterly* 37.4 (1992): 605-33. Print.

Davis, J. L. "The Cross-Section of Realized Stock Returns: The Pre-Compustat Evidence." *Journal of Finance* 49.5 (1994): 1579-93. Print.

Davis, J. L., E. F. Fama, and K. R. French. "Characteristics, Covariances, and Average Returns: 1929 to 1997." *The Journal of Finance* 55.1 (2000): 389-406. Print.

De Bondt, W. F. M., and R. H. Thaler. "Further Evidence on Investor Overreaction and Stock Market Seasonality." *Journal of Finance* 42.3 (1987): 557-81. Print.

Dushnitsky, G., and M. J. Lenox. "When Does Corporate Venture Capital Investment Create Firm Value?" *Journal of Business Venturing* 21.6 (2006): 753-72. Print.

Dutta, S., O. Narasimhan, and S. Rajiv. "Conceptualizing and Measuring Capabilities: Methodology and Empirical Application." *Strategic Management Journal* 26.3 (2005): 277-85. Print.

---. "Success in High-Technology Markets: Is Marketing Capability Critical?" *Marketing Science* 18.4 (1999): 547-68. Print.

Fama, E. F., and K. R. French. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics* 33.1 (1993): 3-56. Print.

---. "The Cross-Section of Expected Stock Returns." *Journal of Finance*.Journal Article (1992): 427-65. Print.

---. "Size and Book-to-Market Factors in Earnings and Returns." *Journal of Finance* 50.1 (1995): 131-55. Print.

---. "Value Versus Growth: The International Evidence." *The Journal of Finance* 53.6 (1998): 1975-99. Print.

Fiegenbaum, A., and H. Thomas. "Attitudes toward Risk and the Risk-Return Paradox: Prospect Theory Explanations." *Academy of Management Journal* (1988): 85-106. Print.

Fisher, F. M., and J. J. McGowan. "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits." *The American Economic Review* 73.1 (1983): 82-97. Print.

Fisher, I. N., and G. R. Hall. "Risk and Corporate Rates of Return." *The Quarterly Journal of Economics* (1969): 79-92. Print.

Fombrun, C., and M. Shanley. "What's in a Name? Reputation Building and Corporate Strategy." *Academy of Management Journal* 33.2 (1990): 233-58. Print.

Fruhan, W. E. "Financial Strategy." *Irwin (Homewood, IL)* (1979). Print.

Gibbs, P. A. "Determinants of Corporate Restructuring: The Relative Importance of Corporate Governance, Takeover Threat, and Free Cash Flow." *Strategic Management Journal* 14.S1 (1993): 51-68. Print.

Goranova, M., R. Dharwadkar, and P. Brandes. "Owners on Both Sides of the Deal: Mergers and Acquisitions and Overlapping Institutional Ownership." *Strategic Management Journal* 31.10 (2010): 1114-35. Print.

Griffin, J. M., and M. L. Lemmon. "Book-to-Market Equity, Distress Risk, and Stock Returns." *The Journal of Finance* 57.5 (2002): 2317-36. Print.

Gutierreez Jr., R. C. "Book-to-Market Equity, Size, and the Segmentation of the Stock and Bond Markets." working paper, Texas A&M University, 2001. Print.

Haugen, R. A. *The New Finance: The Case against Efficient Markets*. Prentice Hall, 1995. Print.

Henkel, J. "The Risk-Return Paradox for Strategic Management: Disentangling True and Spurious Effects." *Strategic Management Journal* 30.3 (2009): 287-303. Print.

Huselid, M. A. "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance." *Academy of Management Journal*.Journal Article (1995): 635-72. Print.

Huselid, M. A., S. E. Jackson, and R. S. Schuler. "Technical and Strategic Human Resource Management Effectiveness as Determinants of Firm Performance." *Academy of Management Journal* 40.1 (1997): 171-88. Print.

Iyer, D. N., and K. D. Miller. "Performance Feedback, Slack, and the Timing of Acquisitions." *The Academy of Management Journal* 51.4 (2008): 808-22. Print.

Jensen, G. R., R. R. Johnson, and J. M. Mercer. "New Evidence on Size and Price-to-Book Effects in Stock Returns." *Financial Analysts Journal* 53.6 (1997): 34-42. Print.

Kor, Y. Y., and J. T. Mahoney. "How Dynamics, Management, and Governance of Resource Deployments Influence Firm-Level Performance." *Strategic Management Journal* 26.5 (2005): 489-96. Print.

Kumar, M. V. "Are Joint Ventures Positive Sum Games? The Relative Effects of Cooperative and Noncooperative Behavior." *Strategic Management Journal* (2010). Print.

Lakonishok, J., A. Shleifer, and R. W. Vishny. "Contrarian Investment, Extrapolation, and Risk." *Journal of Finance* 49.5 (1994): 1541-78. Print.

Lee, S. H., and M. Makhija. "Flexibility in Internationalization: Is It Valuable During an Economic Crisis?" *Strategic Management Journal* 30.5 (2009): 537-55. Print.

Lenox, M. J., S. F. Rockart, and A. Y. Lewin. "Does Interdependency Affect Firm and Industry Profitability? An Empirical Test." *Strategic Management Journal* 31.2 (2010): 121-39. Print.

Liew, J., and M. Vassalou. "Can Book-to-Market, Size and Momentum Be Risk Factors That Predict Economic Growth?" *Journal of Financial Economics* 57.2 (2000): 221-45. Print.

Lindenberg, E. B., and S. A. Ross. "Tobin's Q Ratio and Industrial Organization." *Journal of Business* 54.1 (1981): 1-32. Print.

Lintner, J. "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets." *The review of economics and statistics* 47.1 (1965): 13-37. Print.

Lu, J. W., and P. W. Beamish. "International Diversification and Firm Performance: The S-Curve Hypothesis." *The Academy of Management Journal* 47.4 (2004): 598-609. Print.

MacKinlay, A. C. "Multifactor Models Do Not Explain Deviations from the Capm." *Journal of Financial Economics* 38.1 (1995): 3-28. Print.

Malkiel, B. G. "The Efficient Market Hypothesis and Its Critics." *The Journal of Economic Perspectives* 17.1 (2003): 59-82. Print.

Marsh, T. A., and D. S. Swanson. "Risk-Return Tradeoffs for Strategic Management." *Sloan management review* 25.3 (1984): 35-49. Print.

McDonald, M. L., P. Khanna, and J. D. Westphal. "Getting Them to Think Outside the Circle: Corporate Governance, Ceos'external Advice Networks, and Firm Performance." *The Academy of Management Journal (AMJ)* 51.3 (2008): 453-75. Print.

Merton, R. C. "An Intertemporal Capital Asset Pricing Model." *Econometrica: Journal of the Econometric Society* 41.5 (1973): 867-87. Print.

Miller, K. D., and P. Bromiley. "Strategic Risk and Corporate Performance: An Analysis of Alternative Risk Measures." *Academy of Management Journal* 33.4 (1990): 756-79. Print.

Montgomery, C. A., and B. Wernerfelt. "Diversification, Ricardian Rents, and Tobin's Q." *The Rand journal of economics* 19.4 (1988): 623-32. Print.

Morck, R., A. Shleifer, and R. W. Vishny. "Alternative Mechanisms for Corporate Control." *The American Economic Review*.Journal Article (1989): 842-52. Print.

Murray, A. I. "Top Management Group Heterogeneity and Firm Performance." *Strategic Management Journal* 10.S1 (1989): 125-41. Print.

Nayyar, P. R. "Performance Effects of Information Asymmetry and Economies of Scope in Diversified Service Firms." *Academy of Management Journal* 36.1 (1993): 28-57. Print.

---. "Performance Effects of Three Foci in Service Firms." *Academy of Management Journal* 35.5 (1992): 985-1009. Print.

O'Brien, J. P. "The Capital Structure Implications of Pursuing a Strategy of Innovation." *Strategic Management Journal* 24.5 (2003): 415-31. Print.

Ohlson, J. A. "Financial Ratios and the Probabilistic Prediction of Bankruptcy." *Journal of Accounting Research*.Journal Article (1980): 109-31. Print.

Penrose, E. T. *The Theory of the Growth of the Firm*. Oxford University Press, USA, 1995. Print.

Pitcher, P., and A. D. Smith. "Top Management Team Heterogeneity: Personality, Power, and Proxies." *Organization Science* 12.1 (2001): 1-18. Print.

Reinganum, M. R. "A New Empirical Perspective on the Capm." *Journal of Financial and Quantitative Analysis* 16.04 (1981): 439-62. Print.

Rogowski, R. J., and D. G. Simonson. "Bank Merger Pricing Premiums and Interstate Bidding." *Bank mergers: current issues and perspectives*.Journal Article (1989): 87. Print.

Rosenberg, B., K. Reid, and R. Lanstein. "Persuasive Evidence of Market Inefficiency, Journal of Portfolio Management."Journal Article (1985). Print.

Ross, S. A. "The Arbitrage Theory of Capital Asset Pricing." *Journal of Economic Theory* 13.3 (1976): 341-60. Print.

Ruefli, T. W. "Mean-Variance Approaches to Risk-Return Relationships in Strategy: Paradox Lost." *Management Science* (1990): 368-80. Print.

Ruefli, T. W., J. M. Collins, and J. R. Lacugna. "Risk Measures in Strategic Management Research: Auld Lang Syne?" *Strategic Management Journal* 20.2 (1999): 167-94. Print.

Schendel, D., and C. W. Hofer. *Strategic Management: A New View of Business Policy and Planning*. Little, Brown, 1979. Print.

Sharpe, W. F. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance* 19.3 (1964): 425-42. Print.

Short, J. C., et al. "Firm, Strategic Group, and Industry Influences on Performance." *Strategic Management Journal* 28.2 (2007): 147-67. Print.

Smirlock, M., T. Gilligan, and W. Marshall. "Tobin's Q and the Structure-Performance Relationship." *The American Economic Review*.Journal Article (1984): 1051-60. Print.

Surroca, J., J. A. Tribo, and S. Waddock. "Corporate Responsibility and Financial Performance: The Role of Intangible Resources." *Strategic Management Journal* 31.5 (2010): 463-90. Print.

Tanriverdi, H., and N. Venkatraman. "Knowledge Relatedness and the Performance of Multibusiness Firms." *Strategic Management Journal* 26.2 (2005): 97-119. Print.

Tobin, J. "A General Equilibrium Approach to Monetary Theory." *Journal of Money, Credit and Banking* 1.1 (1969): 15-29. Print.

Tong, T. W., and J. J. Reuer. "Firm and Industry Influences on the Value of Growth Options." *Strategic Organization* 4.1 (2006): 71-71. Print.

Varaiya, N., R. A. Kerin, and D. Weeks. "The Relationship between Growth, Profitability, and Firm Value." *Strategic Management Journal* 8.5 (1987): 487-97. Print.

Vassalou, M., and Y. Xing. "Default Risk in Equity Returns." *The Journal of Finance* 59.2 (2004): 831-68. Print.

Wang, H. C., J. He, and J. T. Mahoney. "Firm-Specific Knowledge Resources and Competitive Advantage: The Roles of Economic-and Relationship-Based Employee Governance Mechanisms." *Strategic Management Journal* 30.12 (2009): 1265-85. Print.

Wang, H., J. Choi, and J. Li. "Too Little or Too Much? Untangling the Relationship between Corporate Philanthropy and Firm Financial Performance." *Organization Science* 19.1 (2008): 143-59. Print.

Welbourne, T. M., and A. O. Andrews. "Predicting the Performance of Initial Public Offerings: Should Human Resource Management Be in the Equation?" *Academy of Management Journal* 39.4 (1996): 891-919. Print.

Wernerfelt, B., and C. A. Montgomery. "Tobin's Q and the Importance of Focus in Firm Performance." *The American Economic Review* 78.1 (1988): 246-50. Print.

Westphal, J. D. "Collaboration in the Boardroom: Behavioral and Performance Consequences of Ceo-Board Social Ties." *Academy of Management Journal* 42.1 (1999): 7-24. Print.

Wiggins, R. R., and T. W. Ruefli. "Sustained Competitive Advantage: Temporal Dynamics and the Incidence and Persistence of Superior Economic Performance." *Organization Science* 13.1 (2002): 82-105. Print.

Wiseman, R. M., and P. Bromiley. "Risk Return Associations: Paradox or Artifact? An Empirically Tested Explanation." *Strategic Management Journal* 12.3 (1991): 231-41. Print.

APPENDIX 1
Measures of Risk

As discussed in the body of the paper, we followed precedence in the literature to operationalize 3 types of risk, (A) Market Risk, (B) Business Risk, and (C) Strategic Risk. The computations for each are described and the correlations among the various measures are presented in the table below:

A. Market Risk

Market Risk was operationalized as β, which was computed using the Capital Asset Pricing Model and also using the Market model. The S&P500 index was used as the overall market return, and the 1- month treasury bill yield was the risk free rate when calculating the excess return.

A1. Market risk 1, defined as CAPM β, was computed as $R_{i,t} = \alpha_i + \beta_i R_{M,t} + \varepsilon_{i,t}$ – where $R_{i,t}$ is excess return i in month t; β_i is Beta of security i; $R_{M,t}$ is market excess return in month t; and $\varepsilon_{i,t}$ is error.

A2. Market risk 2, defined as Market β, was computed as $r_{i,t} = \alpha_i + \beta_i {*} r_{M,t} + \varepsilon_{i,t}$ – where $r_{i,t}$ is return of security i in month t; β_i is Beta of security i; $r_{M,t}$ is market return in month t; and $\varepsilon_{i,t}$ is the error term

A3. Market risk 3 defined as the Mean Sum of Squared Errors (MSE) and it was computed as follows using the market model: $MSE_j = (1/N) \sum (R_{j,t} - R'_{j,t})^2$—where $R_{j,t} = \beta_{0,j} + \beta_{i,j} {*} t + \varepsilon_{j,t}$; $\beta_{i,j}$ are standard regression coefficients; $\varepsilon_{j,t}$ is error; and the autoregressive term $R'_{j,t} = \beta_{0,j} + \beta_{i,j} {*} t$.

The CAPM β and Market β were perfectly correlated, and both of these measures were also highly correlated with MSE ($r=0.75$, $p<0.0001$). We used the CAPM β in our regressions.

B. Business Risk

Business risk was operationalized in 2 different ways: Business Risk 1, as standard deviation of 7-year ROE and Business Risk 2 as the standard deviation of error term in the market model as in A2 above. The correlation between the two measures of business risk was low but statistically significant (r=0.0.07 ($p<0.0001$). In our regressions, we used the standard deviation of 7-year ROE.

C. Strategic Risk

Strategic Risk was operationalized in 2 ways: Strategic Risk 1 was defined as capital expenditures per employee and Strategic Risk 2 as capital expenditure per dollar of total revenue. The two measures were highly correlated ($r=0.77$, $p<0.0001$). We used capital expenditures per employee in our regressions.

Appendix 1

TABLE

Profit or Risk?

Correlations Among Risk factors

		1	2	3	4	5	6	7
1	Market Risk 1	1	0.9999***	0.7523***	0.6118***	0.0366**	-0.0139	0.0049
2	Market Risk 2		1	0.7512***	0.6104***	0.0365**	-0.0140	0.0046
3	Market Risk 3			1	0.9420***	0.0659***	-0.0286*	-0.0104
4	Business Risk 1				1	0.0668***	-0.0159	0.0193
5	Business Risk 2					1	-0.0322**	-0.0176
6	Strategic Risk 1						1	0.7699***
7	Strategic Risk 2							1

***:Significant at 1%

**:Significant at 5%

*: Significant at 10%

Alternative Thinking | Q1 2023

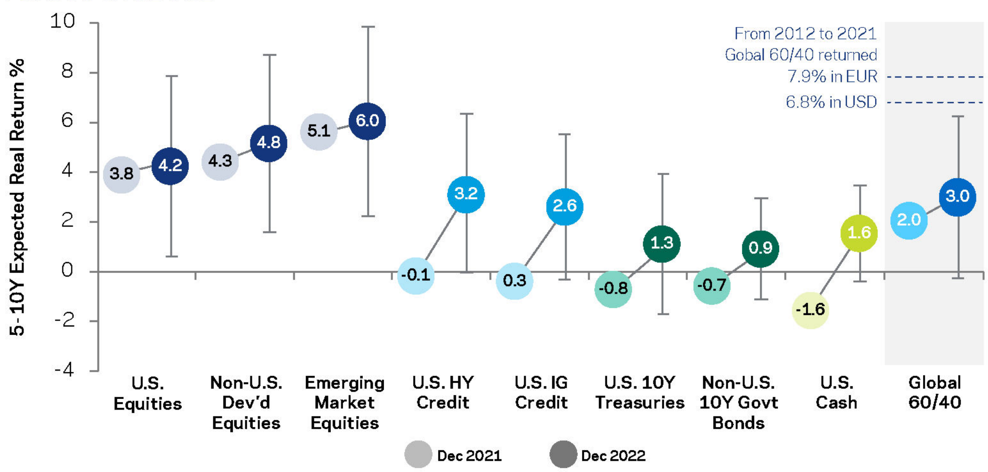
Capital Market Assumptions for Major Asset Classes

Executive Summary

This article updates our estimates of medium-term (5- to 10-year) expected returns for major asset classes. Selected estimates are summarized in **Exhibit 1**. In 2022 expected returns moved slightly higher for equities, and sharply higher for bonds and cash. The expected real return of a 60/40 portfolio increased to 3%, near its decade high but still well below the long-term average of nearly 5% (since 1900[1]), and even further below realized returns of the previous decade.

The article also includes two focus topics: one highlighting the case for emerging market equities, and the other assessing the impact of large interest rate rises on various risk premia—some of which appear compressed at the start of 2023.

Exhibit 1: Medium-Term Expected Real Returns for Liquid Asset Classes



Source: AQR; see Exhibits 3-5 for details. Estimates as of December 31, 2022. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia, Canada. "Non-U.S. 10Y govt. bonds" is GDP-weighted average of Germany, Japan, U.K., Australia, Canada. Error bars cover 50% confidence range, based on historical analysis (see Appendix for details) and adjusted for current expected volatilities. These are intended to emphasize the uncertainty around any point estimates. Realized returns are for January 1, 2012 to December 31, 2021, based on 60% MSCI World and 40% Bloomberg Barclays Global Treasury Index. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

PSG
Portfolio Solutions
Group

1 Historical comparison is based on a simpler methodology than main estimates, due to data availability; methodology described in Appendix.

Contents

About the Portfolio Solutions Group

The Portfolio Solutions Group (PSG) provides thought leadership to the broader investment community and custom analyses to help AQR clients achieve better portfolio outcomes.

We thank Alfie Brixton, Thomas Maloney and Nick McQuinn for their work on this paper. We also thank Pete Hecht and Antti Ilmanen for helpful comments.

Introduction and Framework

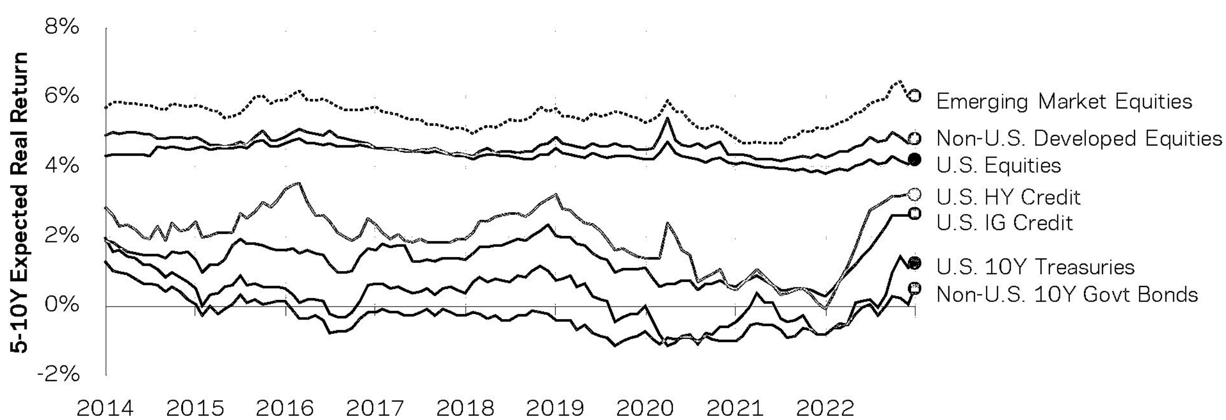
For the past nine years we have published our capital market assumptions for major asset classes, with a focus on medium-term expected returns (see 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021 and 2022). Each year, in addition to the updated estimates, we provide additional analysis or other new material. This year's article includes a discussion of the strategic case for emerging markets and an assessment of the impact of large rises in interest rates on various risk premia.

As usual, we present local real (inflation-adjusted) annual compound rates of return[2] for a horizon of 5 to 10 years. Over such intermediate horizons, starting valuations tend to be useful inputs. For multi-decade forecast horizons their impact is diluted, so theory and long-term historical averages may matter more in judging expected returns. At shorter horizons, returns are largely unpredictable and any predictability has tended to mainly reflect momentum and the macro environment.

Our estimates are intended to assist investors with setting medium-term expectations. They are highly uncertain, and not intended for market timing. The frameworks we present may be more informative than the numbers themselves. As one cautionary example, the error ranges shown in **Exhibit 1**, based on historical analysis, suggest there is a 50% chance that realized equity market returns over the next 10 years will under- or overshoot our estimates by more than 3% *per annum*.

Expected returns for stocks and (especially) bonds rose in 2022 from all-time lows in 2021. Generally, they rebounded to around the levels of the early 2010s, when we started publishing our CMAs (see **Exhibit 2**). Changes in expected premia over risk-free returns (which also increased sharply) have been more mixed, as we discuss later in this article.[3]

Exhibit 2: Expected Real Returns for Liquid Asset Classes
December 2013 to December 2022



Source: AQR; see Exhibits 3-5 for details. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia, Canada. "Non-U.S. 10Y govt. bonds" is GDP-weighted average of Germany, Japan, U.K., Australia, Canada. Estimates are based on current methodologies, are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

2 For a discussion of expected arithmetic (or simple) vs. geometric (or logarithmic, or compound) rates of return, see the 2018 edition.
3 We calculate the excess-of-cash return by subtracting an estimate of real cash return; this is effectively the return accessed by hedged investors irrespective of their base currency (ignoring cross currency basis). Unhedged USD estimates are shown in the Appendix; other currencies available on request.

Equity Markets

Our starting point for equities is the dividend discount model, under which expected real return is approximately the sum of dividend yield (DY), expected trend growth (g) in real dividends or earnings per share (EPS), and expected change in valuation (Δv), that is: E(r) ≈ DY+g+Δv. We take the average of two approaches,[4] described below. We assume no mean reversion in valuations.[5]

1. **Earnings-based:** We start from the inverse of the CAPE ratio (cyclically-adjusted P/E), which is 10-year average inflation-adjusted earnings divided by today's price. We multiply by 0.5 (roughly the U.S. long-run dividend payout ratio), and add real earnings growth of 1.5% (roughly the U.S. long-run average). So earnings-based expected return[6] is: $E(r) \approx 0.5^{*}$ *Adjusted Shiller E/P* $+ g_{EPS}$

2. **Payout-based:** We estimate net total payout yield (NTY) as the sum of current dividend yield and smoothed net buyback yield (NBY). To this we add an estimate of long-term real growth of aggregate payouts that includes net issuance. This growth estimate, g_{TPagg}, is an average of smoothed historical aggregate earnings growth and forecast GDP growth. So our payout-based expected return is: $E(r) \approx NTY + g_{TPagg}$, *where* $NTY = DY + NBY$

All estimates increased in 2022 (see **Exhibit 3**), due to cheapening which was partly offset by lower growth forecasts.[7] Emerging markets saw the biggest rise (see special topic).

Exhibit 3: Expected Local Returns for Equities

December 2022

	1. Earnings-Based		2. Payout-Based				Combined		Excess-of-Cash Return
	Adjusted Shiller EP	0.5 * EP + g_{EPS}	Dividend Yield	NBY	g_{TPagg}	DY+NBY + g_{TPagg}	Real Return	*1yr Change*	
U.S.	4.0%	3.5%	1.7%	0.7%	2.5%	4.9%	**4.2%**	*+0.4%*	**2.7%**
Eurozone	5.1%	4.1%	3.3%	-0.2%	2.3%	5.3%	**4.7%**	*+0.8%*	**4.8%**
Japan	5.5%	4.3%	2.6%	0.2%	2.1%	5.0%	**4.6%**	*+0.4%*	**5.4%**
U.K.	6.0%	4.5%	3.8%	-0.5%	2.1%	5.4%	**5.0%**	*+0.1%*	**4.2%**
Australia	5.1%	4.1%	5.0%	-1.0%	2.5%	6.5%	**5.3%**	*+0.4%*	**4.2%**
Canada	5.1%	4.0%	3.3%	-0.8%	2.5%	5.0%	**4.5%**	*+0.5%*	**3.2%**
Global Dev.	4.4%	3.7%	2.1%	0.4%	2.4%	4.9%	**4.3%**	*+0.4%*	**3.2%**
Global Dev. ex U.S.	5.4%	4.2%	3.4%	-0.2%	2.3%	5.4%	**4.8%**	*+0.5%*	**4.6%**
Emerging Markets	8.1%	6.0%	3.4%	--	2.6%	6.0%	**6.0%**	*+0.9%*	**4.4%**

Source: AQR, Consensus Economics and Bloomberg. Estimates and methodology subject to change and based on data as of December 31, 2022. See main text above for methodology. For earnings yield, U.S. is based on S&P 500; U.K. on FTSE 100 Index; Eurozone is a cap-weighted average of large-cap indices in Germany, France, Italy, Netherlands and Spain; Japan is Topix Index; and "Emerging Markets" is MSCI Emerging Markets Index. For payout-based estimates, all countries are based on corresponding MSCI indices. "Global Developed" is a cap-weighted average. For emerging markets, payout-based estimate is dividend yield + forecast GDP per capita growth. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Hypothetical performance results have certain inherent limitations, some of which are disclosed in the back. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

4 See the 2017 edition and its online appendix for details and discussion of the methodology.
5 See the 2015 edition for a discussion of mean reversion in stock and bond valuations, and our decision to exclude it. Our analysis suggests the timing of any mean reversion is difficult to forecast, and there are plausible arguments for yields remaining below historical levels.
6 For our earnings-based estimate, we apply a 50% payout ratio to all countries, and use g = 1.5% for all countries except for emerging markets, where we use g = 2%. *Adjusted Shiller EP* is Shiller EP * 1.075 where the scalar accounts for average earnings growth during the 10-year earnings window.
7 This year we adjusted our (10-year smoothed) NBY calculation to better account for mergers and buyouts; this has boosted our U.S. equity CMA by 0.2% compared to our old method, and reduced our Australia estimate by 0.3%, with smaller changes for other countries.

Government Bonds

Government bonds' prospective medium-term nominal total returns are strongly anchored by their yields. The so-called *rolling yield* measures the expected return of a constant-maturity bond allocation assuming an unchanged yield curve.[8] For example, a strategy of holding constant-maturity 10-year Treasuries has an expected annual (nominal) return of 3.7%, given the starting yield of 3.8% and expected capital gains of -0.1% from rolldown as the bonds age. **Exhibit 4** shows current local rolling yields for six countries, converted to local real returns by subtracting a survey-based forecast of long-term inflation.

We also show expected excess-of-cash returns, which are effectively the returns accessed by hedged investors irrespective of their base currency (assuming zero cross currency basis). While real returns are often the appropriate unit for assessing expectations versus investment objectives, excess-of-cash returns are more relevant for making international allocation decisions, and for investors with access to leverage.

During 2022, all estimates increased sharply, except for Japan. Large yield rises outweighed reduced rolldown from flatter or inverted curves and modest rises in expected long-term inflation. All markets except Japan now have a positive expected local real return. Most excess-of-cash returns are positive—see the related special topic section for more discussion on bond risk premia.

Any adjustment to these expected returns boils down to expected changes in the yield curve level or shape. Capital gains/losses due to falling/rising yields dominate returns over short horizons but are highly uncertain, and matter less over longer horizons.

Exhibit 4: Expected Local Returns for Government Bonds

December 2022

	Y	RR	I	Y + RR - I		
	10-Year Nominal Bond Yield	**Rolldown Return**	**10-Year Forecast Inflation**	**Expected Real Return**	***1yr Change***	**Excess-of-Cash Return**
U.S.	3.8%	-0.1%	2.5%	**1.2%**	*+2.0%*	**-0.3%**
Japan	0.4%	0.3%	1.0%	**-0.3%**	*0.0%*	**0.5%**
Germany	2.6%	0.1%	2.7%	**0.0%**	*+1.7%*	**0.4%**
U.K.	3.7%	0.2%	2.9%	**1.0%**	*+2.2%*	**0.3%**
Canada	3.3%	0.1%	2.3%	**1.2%**	*+1.6%*	**-0.2%**
Australia	4.1%	0.6%	2.7%	**1.9%**	*+1.9%*	**0.9%**
Global Developed	3.4%	0.1%	2.4%	**1.1%**	*+1.8%*	**0.0%**
Global Developed ex U.S.	2.5%	0.2%	2.2%	**0.5%**	*+1.3%*	**0.3%**

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2022. "Global Developed" and "Global Developed ex US" are GDP-weighted averages. Rolldown return is estimated from fitted yield curves and based on annual rebalance. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

8 If we assumed a more realistic random-walk (rather than unchanged) yield curve, our estimate would theoretically need to include convexity and variance drag components (see footnote 10). However, since these terms are small and mostly offsetting for concentrated bond portfolios, we ignore them here.

Credit Indices

To estimate expected real returns for credit indices, we first apply a haircut of 50% to both IG and HY spreads to represent the combined effects of expected default losses, downgrading bias and bad selling practices.[9] We assume no change in the spread curve, say, through mean reversion. We add the expected real yield of a duration-matched Treasury, and rolldown from both Treasury and spread curves. Finally, we include corrections for convexity and variance drag.[10] **Exhibit 5** shows our updated estimates for U.S. credit indices[11] and hard-currency emerging market sovereign debt. Estimates rose sharply in 2022, with wider spreads adding to higher Treasury yields. The HY-IG spread increased from previous narrow levels (HY's spread advantage over IG now outweighs its lower rolldown and convexity).

Exhibit 5: Expected Returns for Credit Indices

December 2022

	A. Spread Return	B. Treasury Real Yield	C. Rolldown Return	D. Convexity & Variance			
	OAS * 0.5	Y - I	R_T+R_C	C - V	Expected Real Return A+B+C+D	*1yr Change*	Excess-of-Cash Return
U.S. IG	0.7%	1.6%	0.1%	0.2%	**2.6%**	+2.3%	**1.1%**
U.S. HY	2.3%	1.8%	-0.5%	-0.4%	**3.2%**	+3.3%	**1.7%**
EM HC Debt	2.0%	1.6%	0.0%	0.0%	**3.5%**	+2.4%	**2.0%**

Source: Bloomberg, AQR. Estimates as of December 31, 2022. OAS and duration data are for Bloomberg Barclays U.S. Corporate Investment Grade (IG), U.S. Corporate High Yield (HY) and Emerging USD Sovereign (EM HC Debt) Indices. Index durations are 7.4 years, 4.4 years and 7.6 years respectively. Excess-of-cash return is calculated by subtracting real cash return estimates described later in the article. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

Commodities

Commodities do not have obvious yield measures, and we find no statistically significant predictability in medium-term returns (see the 2016 edition). Our estimate of 5- to 10-year expected return is therefore simply the long-run average return of an equal-weighted portfolio of commodity futures. This portfolio has earned about 3% geometric average excess return over cash since 1877, and a similar return if measured since 1951.[12] We add the U.S. real cash return to give our expected real return of 4.6%.

We do not have medium-term return estimates for individual commodities, but would expect them to deliver a substantially lower risk-adjusted return than a diversified basket over the long term. A gold investment, for example, has exhibited useful tail-hedging properties historically, but it forgoes the considerable diversification found within the broader asset class (as 2022 demonstrated).[13]

9 Consistent with Giesecke et al. (2011) and Ben Dor et al. (2021), who find that over the long term, the average credit risk premium is roughly half the spread. 'Bad selling' refers to the practice of selling bonds that no longer meet the rating or maturity criteria of the index.

10 These terms, both related to volatility, are not as closely offsetting for broad indices as they are for single bonds, due to diversification effects. Briefly, the convexity term estimates the impact of non-linearities assuming yields will change, while the variance drag term estimates the impact of compounding effects assuming return volatility will be non-zero.

11 **Exhibit 5** shows spreads for Bloomberg Barclays cash bond indices. Synthetic indices (Markit North America CDX) have tended to have somewhat tighter spreads (but during 2021 this basis was near zero). For EM debt we use U.S. HY OAS rolldown due to data limitations.

12 For more details see the 2016 edition, Levine, Ooi, Richardson and Sasseville (2018), and the AQR data library.

13 From February 1975 to December 2022, an investment in gold futures delivered around 1% real return, approximately the same as cash.

Alternative Risk Premia

It is difficult to apply a yield-based approach to dynamic strategies where holdings are constantly evolving. Below we state long-term assumptions for what we believe to be sustainable long-term premia, backed by a broad range of empirical evidence.[14]

Factor-Tilted Long-Only Portfolios

We believe a hypothetical value-tilted, diversified long-only equity portfolio that is carefully implemented and reasonably priced may be assumed to have an expected real return 0.5% higher than the cap-weighted index, after fees, with 2-3% tracking error. For an integrated multi-factor strategy—which we assume to include balanced allocations to value, momentum and defensive themes—we assume an expected net active return of around 1% at a similar tracking error. Finally, we think a defensive equity portfolio may be assumed to have an expected return similar to that of the relevant cap-weighted index, but may achieve this with lower volatility.[15] These are long-term estimates—we discuss tactical considerations below.

Long/Short Factor Premia

Alternative risk premia strategies apply similar tilts as long-only smart beta strategies, but in a market-neutral fashion and often in multiple asset classes. Because long/short strategies can be scaled to different risk levels, we focus on expected Sharpe ratios. The degree of diversification is critical. A single theme applied long/short in a single asset class might have an expected Sharpe ratio of only 0.2-0.3. For a diversified combination, we believe an expected Sharpe ratio of 0.7-0.8, net of trading costs and fees, can be feasible when multiple factor themes are applied in multiple asset classes. At a target volatility of 10%, such a hypothetical portfolio would have an expected return of 7-8% over cash.[16] We stress that this requires careful craftsmanship in portfolio construction as well as great efficiency in controlling trading, financing and shorting costs.[17] Strategies that are less well-designed or poorly implemented may have much lower expected returns.

Current valuations

Aggregate valuations across multiple styles are near long-term averages. Among individual styles, the equity value style continues to look extremely cheap, despite a second consecutive year of value outperformance. Indeed, spreads between value and growth stocks remain comparable to their previous peak during the Dotcom Bubble. Our research suggests there is quite a weak link between the value spreads of style factors and their future returns, making it difficult to use tactical timing based on valuations to outperform a strategic multi-style portfolio.[18] However, we believe the current extreme cheapness of value warrants a continued overweight to that style in multi-factor strategies.[19]

14 See for example Ilmanen et al. (2021), "How do Factor Premia Vary Over Time? A Century of Evidence".
15 Factor-tilted strategies exhibit many design variations. Our estimates are purely illustrative and do not represent any AQR product or strategy.
16 Consistent with historical data, we assume low correlations between the factors to produce our Sharpe ratio range for a diversified combination of long/short factors. As transaction costs depend on implementation and both transaction costs and fees vary with target volatility, our estimates are based on a transaction-cost-optimized strategy targeting 10% volatility with fees of 1 to 1.5%. Refer to the 2015 edition for discussion of factor premia assumptions. All assumptions are purely illustrative and do not represent any AQR product or strategy.
17 See Israel, Jiang and Ross (2017), "Craftsmanship Alpha: An Application to Style Investing".
18 See Asness, Chandra, Ilmanen and Israel (2017), "Contrarian Factor Timing Is Deceptively Difficult".
19 See *Cliff's Perspective* blog, The Bubble Has Not Popped, January 2023.

Private Equity and Real Estate

Illiquid assets are inherently harder to model than public markets, and this is exacerbated by a lack of good quality data. Nevertheless, in recent years we extended our discounted-cashflow-based approach into the illiquid realm, and we update these estimates below. For private equity (PE) our estimate is for U.S. buyout funds. We present net-of-fee expected returns, as fees are a substantial component of returns for illiquid assets. Each of our inputs is debatable, as data limitations necessitate lots of simplifying assumptions, and each input can substantially affect the final estimate. **Exhibit 6** illustrates our framework and current inputs.[20] First, we estimate unlevered ER using the DDM: $E(r) \approx y_U + g_U$, where y_U = unlevered payout yield and g_U = real earnings-per-share growth rate. Then, we estimate the levered return by applying leverage and the cost of debt, and finally we add expected multiple expansion and subtract fees.

Our yield-based real return estimate is 3.5% net of fees, lower than last year mainly due to a higher cost of debt[21] and a lack of cheapening in reported valuations (so far). An alternative approach, which applies simple size and leverage adjustments to a public proxy and assuming zero net alpha, generates a higher estimate of 4.3%.[22] Taking a simple average of the two approaches gives a final estimate of **3.9%**, slightly *lower* than our U.S. public large cap equity estimate.

Exhibit 6: Expected Real Returns for U.S. Private Equity

	Unlevered			Leverage		Levered					
	y_u	g_u	$r_u = y_u + g_u$	D	k_D	$r_L = r_u + D * (r_u - k_D)$	m	$r_G = r_L + m$	f	$r_N = r_G - f$	
	Income Yield	Real Growth Rate	Real Return	Debt to Equity	Real Cost of Debt	Levered Real Return	Multiple Expansion	Gross Real ER	Fees	Net Exp. Real Return	*1yr Change*
U.S. PE	2.2% +	3.0% =	5.2%	105%	2.3%	8.2% +	0.3% =	8.5%	5.0% =	**3.5%**	*-2.1%*

Source: AQR, Pitchbook, Bloomberg, CEM Benchmarking. Estimates as of September 30, 2022. Strictly speaking, our inputs are log returns and should be converted to simple returns before leverage is applied, then converted back to log returns. This 'round-trip' has only a small impact, so we omit it here. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any AQR product or strategy.

We estimate expected returns for unlevered U.S. direct real estate (RE) as represented by the NCREIF indices. We caveat that returns for individual RE funds can vary vastly from the industry average (this is also true of PE). As with our DDM-based approach for equities, we sum payout yield and expected long-term growth rate.[23] **Exhibit 7** shows a slight fall in our expected real return for unlevered RE to 2.4%. The lack of cheapening for private RE (so far) constrasts sharply with the large losses for public REITs in 2022.

20 See Ilmanen, Chandra and McQuinn (2020) for a detailed discussion of the framework, our input choices, and the sources, as well as a literature review. Strictly speaking, the framework applies to the current vintage rather than the entire PE market. This paper also discusses the theoretical rationales and historical average returns to assess expected PE returns.

21 We have revised our method for estimating real cost of debt, now using bank loan spread data to reflect typical sources of PE financing. This revision raises our cost of debt estimate somewhat. Any reasonable method would show a substantial increase in cost of debt during 2022, due to higher real rates and wider spreads – and hence a reduction in PE expected return.

22 See the 2019 edition for details of this alternative method.

23 See Ilmanen, Chandra and McQuinn (2019) for full details of our methodology and assumptions.

Exhibit 7: Expected Real Returns for U.S. Private Real Estate

	NOI	C ≈ NOI / 3	CF ≈ NOI - C	g	ER = CF + g	
	NOI Yield	Capital Expenditure	Cashflow Yield	Real Growth	Unlevered Real Return	*1yr Change*
U.S. Real Estate	3.6%	1.2%	2.4%	0.0%	**2.4%**	*-0.2%*

Source: AQR, NCREIF Webinar Q3 2022. Estimates as of September 30, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any AQR product or strategy.

Cash

As discussed in the 2020 edition, our yield-based cash return assumption is a weighted average of current short-term and long-term yields. We are effectively averaging between the pure expectations and pure risk premium hypotheses. Giving a larger weight to the 10-year yield implies market rate expectations explain a larger portion of the yield curve slope than the required term premium, a conjecture arguably justified by the role of forward guidance from credible central banks.

Exhibit 8 shows real cash return estimates rose sharply in 2022 from all-time lows in 2020-21, turning positive in the U.S. and several other markets.[24] This implies lower risk premia for other asset classes, as discussed in this article's second special topic.

Exhibit 8: Expected Local Real Returns for Cash

December 2022

	S	L	I	(L*2/3 + S*1/3) - I	
	3-Month Yield	10-Year Yield	10Y Forecast Inflation	Expected Real Cash Return	*1yr Change*
U.S.	4.3%	3.9%	2.5%	**1.6%**	*+3.1%*
Japan	-0.2%	0.4%	1.0%	**-0.8%**	*0.0%*
Germany	1.8%	2.6%	2.7%	**-0.4%**	*+2.0%*
U.K.	3.5%	3.7%	2.9%	**0.7%**	*+2.6%*
Australia	3.1%	4.1%	2.7%	**1.1%**	*+2.3%*
Canada	4.3%	3.3%	2.3%	**1.4%**	*+2.6%*

Source: Bloomberg, Consensus Economics and AQR. Estimates as of December 31, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

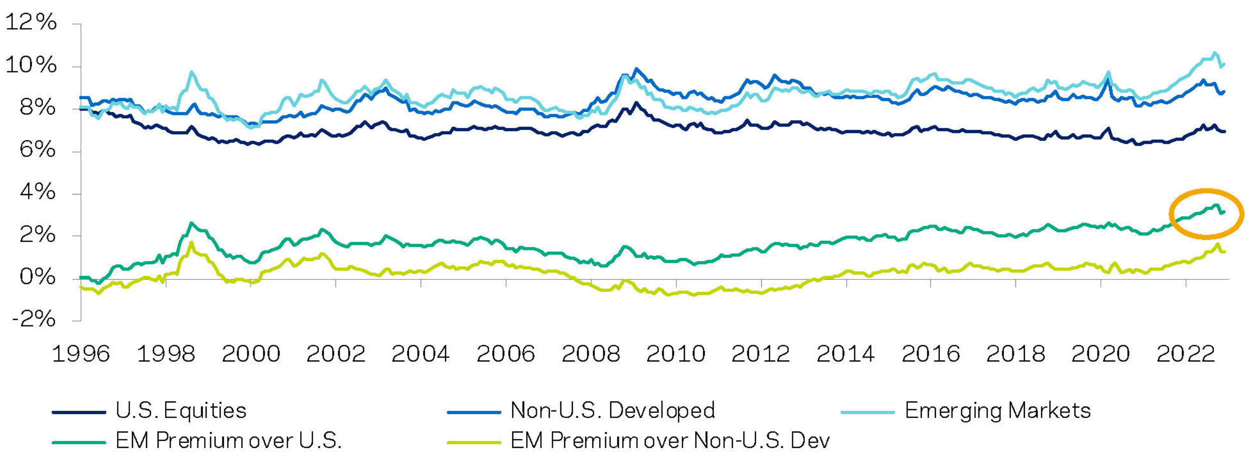
24 Survey-based forecasts from Consensus Economics are broadly consistent with these market-based estimates, except for the U.S. where the survey forecast is around 100bps lower (real cash rate near zero). We find no evidence that estimates based on survey data have been more accurate than our market-based assumptions, but they can provide useful insights (see Special Topic 2).

Special Topic 1: Emerging Market Equities—Assessing the Strategic Case

Emerging markets are a heterogeneous category presenting a wealth of investment opportunities. An allocation to emerging market equities should be expected to deliver higher returns, higher risk and useful diversification over the long term. But the region's relative performance has experienced multi-year cycles, with the past decade being particularly disappointing. According to our capital market assumptions, this period of underperformance has driven the region's forward-looking expected return advantage over the U.S. market to more than 3%, its highest for decades (see **Exhibit 9**).

Exhibit 9: Expected Total USD Returns for Equity Regions

January 1996 – December 2022



Sources: Bloomberg, Consensus Economics and AQR. Chart shows nominal total arithmetic USD returns. Local real equity yield is calculated as expected payout + expected real growth, where expected payout is the simple average of two measures: 0.5 * Shiller E/P * 1.075 and Dividend/Price. The 0.5 multiplier reflects the long-term payout ratio; the 1.075 multiplier accounts for EPS growth during the 10-year earnings window. Long term real EPS growth is assumed to be 1.5% for developed markets and 2% for emerging markets. Local real returns are converted to USD nominal returns by adding expected FX return (derived from long-term expected inflation differentials) and adding long-term expected U.S. inflation, and then converted to arithmetic returns by adding a variance drag term.

Other strategic considerations

There are many other considerations besides relative valuations. Emerging markets are associated with higher growth expectations, but GDP growth does not always translate to higher equity returns. Insiders may be able to exploit less-informed foreign investors. And investors may overpay for expected growth, and for the bang-for-the-buck of a high-risk, high-return asset class.

On the other hand, greater frictions and less market efficiency may create attractive opportunities for active managers. One example is the current 'value spread' between cheap and expensive companies, which is even more extreme in emerging than developed markets.[25] Historical evidence suggests that both discretionary and systematic active managers have performed better in emerging

25 Value spread as of December 31, 2022 was at 97th percentile for emerging markets, compared to 92nd percentile for global developed.

than developed markets.[26] And finally, the potential for ESG-conscious investors to make an impact may be greater in emerging markets, where carbon footprints tend to be larger and ESG scores lower.

The role of emerging markets currency risk

An emerging markets allocation is a combination of equity and currency risk. Historically, spot currency moves have added substantial volatility that has been moderately positively correlated to the equity markets themselves. But this additional risk has been compensated with positive average returns from the interest rate differential or carry (put differently, it has been costly to hedge the exposure). There is also some evidence that currency risk has enhanced the inflation resilience of an emerging market equity allocation by adding more commodity-like exposure.

Special Topic 2: Waiting for the Axe to Fall? Rising Cash Rates and Market Risk Premia

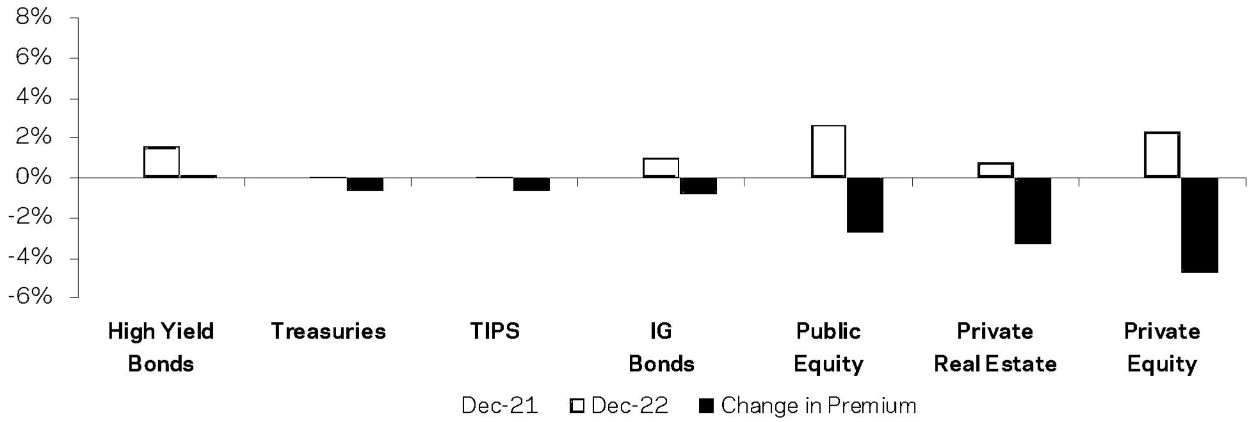
On which asset classes has the 'real rates axe' yet to fall?

Over the past year, our expected return estimates for cash generally increased by more than our estimates for other asset classes, implying lower excess-of-cash returns or risk premia. But the impact varies widely by asset class. **Exhibit 10** shows expected excess-of-cash returns for U.S. asset classes, ordered by the change in 2022. Fixed income premia appear relatively stable, reflecting a near-full repricing in reponse to the rise in rates (see below for further discussion), but equities and—especially—private assets have not (yet) repriced nearly as much. This may be a warning flag for their near-term prospects.

Put differently, at the start of 2022, all major classes were expensive, reflecting historically low real riskless discount rates but fairly normal forward-looking risk premia. Now, at the start of 2023, real riskless discount rates have largely normalized, while forward-looking risk premia on non-bond asset classes appear compressed (especially U.S equities and illiquid assets).

26 In the ten years ending June 30, 2022, mean IRs across systematic and discretionary institutional managers were 0.06 and 0.03 respectively for U.S. large cap, but 0.45 and 0.19 for emerging markets large cap, based on eVestment data (gross of fees).

Exhibit 10: Which Premia Have Shrunk? Expected Excess-of-Cash Returns for U.S. Asset Classes



Source: AQR. Estimates as of December 31, 2022 except for real estate and private equity, which are as of September 30, 2022 (the latest available). Annual geometric excess-of-cash rates of return. Fixed income estimates relate to corresponding Bloomberg Barclays indices rather than single bonds. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages..

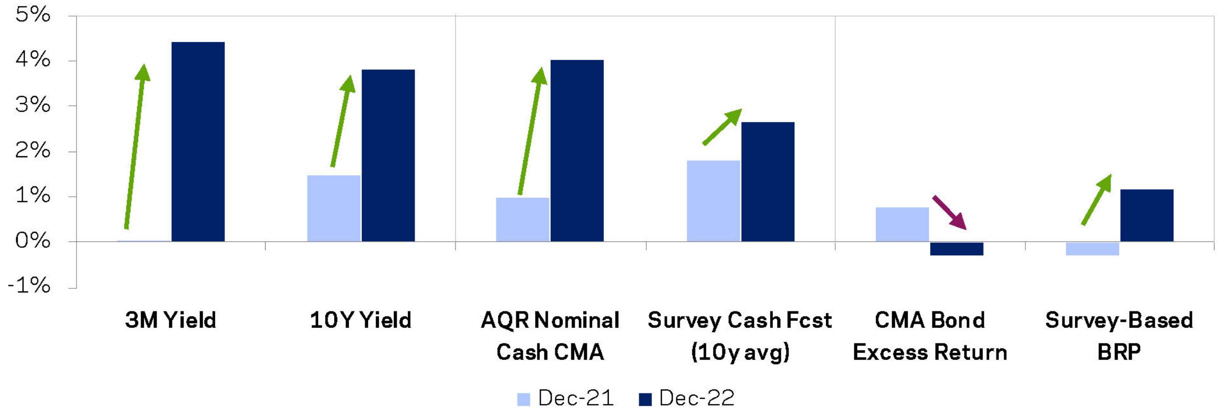
Estimating bond risk premia amid volatile markets

For bonds we must look a little more carefully. Our cash CMA methodology effectively assumes that two thirds of the yield curve slope can be attributed to expected changes in short rates, and one third can be attributed to the bond risk premium (BRP). This may be a reasonable assumption on average, but in some years something very different may be happening.

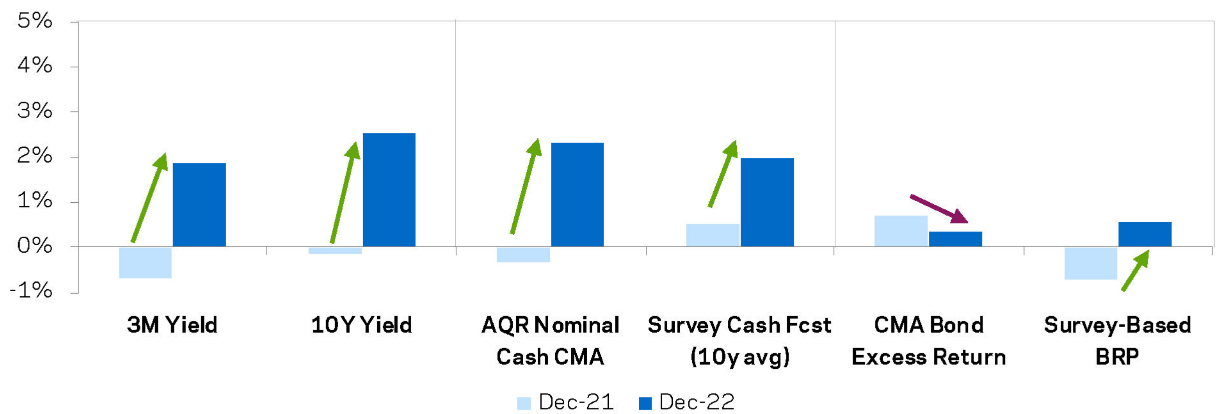
In 2022, the U.S. Treasury curve flattened (in fact inverted), implying a loss of carry and rolldown for Treasuries, and hence a slightly negative premium according to our CMAs (see **Exhibit 11**, panel A, red arrow). But survey data suggests the two components of the slope may be large but offsetting: a *negative* expected change in short rate and a resurgent *positive* bond risk premium (rightmost green arrow in chart). For European bonds (panel B), surveys imply the slope is now attributable to a combination of an expected (further) rise in short rate and a positive premium. In both markets, our assumptions show a reduction in bond risk premium during 2022, while surveys imply an increase.

Exhibit 11: Did Bond Risk Premia Grow or Shrink in 2022?

A. U.S. Treasuries



B. German Government Bonds



Source: AQR, Consensus Economics. Estimates as of December 31, 2022. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

So which is correct? It seems plausible that bond risk premia did increase in 2022, as inflation and monetary policy uncertainty raised perceptions of bonds as risky (and perhaps less diversifying[27]) assets.[28] We continue to evaluate market- and survey-based approaches to estimating market risk premia, and may incorporate survey data in our CMAs in the future. Humility is warranted: all methods for estimating time-varying expected returns and risk premia involve debatable assumptions and wide bands of uncertainty. For strategic investors, the positive long-term average premium is the prize.

27 See Brixton et al. (2023), "A Changing Stock-Bond Correlation: Drivers and Implications."
28 Other estimates of bond risk premia show fluctuations but little net change during 2022; see the term structure models of Kim and Wright, and Adrian et al.

Concluding thoughts (and a word on liquidity)

To invest is to accept the risk of losses in pursuit of returns above the risk-free rate. A rise in the risk-free rate could eventually make the investor's task easier, by allowing them to attain a given real or nominal return goal with less risk. But *we are not there yet*, because valuations of some risky assets (and especially illiquid assets) have not adjusted to higher discount rates, so their premia appear compressed.

Liquidity risk has been in the spotlight in recent months, with the gating of a large real estate fund in the U.S. and LDI stress triggering a dash for cash for some U.K. pension funds. Over the past decade, many investors responded to low expected returns by accepting less liquidity in their portfolios. Illiquidity has conferred cosmetic benefits of price-smoothing and lagged reporting,[29] which are conspicuously lacking in public markets and liquid alternatives where mark-to-market volatility has been high. But there can be costs to illiquidity too. These have materialized in the past (recall private asset firesales during the Global Financial Crisis), and the current compressed premia are a hint that they may do so again. Allocations that are *both diversifying and liquid* are likely to be particularly valuable for enhancing portfolio resilience in uncertain times.

29 Investor preference for smooth returns may even offset any required illiquidity premia in private assets; see Ilmanen (2022).

References

Adrian, T., R. K. Crump, and E. Moench, 2013, "Pricing the term structure with linear regressions," *Journal of Financial Economics*, 110, 110-138.

Asness, C., S. Chandra, A. Ilmanen and R. Israel, 2017, "Contrarian Factor Timing Is Deceptively Difficult," *Journal of Portfolio Management Special Issue*.

Brixton, A., J. Brooks, P. Hecht, A. Ilmanen, T. Maloney and N. McQuinn, 2023, "A Changing Stock-Bond Correlation: Drivers and Implications," *Journal of Portfolio Management* (forthcoming).

Ben Dor, A., A. Desclée, L. Dynkin, J. Hyman and S. Polbennikov, 2021, "Systematic Investing in Credit," Wiley.

Giesecke, K., F. Longstaff, S. Schaefer and I. Strebulaev, 2011, "Corporate Bond Default Risk: A 150 Year Perspective," *Journal of Financial Economics*, 102, 233-250.

Ilmanen, A., 2022, "Investing Amid Low Expected Returns," Wiley.

Ilmanen, A., S. Chandra and N. McQuinn, 2020, "Demystifying Illiquid Assets: Expected Returns for Private Equity," *Journal of Alternative Investments*, 22(3).

Ilmanen, A., S. Chandra and N. McQuinn, 2019, "Demystifying Illiquid Assets: Expected Returns for Real Estate," AQR white paper.

Ilmanen, A., R. Israel, R. Lee, T. J. Moskowitz, and A. Thapar, 2021, "How Do Factor Premia Vary Over Time? A Century of Evidence," *Journal of Investment Management*, 19(4).

Israel, R., S. Jiang and A. Ross, 2017, "Craftsmanship Alpha: An Application to Style Investing," *Journal of Portfolio Management Multi-Asset Strategies Special Issue*.

Kim, D. H., and J. H. Wright, 2005, "An arbitrage-free three-factor term structure model and the recent behavior of long-term yields and distant-horizon forward rates," *Federal Reserve Board Finance and Economics Discussion Series*, 33.

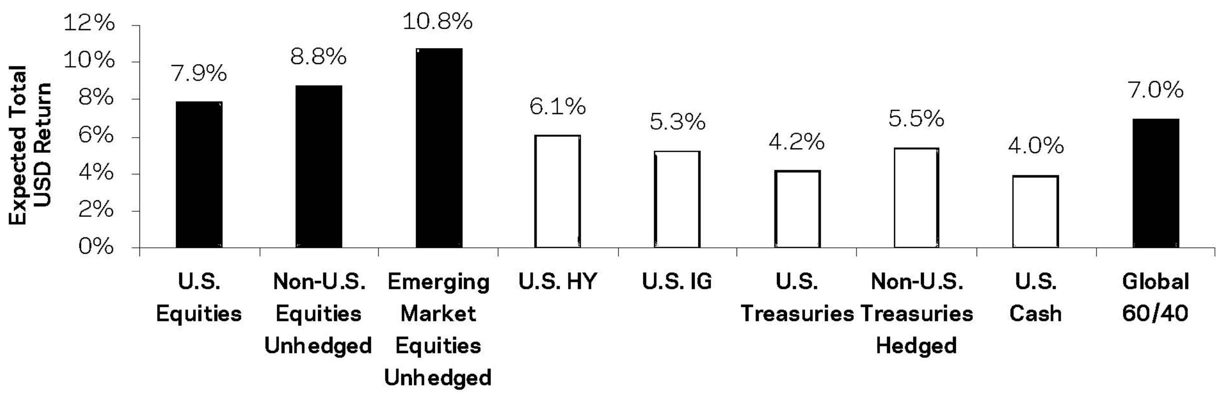
Levine, A., Y. Ooi, M. Richardson and C. Sasseville, 2018, "Commodities for the Long Run," *Financial Analysts Journal*, 74(2).

Appendix

Translating Local Real Returns to Expected Total Returns for a Given Base Currency

In the rest of this paper we report local real and excess-of-cash returns. In **Exhibit A1** we translate these into *nominal arithmetic* returns by adding local expected inflation and variance drag terms. We also quote *unhedged* U.S dollar estimates for non-U.S. equities, in line with common investing practice. Currency return assumptions are based on expected inflation differentials. Expected returns for other base currencies are available on request.

Exhibit A1: Expected Total Nominal Arithmetic Returns for a U.S. Dollar Investor



Source: AQR. Estimates as of December 31, 2022 are USD-denominated total nominal annual arithmetic rates of return. "Non-U.S. developed equities" is cap-weighted average of Euro-5, Japan, U.K., Australia and Canada, unhedged. U.S. and Non-U.S. Treasuries are respective Bloomberg Barclays indices rather than single bonds. Global 60/40 is a 60%/40% weighted average of the developed equities listed above and developed government bonds listed above, respectively. Estimates are for illustrative purposes only, are not a guarantee of performance and are subject to change. Not representative of any portfolio that AQR currently manages.

Sources and Methodology for Long-Term Historical Expected Returns

Sources for historical equity and bond expected returns are AQR, Robert Shiller's data library, Kozicki-Tinsley (2006), Federal Reserve Bank of Philadelphia, Blue Chip Economic Indicators, Consensus Economics and Morningstar. Prior to 1926, stocks are represented by a reconstruction of the S&P 500 available on Robert Shiller's website which uses dividends and earnings data from Cowles and associates, interpolated from annual data. After that, stocks are the S&P 500. Bonds are represented by long-dated Treasuries. The equity yield is a 50/50 mix of two measures: 50% Shiller E/P * 1.075 and 50% Dividend/ Price + 1.5%. Scalars are used to account for long term real Earnings Per Share (EPS) Growth. Bond yield is 10-year real Treasury yield minus 10-year inflation forecast as in *Expected Returns* (Ilmanen, 2011), with no rolldown added.

Methodology for Forecast Error Analysis (Exhibit 1)

Not only are the return forecasts uncertain, but also any measures of forecast uncertainty are debatable. Forecasting requires humility at many levels. We first produce historical time series of yield-based estimates for U.S. equities and U.S. Treasuries using the method described in the previous paragraph (analysis starts in 1900, but we use data from 1870s onwards). We test their predictive power using quarterly overlapping 10-year periods since 1900 and measure the distribution of errors. See the 2018 edition for more details. Error ranges in **Exhibit 1** are based on interquartile ranges of these distributions, adjusted for current volatility estimates.

Disclosures

This document has been provided to you solely for information purposes and does not constitute an offer or solicitation of an offer or any advice or recommendation to purchase any securities or other financial instruments and may not be construed as such. The factual information set forth herein has been obtained or derived from sources believed by the author and AQR Capital Management, LLC ("AQR"), to be reliable, but it is not necessarily all-inclusive and is not guaranteed as to its accuracy and is not to be regarded as a representation or warranty, express or implied, as to the information's accuracy or completeness, nor should the attached information serve as the basis of any investment decision. This document is not to be reproduced or redistributed without the written consent of AQR. The information set forth herein has been provided to you as secondary information and should not be the primary source for any investment or allocation decision.

Past performance is not a guarantee of future performance.

This presentation is not research and should not be treated as research. This presentation does not represent valuation judgments with respect to any financial instrument, issuer, security, or sector that may be described or referenced herein and does not represent a formal or official view of AQR.

The views expressed reflect the current views as of the date hereof, and neither the author nor AQR undertakes to advise you of any changes in the views expressed herein. It should not be assumed that the author or AQR will make investment recommendations in the future that are consistent with the views expressed herein, or use any or all of the techniques or methods of analysis described herein in managing client accounts. AQR and its affiliates may have positions (long or short) or engage in securities transactions that are not consistent with the information and views expressed in this presentation.

The information contained herein is only as current as of the date indicated and may be superseded by subsequent market events or for other reasons. Charts and graphs provided herein are for illustrative purposes only. The information in this presentation has been developed internally and/or obtained from sources believed to be reliable; however, neither AQR nor the author guarantees the accuracy, adequacy, or completeness of such information. Nothing contained herein constitutes investment, legal, tax, or other advice, nor is it to be relied on in making an investment or other decision.

There can be no assurance that an investment strategy will be successful. Historic market trends are not reliable indicators of actual future market behavior or future performance of any particular investment, which may differ materially, and should not be relied upon as such. Target allocations contained herein are subject to change. There is no assurance that the target allocations will be achieved, and actual allocations may be significantly different from those shown here. This presentation should not be viewed as a current or past recommendation or a solicitation of an offer to buy or sell any securities or to adopt any investment strategy.

The information in this presentation might contain projections or other forward-looking statements regarding future events, targets, forecasts, or expectations regarding the strategies described herein and is only current as of the date indicated. There is no assurance that such events or targets will be achieved and might be significantly different from that shown here. The information in this presentation, including statements concerning financial market trends, is based on current market conditions, which will fluctuate and may be superseded by subsequent market events or for other reasons. Performance of all cited indices is calculated on a total return basis with dividends reinvested.

The investment strategy and themes discussed herein may be unsuitable for investors depending on their specific investment objectives and financial situation. Please note that changes in the rate of exchange of a currency might affect the value, price, or income of an investment adversely. Neither AQR nor the author assumes any duty to, nor undertakes to update forward-looking statements. No representation or warranty, express or implied, is made or given by or on behalf of AQR, the author, or any other person as to the accuracy and completeness or fairness of the information contained in this presentation, and no responsibility or liability is accepted for any such information. By accepting this presentation in its entirety, the recipient acknowledges its understanding and acceptance of the foregoing statement. Diversification does not eliminate the risk of experiencing investment losses.

Gross performance results do not reflect the deduction of investment advisory fees and other expenses, which would reduce an investor's actual return. AQR's asset based fees may range up to 2.85% of assets under management, and are generally billed monthly or quarterly at the commencement of the calendar month or quarter during which AQR will perform the services to which the fees relate. Where applicable, performance fees are generally equal to 20% of net realized and unrealized profits each year, after restoration of any losses carried forward from prior years. In addition, AQR funds incur expenses (including start-up, legal, accounting, audit, administrative and regulatory expenses) and may have redemption or withdrawal charges up to 2% based on gross redemption or withdrawal proceeds. Please refer to AQR's ADV Part 2A for more information on fees. Consultants supplied with gross results are to use this data in accordance with SEC, CFTC, NFA or the applicable jurisdiction's guidelines.

"Expected" or "Target" returns or characteristics refer to expectations based on the application of mathematical principles to portfolio attributes and/or historical data, and do not represent a guarantee. These statements are based on certain assumptions and analyses made by AQR in light of its experience and perception of historical trends, current conditions, expected future developments and other factors it believes are appropriate in the circumstances, many of which are detailed herein. Changes in the assumptions may have a material impact on the information presented.

Broad-based securities indices are unmanaged and are not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index

Index Definitions:

The **S&P 500 Index** is the Standard & Poor's composite index of 500 stocks, a widely recognized, unmanaged index of common stock prices.

The **FTSE 100 Index** is an index composed of the 100 largest companies by market capitalization listed on the London Stock Exchange.

The **TOPIX Index** is a free-float adjusted market capitalization-weighted index that is calculated based on all the domestic common stocks listed on the TSE First Section.

The **MSCI Emerging Markets Index** is a free float-adjusted market capitalization index that is designed to measure equity market performance of emerging markets.

The **Bloomberg Barclays U.S. Corporate Bond Index** measures the USD-denominated, investment-grade, fixed-rate, taxable corporate bond market.

The **Bloomberg Barclays U.S. Corporate High Yield Index** measures the USD-denominated, high yield, fixed-rate corporate bond market. Securities are classified as high yield if the middle rating of Moody's, Fitch and S&P is Ba1/BB+/BB+ or below.

The **Bloomberg Barclays Emerging Markets Hard Currency (USD) Sovereign Index** is an Emerging Markets debt benchmark that includes USD-denominated debt from sovereign EM issuers.

The **NCREIF Property Index** measures the performance of real estate investments on a quarterly basis and evaluates the rate of returns in the market. The NPI covers properties that are acquired in place of institutional investors that are exempted from taxes in the fiduciary environment.

Administrative Region of the People's Republic of China ("Hong Kong") pursuant to the Securities and Futures Ordinance (Cap 571) (CE no: BHD676). AQR Capital Management (Asia) Limited, Unit 2023, 20/F, One IFC, 1 Harbour View Street, Central Hong Kong, Hong Kong. Licensed and regulated by the Securities and Futures Commission of Hong Kong (CE no: BHD676).

China: This document does not constitute a public offer of any fund which AQR Capital Management, LLC ("AQR") manages, whether by sale or subscription, in the People's Republic of China (the "PRC"). Any fund that this document may relate to is not being offered or sold directly or indirectly in the PRC to or for the benefit of, legal or natural persons of the PRC.

Further, no legal or natural persons of the PRC may directly or indirectly purchase any shares/units of any AQR managed fund without obtaining all prior PRC's governmental approvals that are required, whether statutorily or otherwise. Persons who come into possession of this document are required by the issuer and its representatives to observe these restrictions.

Singapore: This document does not constitute an offer of any fund which AQR Capital Management, LLC ("AQR") manages. Any fund that this document may relate to and any fund related prospectus that this document may relate to has not been registered as a prospectus with the Monetary Authority of Singapore. Accordingly, this document and any other document or material in connection with the offer or sale, or invitation for subscription or purchase, of shares may not be circulated or distributed, nor may the shares be offered or sold, or be made the subject of an invitation for subscription or purchase, whether directly or indirectly, to persons in Singapore other than (i) to an institutional investor pursuant to Section 304 of the Securities and Futures Act, Chapter 289 of Singapore (the "SFA")) or (ii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Korea: Neither AQR Capital Management (Asia) Limited or AQR Capital Management, LLC (collectively "AQR") is making any representation with respect to the eligibility of any recipients of this document to acquire any interest in a related AQR fund under the laws of Korea, including but without limitation the Foreign Exchange Transaction Act and Regulations thereunder. Any related AQR fund has not been registered under the Financial Investment Services and Capital Markets Act of Korea, and any related fund may not be offered, sold or delivered, or offered or sold to any person for re-offering or resale, directly or indirectly, in Korea or to any resident of Korea except pursuant to applicable laws and regulations of Korea.

Japan: This document does not constitute an offer of any fund which AQR Capital Management, LLC ("AQR") manages. Any fund that this document may relate to has not been and will not be registered pursuant to Article 4, Paragraph 1 of the Financial Instruments and Exchange Law of Japan (Law no. 25 of 1948, as amended) and, accordingly, none of the fund shares nor any interest therein may be offered or sold, directly or indirectly, in Japan or to, or for the benefit, of any Japanese person or to others for re-offering or resale, directly or indirectly, in Japan or to any Japanese person except under circumstances which will result in compliance with all applicable laws, regulations and guidelines promulgated by the relevant Japanese governmental and regulatory authorities and in effect at the relevant time. For this purpose, a "Japanese person" means any person resident in Japan, including any corporation or other entity organised under the laws of Japan.

Request ID: 371260

www.aqr.com

AQR Capital Management, LLC Two Greenwich Plaza, Greenwich, CT 06830 **P** +1.203.742.3600 **F** +1.203.742.3100

Earnings Growth: The Two Percent Dilution

William J. Bernstein and Robert D. Arnott

Two important concepts played a key role in the bull market of the 1990s. Both represent fundamental flaws in logic. Both are demonstrably untrue. First, many investors believed that earnings could grow faster than the macroeconomy. In fact, earnings must grow slower than GDP because the growth of existing enterprises contributes only part of GDP growth; the role of entrepreneurial capitalism, the creation of new enterprises, is a key driver of GDP growth, and it does not contribute to the growth in earnings and dividends of existing enterprises. During the 20th century, growth in stock prices and dividends was 2 percent less than underlying macroeconomic growth. Second, many investors believed that stock buybacks would permit earnings to grow faster than GDP. The important metric is not the volume of buybacks, however, but net buybacks—stock buybacks less new share issuance, whether in existing enterprises or through IPOs. We demonstrate, using two methodologies, that during the 20th century, new share issuance in many nations almost always exceeded stock buybacks by an average of 2 percent or more a year.

The bull market of the 1990s was largely built on a foundation of two immense misconceptions. Whether their originators were knaves or fools is immaterial; the errors themselves were, and still are, important. Investors were told the following:

1. With a technology revolution and a "new paradigm" of low payout ratios and internal reinvestment, earnings will grow faster than ever before. Real growth of 5 percent will be easy to achieve.

Like the myth of Santa Claus, this story is highly agreeable but is supported by neither observable current evidence nor history.

2. When earnings are not distributed as dividends and not reinvested into stellar growth opportunities, they are distributed back to shareholders in the form of stock buybacks, which are a vastly preferable way of distributing company resources to the shareholders from a tax perspective.

True, except that over the long term, net buybacks (that is, buybacks minus new issuance and options) have been reliably negative.

The vast majority of the institutional investing community has believed these untruths and has acted accordingly. Whether these tales are lies or merely errors, our implied indictment of these misconceptions is a serious one—demanding data. This article examines some of the data.

Big Lie #1: Rapid Earnings Growth

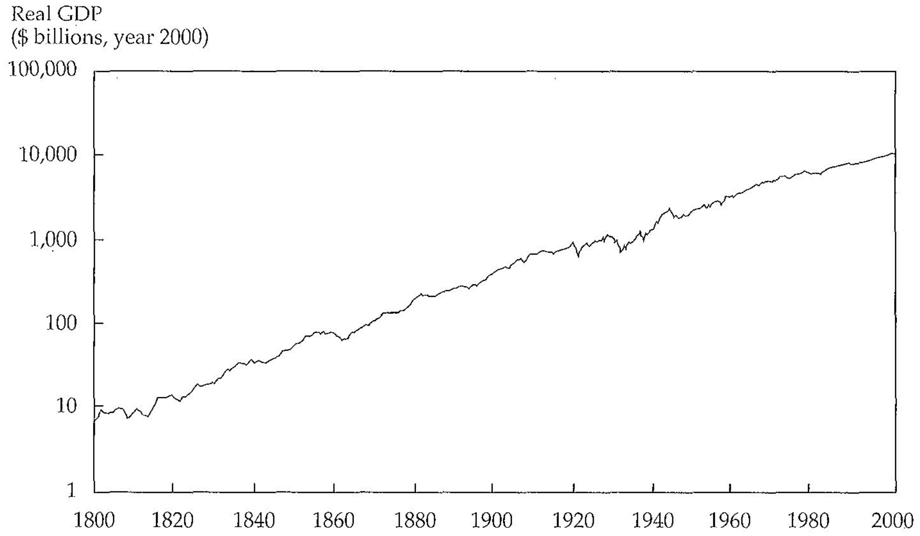
In the past two centuries, common stocks have provided a sizable risk premium to U.S. investors: For the 200 years from 1802 through 2001 (inclusive), the returns for stocks, bonds, and bills were, respectively, 8.42 percent, 4.88 percent, and 4.21 percent. In the most simplistic terms, the reason is obvious: A bill or a bond is a promise to pay interest and principal, and as such, its upside is sharply limited. Shares of common stock, however, are a claim on the future dividend stream of the nation's businesses. While the investor in fixed-income securities is receiving a modest fixed trickle from low-risk securities, the shareholder is the beneficiary of the ever-increasing fruits of innovation-driven economic growth.

Viewed over the decades, the powerful U.S. economic engine has produced remarkably steady growth. **Figure 1** plots the real GDP of the United States since 1800 as reported by the U.S. Department

William J. Bernstein is principal at Efficient Frontier Advisors, LLC, Eastford, Connecticut. Robert D. Arnott is chairman of First Quadrant, LP, and Research Affiliates, LLC, Pasadena, California.

Note: This article was accepted for publication prior to Mr. Arnott's appointment as editor of the Financial Analysts Journal.

Figure 1. Real U.S. GDP Growth, 1800–2000



of Commerce. From that year to 2000, the economy as measured by real GDP, averaging about 3.7 percent growth a year, has grown a thousandfold. The long-term uniformity of economic growth demonstrated in Figure 1 is both a blessing and a curse. To know that real U.S. GDP doubles every 20 years is reassuring. But it is also a dire warning to those predicting a rapid acceleration of economic growth from the computer and Internet revolutions. Such extrapolations of technology-driven increased growth are painfully oblivious to the broad sweep of scientific and financial history, in which innovation and change are constant and are neither new to the current generation nor unique.

The impact of recent advances in computer science pales in comparison with the technological explosion that occurred between 1820 and 1855. This earlier era saw the deepest and most far reaching technology-driven changes in everyday existence ever seen in human history. The changes profoundly affected the lives of those from the top to the bottom of the social fabric in ways that can scarcely be imagined today. At a stroke, the speed of transportation increased tenfold. Before 1820, people, goods, and information could not move faster than the speed of the horse. Within a generation, journeys that had previously taken weeks and months involved an order of magnitude less time, expense, danger, and discomfort. Moreover, important information that previously required the same long journeys could now be transmitted instantaneously.

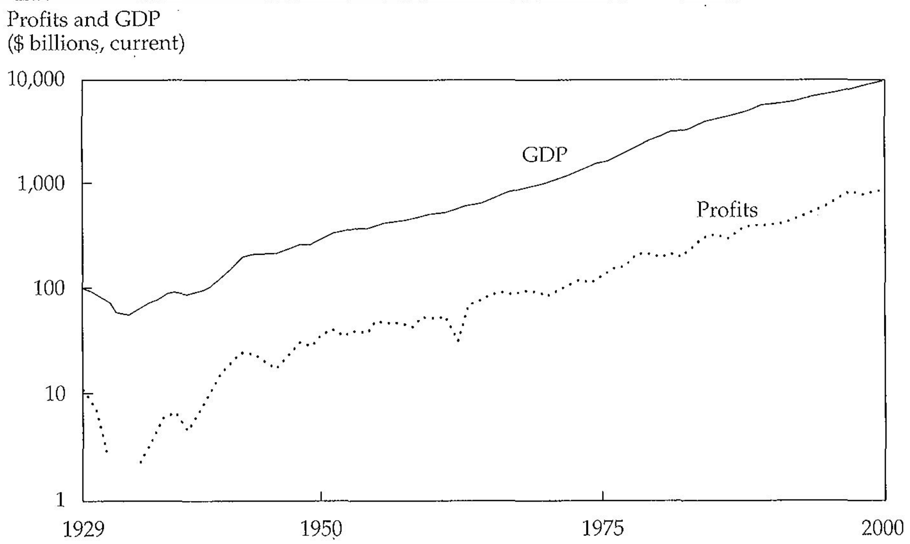
The average inhabitant of 1820 would have found the world 35 years later incomprehensible, whereas a person transported from 1967 to 2002 would have little trouble understanding the intervening changes in everyday life. From 1820 to 1855, the U.S. economy grew sixfold, four times the growth seen in the "tech revolution" of the past 35 years. More importantly, a close look at the right edge of Figure 1—the last decade of the 20th century—shows that the acceleration in growth during the "new paradigm" of the tech revolution of the 1990s was negligible when measured against the broad sweep of history.

The relatively uniform increase in GDP shown in Figure 1 suggests that corporate profits experienced a similar uniformity in growth. And, indeed, **Figure 2** demonstrates that, except for the Great Depression, during which overall corporate profits briefly disappeared, nominal aggregate corporate earnings growth has tracked nominal GDP growth, with corporate earnings remaining constant at 8–10 percent of GDP since 1929. The trend growth in corporate profits shown in Figure 2 is nearly identical, within a remarkable 20 bps, to the trend growth in GDP.[1]

Cannot stock prices also, then, be assumed to grow at the same rate as GDP? After all, a direct relationship between aggregate corporate profits and GDP has existed since at least 1929. The problem with this assumption is that per share earnings and dividends keep up with GDP *only if* no new shares are created. Entrepreneurial capitalism, however, creates a "dilution effect" through new enterprises and new stock in existing enterprises. So, per share earnings and dividends grow considerably slower than the economy.

In fact, since 1871, real stock prices have grown at 2.48 percent a year—versus 3.45 percent a year for GDP. Despite rising price–earnings ratios, we observe a "slippage" of 97 bps a year between stock

Figure 2. Nominal U.S. Corporate Profits and GDP, 1929–2000



prices and GDP. The true degree of slippage is much higher because almost half of the 2.48 percent rise in real stock prices after 1871 came from a substantial upward revaluation. The highly illiquid industrial stocks of the post–Civil War period rarely sold at more than 10 times earnings; often, they sold for multiples as low as 3 or 4 times earnings. These closely held industrial stocks gave way to instantly and cheaply tradable common shares, which today are priced nearly an order of magnitude more dearly.

Until the bull market of 1982–1999, the average stock was valued at 12–16 times earnings and 20–25 years' worth of dividends. By the peak of the bull market, both figures had tripled. Although the bull market was compressed into 18 years of the total period under discussion, this tripling of valuation levels was worth almost 100 bps a year—even when amortized over the full 130-year span. Thus, per share earnings and dividends grew 2 percent a year slower than the macroeconomy. If aggregate earnings and dividends grew as quickly as the economy while per share earnings and dividends were growing at an average of 2 percent a year slower, then shareholders have seen a slippage or dilution of 2 percent a year in the per share growth of earnings and dividends.

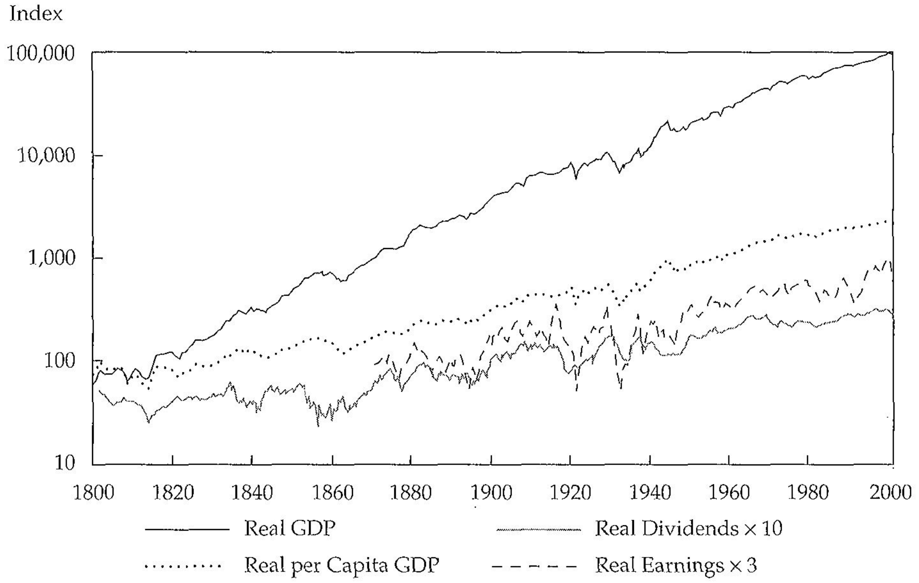
The dilution is the result of the net creation of shares as existing and new companies capitalize their businesses with equity. An often overlooked, but unsurprising, fact is that more than half of aggregate economic growth comes from new ideas and the creation of new enterprises, not from the growth of established enterprises. Stock investments can participate only in the growth of established businesses; venture capital participates only in the new businesses. The same investment capital cannot be simultaneously invested in both.

"Intrapreneurial capitalism," or the creation of new enterprises within existing companies, is a sound engine for economic growth, but it does not supplant the creation of new enterprises. Nor does it reduce the 2 percent gap between economic growth and earnings and dividend growth.

Note also that earnings and dividends grow at a pace very similar to that of per capita GDP (with some slippage associated with the "entrepreneurial" stock rewards to management). Consider that per capita GDP is a measure of productivity (with slight differences for changes in the work force) and aggregate economic wealth per capita can grow only in close alignment with productivity growth. Productivity growth is also the key driver of per capita income and of per share earnings and dividends. Accordingly, no one should be surprised that *per capita GDP, per capita income, per share earnings, and per share dividends—all grow in reasonably close proportion to productivity growth.*

If earnings and dividends grow faster than productivity, the result is a migration from return on labor to return on capital; if earnings and dividends grow more slowly, by a margin larger than the stock awards to management, then the economy migrates from rewarding capital to rewarding labor. Either way, such a change in the orientation of the economy cannot continue indefinitely. **Figure 3** demonstrates the close link between the growth of real corporate earnings and dividends and the growth of real per capita GDP; note that all of these measures exhibit growth far below the growth of real GDP.

Figure 3. Link of U.S. Earnings and Dividends to Economic Growth, 1802–2001



Note: Real GDP, real per capita GDP, and real stock prices were all constructed so that the series are on a common basis of January 1802 = 100.

A Global Laboratory

Is the United States unique? For an answer, we compared dividend growth, price growth, and total return with data on GDP growth and per capita GDP growth for the 16 countries covered by Dimson, Marsh, and Staunton (2002) spanning the 20th century.[2] The GDP data came from Maddison's (1995, 2001) world GDP survey for 1900–1998 and International Finance Corporation data for 1998–2000. The interrelationships of the data shown in **Table 1** are complex:

- The first column contains the real return (in U.S. dollars) of each national stock market.
- The second is real per share dividend growth.
- The third is real aggregate GDP growth for each nation (measured in U.S. dollars).
- The fifth is growth of real per capita GDP (measured in U.S. dollars).
- Thus, the fourth column measures the gap between growth in per share dividends and aggregate GDP—an excellent measure of the leakage that occurs between macroeconomic growth and the growth of stock prices.
- The last column represents the gap between the growth in per share dividends and per capita GDP.

For the full 16-nation sample in Table 1, the average gap between dividend growth and the growth in aggregate GDP is a startling 3.3 percent. The annual shortfall between dividend growth and per capita GDP growth is still 2.4 percent.

The 20th century was not without turmoil. Therefore, we divided the 16 nations into two groups according to the degree of devastation visited upon them by the era's calamities. The first group suffered substantial destruction of the countries' productive physical capital at least once during the century; the second group did not.

The nine nations in Group 1—Belgium, Denmark, France, Germany, Italy, Japan, the Netherlands, Spain, and the United Kingdom—were devastated by one or both of the two world wars or by civil war. The remaining seven—Australia, Canada, Ireland, South Africa, Sweden, Switzerland, and the United States—suffered relatively little direct damage. Even in this fortunate group, Table 1 shows dividend growth that is 2.3 percent less than GDP growth and 1.1 percent less than per capita GDP growth, on average. These gaps are close to the 2.7 percent and 1.4 percent figures observed in the United States during the 20th century.

The data for nations that were devastated during World Wars I and II and the Spanish Civil War are even more striking: The good news is that the economies in Group 1 repaired the devastations wrought by the 20th century; they enjoyed overall GDP growth and per capita GDP growth that rivaled the growth of the less-scarred Group 2 nations. The bad news is that the same cannot be said for per share equity performance; a 4.1 percent slippage occurred between the growth of their economies and per share corporate payouts. The

Table 1. Dilution of GDP Growth as It Flows Through to Dividend Growth: 16 Countries, 1900–2000

Country	Constituents of Real Stock Returns: Real Return	Constituents of Real Stock Returns: Dividend Growth	Real GDP Growth	Dilution in Dividend Growth (vis-à-vis GDP growth)	Real per Capita GDP Growth	Dilution in Dividend Growth (vis-à-vis per capita GDP growth)
Australia	7.5%	0.9%	3.3%	–2.4%	1.6%	–0.7%
Belgium	2.5	–1.7	2.2	–3.9	1.8	–3.5
Canada	6.4	0.3	4.0	–3.7	2.2	–1.9
Denmark	4.6	–1.9	2.7	–4.6	2.0	–3.9
France	3.6	–1.1	2.2	–3.3	1.8	–2.9
Germany	3.6	–1.3	2.6	–3.9	1.6	–2.9
Ireland	4.8	–0.8	2.3	–3.1	2.1	–2.9
Italy	2.7	–2.2	2.8	–5.0	2.2	–4.4
Japan	4.2	–3.3	4.2	–7.5	3.1	–6.4
Netherlands	5.8	–0.5	2.8	–3.3	1.7	–2.2
South Africa	6.8	1.5	3.4	–1.9	1.2	0.3
Spain	3.6	–0.8	2.7	–3.5	1.9	–2.7
Sweden	7.6	2.3	2.5	–0.2	2.0	0.3
Switzerland	5.0	0.1	2.5	–2.4	1.7	–1.6
United Kingdom	5.8	0.4	1.9	–1.5	1.4	–1.0
United States	6.7	0.6	3.3	–2.7	2.0	–1.4
Full-sample average	5.1	–0.5	2.8	–3.3	1.9	–2.4
War-torn Group 1 average	4.0	–1.4	2.7	–4.1	1.9	–3.3
Non-war-torn Group 2 average	6.4	0.7	3.0	–2.3	1.8	–1.1

creation of new enterprises in the wake of war was an even more important engine for economic recovery than in the Group 2 nations.

Thus, in Group 2 "normal nations" (i.e., those untroubled by war, political instability, and government confiscation of wealth), the natural ongoing capitalization of new technologies apparently produces a net dilution of outstanding shares of slightly more than 2 percent a year. The Group 1 nations scarred badly by war represent a more fascinating phenomenon; they can be thought of as experiments of nature in which physical capital is devastated and must be rebuilt. Fortunately, destroying a nation's intellectual, cultural, and human capital is much harder than destroying its economy; within little more than a generation, the GDP and per capita GDP of war-torn nations catch up with, and in some cases surpass, those of the undamaged nations. Unfortunately, the effort requires a high rate of equity recapitalization, which is reflected in the substantial dilution seen in Table 1 for the war-torn countries. This recapitalization savages existing shareholders.

In short, the U.S. experience was not unique. Around the world, every one of these countries except Sweden experienced dividend growth sharply slower than GDP growth, and only two countries experienced dividend growth even slightly faster than per capita GDP growth. The U.S. experience was better than most and was similar to that of the other nations that were not devastated by war.

The data for the individual countries in Table 1 show that the average real growth in dividends was negative for most countries. It also shows that dilution of GDP growth (the fourth column) was substantial for all the countries studied and that dilution of per capita GDP growth (the last column) was substantial for most countries but fit dividend growth with much less "noise" than did the dilution of overall GDP growth.

This analysis has disturbing implications for "paradigmistas" convinced of the revolutionary nature of biotechnology, Internet, and telecommunications/broadband companies. A rapid rate of technological change may, in effect, turn "normal" Group 2 nations into strife-torn Group 1 nations: An increased rate of obsolescence effectively destroys the economic value of plant and equipment as surely as bombs and bullets, with the resultant dilution of per share payouts happening much faster than the technology-driven acceleration of economic growth—if such acceleration exists. How many of the paradigmistas truly believe that the tech revolution will benefit the shareholders of existing enterprises remotely as much as it can benefit the entrepreneurs creating the new enterprises that make up the vanguard of this revolution?

Whatever the true nature of the interaction of technological progress and per share earnings, dividends, and prices, it will come as an unpleasant surprise to many that even in the Group 2 nations, average real per share dividend growth was only 0.66 percent a year (rounded in Table 1 to 0.7 percent); for the war-torn Group 1 nations, it was disturbingly negative.

In short, the equity investor in a nation blessed by prolonged peace cannot expect a real return greatly in excess of the much-maligned dividend yield; the investor cannot expect to be rescued by more rapid economic growth. Not only is outsized economic growth unlikely to occur, but even if it does, its benefits will be more than offset by the dilution of the existing investor's ownership interest by technology-driven increased capital needs.

Big Lie #2: Stock Buybacks

Stock buybacks are attractive to companies and beneficial to investors. They are a tax-advantaged means of providing a return on shareholder capital and preferable to dividends, which are taxed twice. Buybacks have enormous appeal. But contrary to popular belief, they did not occur in any meaningful way in the 1990s.

To support this contention, we begin with a remarkably simple measure of slippage in per share earnings and dividend growth: the ratio of the proportionate increase in market capitalization to the proportionate increase in stock price. For example, if over a given period, the market cap increases by a factor of 10 and the cap-weighted price index increases by a factor of 5, a 100 percent net share issuance has taken place in the interim. Formally,

$$\text{Net dilution} = \left(\frac{1+c}{1+r}\right) - 1,$$

where c is capitalization increase and r is price return. This relationship has the advantage of factoring out valuation changes, which are embedded in both the numerator and denominator, and neutralizing the impact of stock splits. Furthermore, it holds only for universal market indexes, such as the CRSP 1–10 or the Wilshire 5000, because less inclusive indexes can vary the ratio simply by adding or dropping securities. **Figure 4** contains plots of the total market cap and price indexes of the CRSP 1–10 beginning at the end of 1925.

The CRSP data contained NYSE-listed stocks until 1962. Even the CRSP data, however, can involve adding securities: CRSP added the Amex stocks in July 1962 and the Nasdaq stocks in July 1972, which created artificial discontinuities on those dates. The adjustment for these shifts is evident in **Figure 5**, for which we held the dilution ratio constant during the two months in question.[3] Note how market cap slowly and gradually pulls away from market price. The gap does not look large in Figure 4, but by the end of 2001, the cap index had grown 5.49 times larger than the price index, suggesting that for every share of stock extant in 1926, 5.49 shares existed in late 2001. The implication is that net new share issuance occurred at an annualized rate of 2.3 percent a year. Note that this rate is identical to the average dilution for non-war-torn countries during the 20th century given in Table 1. To give a better idea of how this dilution has proceeded over the past 75 years, Figure 5 provides a dilution index, defined as the ratio of capitalization growth to price index growth.

Figure 4. CRSP 1–10 Market Cap and Price Indexes, 31 December 1925–June 2002

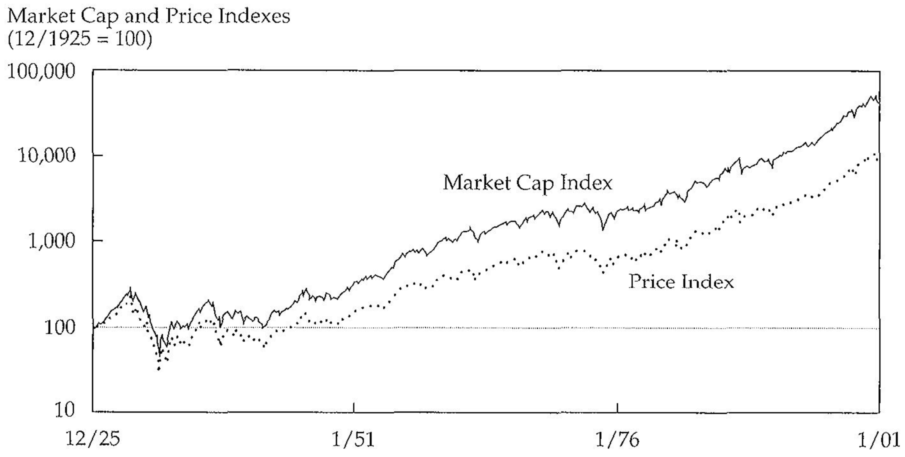


Figure 5. Cumulative Excess Growth of Market Cap Relative to Price Index, 31 December 1925 through June 2002

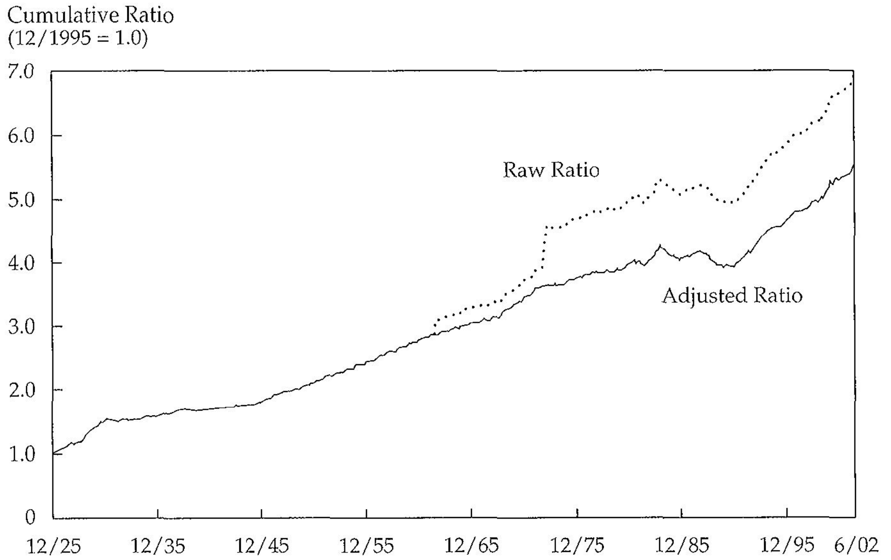
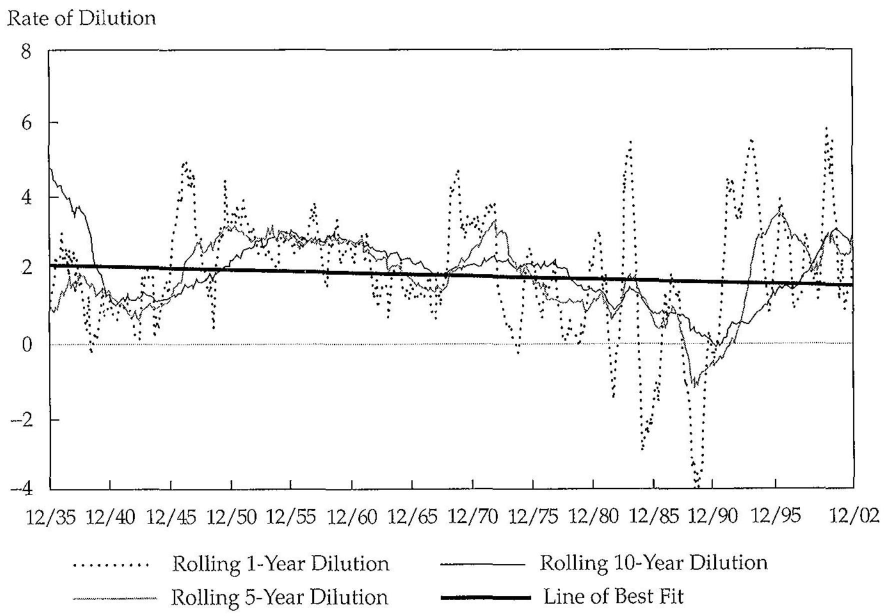


Figure 5 traces the growth in the ratio of the capitalization of the CRSP 1–10 Index as compared with the market-value-weighted price appreciation of these same stocks. The fact that this line rises nearly monotonically shows clearly that new-share issuance almost always sharply exceeds stock buybacks. The notable exception occurred in the late 1980s, when buybacks modestly outpaced new share issuance (evident from the fact that the line falls slightly during these "Milken years"). This development probably played a key role in precipitating the popular illusion that buybacks were replacing dividends. For a time, they did. But that stock buybacks were an important force in the 1990s is simply a myth. And belief in the myth may have been an important force in the bull market of the 1990s.

Figure 6 shows the rolling 1-year, 5-year, and 10-year dilution effect on existing equity shareholders as a consequence of a growth in the aggregate

Figure 6. Annualized Rate of Shareholder Dilution, 31 December 1935 through June 2002



supply of equity shares. Keep in mind that every 1 percent rise in equity capital is a 1 percent rise in market cap in which existing shareholders did not (could not) participate. Aside from the 1980s, this dilution effect on shareholders was essentially never negative—not even on a one-year basis. One can see how the myth of stock buybacks gained traction after the 1980s; even the 10-year average rate of dilution briefly dipped negative in the late 1980s. But then, during the late 1990s, stock buybacks were outstripped by new share issuance at a pace that was only exceeded in the IPO binge of 1926–1930. These conclusions hold true whether one is looking at net new share issuance on a 1-year, 5-year, or 10-year basis.

Those who argue that stock buybacks will allow future earnings growth to exceed GDP growth can draw scant support from history. Investors did see enormous earnings growth, far faster than real economic growth, from 1990 to 2000. But Figure 3 shows how tiny that surge of growth was in the context of 130 years of earnings history. Much of the earnings surge of the 1990s was dubious, at best.

The Eye of the Storm?

The big question today is whether the markets are likely to rebound into a new bull market or have merely been in the eye of the storm. We think the markets are in the eye.

The rapid earnings growth of the 1990s, which many pointed to as "proof" of a new paradigm, had several interesting characteristics:

1. A trough in earnings in the 1990 recession transformed into a peak in earnings in the 2000 bubble. Measuring growth from trough to peak is an obvious error; extrapolating that growth is even worse. This decade covered a large chunk of the careers of most people on Wall Street, many of whom have come to believe that earnings can grow very fast for a very long time. Part of conventional wisdom now is that earnings growth can outstrip macroeconomic growth.
2. Influenced by the new paradigm, analysts frequently ignored write-offs to focus increasingly on operating earnings. This practice is acceptable if write-offs are truly "extraordinary items," but it is not acceptable if write-offs become a recurring annual or biannual event, as was commonplace in the 1990s. Furthermore, what are extraordinary items for a single company are entirely ordinary for the economy as a whole. In some companies and some sectors, write-offs are commonplace. The focus on operating earnings for the broad market averages is misguided at best and deceptive at worst.
3. Those peak earnings of 1999–2000 consisted of three dubious components. The first is an underrecognition of the impact of stock options, which various Wall Street strategists estimated at 10–15 percent of earnings. The second is pension expense (or pension "earnings") based on assumptions of a 9.5 percent return, which were realistic then but are no longer; this factor pumped up earnings by approximately 15 percent at the peak and 20–30 percent from current depressed levels. The third component is Enron-style "earnings management," which various observers have estimated to be 5–10 percent of the peak earnings. (We suspect this percentage will turn out to be conservative.)

If these three sources of earnings overstatement (aggressive pension accounting, failure to expense management stock options, and outright fraud) are removed, the $54 peak earnings per share for the S&P 500 Index in 2000 turn out to be closer to $36. This figure implies normalized earnings a notch lower still. If the normalized earnings for the S&P 500 are in the $30–$36 range, as we suspect is the case, then the market at mid-year 2003 was still at a relatively rich 27–32 times normalized earnings. Using Shiller's (2000) valuation model (real S&P 500 level divided by 10-year average of real reported earnings) confirms this analysis. Shiller's model pegs the current multiple at nearly 30 times normalized earnings in mid-2003.

In principle, several conditions could allow earnings growth to exceed GDP growth. Massive stock buybacks are one. But we have demonstrated that buybacks in the 20th century were far more smoke than fire. Buybacks have been much touted as the basis for sustained earnings growth at unprecedented rates, but they simply do not show up in the data on market capitalization relative to market index price levels. Cross-holdings could also offer an interesting complication. But again, their impact does not show up in the objective shareholder dilution data. We have demonstrated that buybacks and cross-holdings do not yet show any signs of offsetting the historical 2 percent dilution, but the exploration of the possible impact of buybacks and cross-holdings is beyond the scope of this study.

Conclusion

Expected stock returns would be agreeable if dividend growth, and thus price growth, proceeded at the same rate as, or a higher rate than, aggregate economic growth. Unfortunately, dividends do not grow at such a rate: When we compared the Dimson et al. 20th century dividend growth series with aggregate GDP growth, we found that even in nations that were not savaged by the century's tragedies, dividends grew 2.3 percent more slowly, on average, than GDP. Similarly, by measuring the gap between the growth of market cap and share prices in the CRSP database, we found that between 1926 and the present, a 2.3 percent net annual dilution has occurred in the outstanding number of shares in the United States.

Two independent analytical methods point to the same conclusion: In stable nations, a roughly 2 percent net annual creation of new shares—the Two Percent Dilution—leads to a separation between long-term economic growth and long-term growth in dividends per share, earnings per share, and share price.

The markets are probably in the eye of a storm and can expect further turmoil as the rest of the storm passes over. If normalized S&P 500 earnings are \$30–\$36 per share, if payout ratios on those normalized earnings are at the low end of the historical range (implying lower-than-normal future earnings growth), if normal earnings growth is really only about 1 percent a year above inflation, if stock buybacks have been little more than an appealing fairy tale, if the credibility of earnings is at an all-time low, and if demographics suggest Baby Boomer dis-saving in the next 20 years, then we have a problem.

The authors would like to acknowledge the help, suggestions, and encouragement of Cliff Asness, Peter Bernstein, and Max Darnell.

Notes

1. In calculating "trend growth," we used a loglinear line of best fit to minimize the impact of distortions from an unusually high or low starting or ending date. The loss years of 1932 and 1933 were excluded because of loglinear calculation.
2. The Dimson et al. book is a masterwork. If you do not have a copy, you should.
3. We assumed the dilution factor to be zero in those two months. If a massive stock buyback or a massive new IPO occurred during one of these two months, we may have missed it. But net buybacks or net new share issuance during months in which the "index" saw a major reconstitution would be difficult to measure.

References

Dimson, Elroy, Paul Marsh, and Mike Staunton. 2002. *The Triumph of the Optimists*. Princeton, NJ: Princeton University Press.

Maddison, Angus. 1995. *Monitoring the World Economy, 1820–1992*. Washington, DC: OECD.

———. 2001. *The World Economy: A Millennial Perspective*. Washington, DC: OECD.

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

alternative investment vehicles has recently been documented, no such evidence is available on the ability of investors to generate superior risk-adjusted returns based on timing among various hedge fund styles.

This article is, to the best of our knowledge, the first to document the existence of predictability in hedge fund index returns and to focus on its implications for tactical allocation decisions. Specifically, we examined (lagged) multifactor models for the return on nine hedge fund indexes. We chose factors that would measure the many dimensions of financial risk—market risks (proxied by stock prices, interest rates, and commodity prices), volatility risk (proxied by implicit volatilities from option prices), default risk (proxied by default spreads), and liquidity risk (proxied by trading volume). We show that a parsimonious set of models captures a significant amount of predictability for most hedge fund styles.

We also found that the benefits of tactical style allocation are potentially enormous. The article first provides evidence of the economic significance of the performance of hedge fund style-timing models by comparing the performance of a market timer with perfect forecasting ability in the alternative investment universe with the performance of a perfect market timer in the traditional universe. Then, the performance of a realistic style-timing model is presented. An equity-oriented portfolio that mixed traditional and alternative investment vehicles and a similar debt-oriented mixed portfolio produced spectacular results. Moreover, the results do not seem to be significantly affected by the presence of reasonably high transaction costs.

Some specific features of hedge fund investing do not facilitate the implementation of tactical allocation strategies. In particular, the absence of liquidity and the presence of lockup periods, which are typical of investments in hedge funds, are likely to prevent investors from implementing any kind of dynamic allocation among funds. We believe, however, that the future of hedge fund style timing is even brighter than its past or present. The hedge fund industry is still relatively new, and market conditions are evolving at an astounding pace. Although the world of alternative investing has consisted of a disparate set of managers following disparate specific strategies, significant attempts at structuring the markets have occurred in the past few years. Important, well-established firms are creating relatively liquid investment products designed to track the performance of hedge fund indexes. ■

Keywords: Alternative Investments: hedge fund strategies; Portfolio Management: asset allocation; Portfolio Management: hedge fund strategies

Earnings Growth: The Two Percent Dilution

page 47

William J. Bernstein and Robert D. Arnott

The bull market of the 1990s was built largely on a foundation of two immense misconceptions:

- With a technology revolution and a "new paradigm" of low payout ratios and internal reinvestment, earnings will grow faster than ever before. Five percent real growth will be easy to achieve.
- When earnings are not distributed as dividends and not reinvested into stellar growth opportunities, they are distributed back to shareholders in the form of stock buybacks.

In fact, neither of these widespread beliefs stands up to historical scrutiny. Since 1800, the economy, as measured by real GDP, has grown a thousandfold, averaging about 3.7 percent a year. The long-term uniformity of economic growth is remarkable; it is both a blessing and a curse. To know that real U.S. GDP doubles every 20 years is reassuring. But this growth is also a dire warning to those predicting rapid acceleration of economic growth from the computer and Internet revolutions.

The relatively uniform increase in GDP implies a similar uniformity in the growth of corporate profits—which does, in fact, occur. Except for the Great Depression, during which overall corporate profits briefly disappeared, nominal aggregate corporate earnings have tracked nominal GDP growth, with corporate earnings staying at 8–10 percent of the GDP growth. The trend growth in corporate profits is identical, to within a remarkable 20 bps, to the trend growth in GDP.

For 16 countries, with data spanning the 20th century, we compared dividend growth, price growth, and total return with GDP data from the same period. We found that in stable, non-war-torn nations, per share dividend growth was 2.3 percent less than growth in aggregate GDP and 1.1 percent less than growth in per capita GDP. In the war-torn nations, the situation was far worse—per share dividend growth 4.1 percent less than growth in aggregate GDP and 3.3 percent less than growth in per capita GDP.

Data for the comprehensive CRSP 1–10 Index from 1926 to June 2002 show that, after adjustment for additions to the index, total U.S. market capitalization grew 2.3 percent faster than the price index. Thus, over the past 76 1/2 years, a 2.3 percent net new issuance of shares took place, which is the equivalent of *negative* buybacks. Although net buybacks occurred in the 1980s, by the 1990s, buyback activity had once again returned to historical norms.

Earnings growth was indeed high during the 1990s. But the persistence of this growth is dubious for three reasons:

- The market went from trough earnings in the 1990 recession to peak earnings in the 2000 bubble. Measuring growth from trough to peak is meaningless; extrapolating that growth is even worse.
- Analysts frequently ignored write-offs while increasing their focus on operating earnings. This behavior is acceptable if write-offs are truly "extraordinary items" but not if write-offs become an annual or biannual event, as was commonplace in the 1990s. Furthermore, what are extraordinary items for a single company are entirely ordinary for the economy as a whole.
- The peak earnings of 1999–2000 consisted of three dubious components. The first was an underrecognition of the impact of stock options, which various Wall Street strategists estimated at 10 percent or more of earnings. The second was pension expense (or pension "earnings") based on 9–10 percent return assumptions, which were realistic then but are no longer; this factor pumped up earnings by about 15 percent at the peak and 20–30 percent from recent, depressed levels. The third was Enron-style "earnings management," which various observers have estimated at 5–10 percent of the peak earnings.

In summary, in a dynamic, free-market economy, considerable capital is consumed funding new ventures. For this reason, per share growth of prices, earnings, and dividends will lag aggregate macroeconomic growth by an amount equal to the net issuance of new shares. In peaceful, stable societies, this gap appears to be about 2 percent a year. In war-torn nations, this gap is considerably larger. Although these nations' economies can recover relatively rapidly, the high degree of recapitalization that is required savages shareholders. ▣

Keywords: Portfolio Management: asset allocation; Economics: macroeconomics; Investment Industry: future directions and sources of change

Outlier-Resistant Estimates of Beta page 56

R. Douglas Martin and Timothy T. Simin

Recent surveys show that many analysts continue to use the capital asset pricing model and that most of them purchase betas from commercial providers, which invariably use a raw or adjusted ordinary least-squares estimate of beta. The sanctified use of OLS is justified by the fact that the OLS beta is statistically the best estimate of the linear model parameters under idealized assumptions.

In practice, however, one of the ways these assumptions fail is associated with the occurrence of a small fraction of exceptionally large or small returns—that is, outliers. We show by using several examples that outliers can, depending on their location in the equity-market-returns space, substantially bias OLS estimates of beta. Furthermore, the weekly returns for 8,314 companies from the CRSP database that had at least two years of returns in the period January 1992 through December 1996 contained many examples in which the deletion of a few outliers, sometimes even a single outlier, dramatically affected the OLS beta.

The vast majority of commercial providers do nothing to deal with outliers; the few that do deal with this problem use some form of outlier treatment without a solid statistical rationale. We deal with the vulnerability of the OLS beta to outliers by introducing a new beta estimate that is resistant to the types of outliers that cause the most bias in OLS estimates but that produces estimates similar to OLS for outlier-free data. The outlier-resistant beta is an intuitively appealing weighted-least-squares estimate with data-dependent weights. It has several advantages over other commonly used "robust" techniques.

The outlier-resistant beta applied to the CRSP database shows that the absolute value of the difference between the resistant and OLS betas is greater than 0.5 for 13 percent of the companies and that this difference is considerably larger than 1.0 for 3.2 percent of the companies. Such extreme sensitivity of the OLS beta to outliers results in misleading interpretations of the risk and return characteristics of a company. This study shows that outlier distortion of the OLS beta is primarily a small-firm effect (i.e., there is a monotonic relationship between the median market capitalization of companies and the absolute difference between the resistant and OLS betas). Furthermore, the resistant beta has superior performance relative to the OLS beta for predicting future betas when influential outliers are present but suffers (at most) only a slight degradation in performance when no influential outliers are present.

What risk premium is "normal"?
Robert D Arnott; Peter L Bernstein
Financial Analysts Journal; Mar/Apr 2002; 58, 2; ABI/INFORM Global
pg. 64

What Risk Premium Is "Normal"?

Robert D. Arnott and Peter L. Bernstein

The goal of this article is an estimate of the objective forward-looking U.S. equity risk premium relative to bonds through history—specifically, since 1802. For correct evaluation, such a complex topic requires several careful steps: 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. We demonstrate that the long-term forward-looking risk premium is nowhere near the level of the past; today, it may well be near zero, perhaps even negative.

The investment management industry thrives on the expedient of forecasting the future by extrapolating the past. As a consequence, U.S. investors have grown accustomed to the idea that stocks "normally" produce an 8 percent real return and a 5 percent (that is, 500 basis point) risk premium over bonds, compounded annually over many decades.[1] Why? Because long-term historical returns have been in this range with impressive consistency. And because investors see these same long-term historical numbers year after year, these expectations are now embedded in the collective psyche of the investment community.[2]

Both the return and the risk premium assumptions are unrealistic when viewed from current market levels. Few have acknowledged that an important part of the lofty real returns of the past stemmed from rising valuation levels and from high dividend yields, which have since diminished. As we will demonstrate, the long-term forward-looking risk premium is nowhere near the 5 percent level of the past; indeed, today, it may well be near zero, perhaps even negative. Credible studies in and outside the United States are challenging the flawed conventional view. Well-researched studies by Claus and Thomas (2001) and Fama and French (2000) are just two (see also Arnott and Ryan 2001). Similarly, the long-term forward-looking real return from stocks is nowhere near history's 8 percent. We argue 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 percent, similar to bond returns. In fact, 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.

Robert D. Arnott is managing partner at First Quadrant, L.P., Pasadena, California. Peter L. Bernstein is president of Peter L. Bernstein, Inc., New York.

Furthermore, if we examine the historical record, neither the 8 percent real return nor the 5 percent 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. But this topic merits careful exploration. After all, according to the Ibbotson Associates data, equity investors earned 8 percent real returns and stocks have outpaced bonds by more than 5 percent over the past 75 years. Intuition suggests that investors should not require such outsized returns in order to bear equity market risk. Should investors have expected these returns in the past, and why shouldn't they continue to do so? We examine these questions expressed in a slightly different way. First, can we derive an objective estimate of what investors had good reasons to expect in the past? Second, why should we expect less in the future than we have earned in the past?

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, the idea that future risk premiums should be different from past excess returns is not at all unreasonable.[3]

This complex topic requires several careful steps if it is to be evaluated correctly. To gauge the risk premium for stocks relative to bonds, we need an expected real bond return and an expected real stock 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.

Has the Risk Premium Natural Limits?

For equities to have a zero or negative risk premium relative to bonds would be unnatural because stocks are, on average over time, more volatile than bonds. Even if volatility were not an issue, stocks are a secondary call on the resources of a company; bondholders have the first call. Because the risk premium is usually measured for corporate stocks as compared with government debt obligations (U.S. T-bonds or T-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 (because of default risk and tax differences) relative to T-bonds, which should typically offer a premium yield (because of yield-curve risk) relative to T-bills. After all, long bonds have greater duration—hence, greater volatility of price in response to yield changes—so a capital loss is easier on a T-bond than on a T-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 100 bps 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 facet was demonstrated in Arnott and Ryan and is explored further in this article.

If 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, expecting a large reward for exposing capital to risk is not unreasonable. Our analysis suggests that the U.S. equity risk premium approached or exceeded 10 percent during the Civil War, during the Great Depression, and in the wake of World Wars I and II. That said, however, it is difficult to see how one might objectively measure the forward-looking risk premium in such conditions.

A 5 percent excess return on stocks over bonds compounds so mightily over long spans that most serious fiduciaries, if they believed stocks were going to earn a 5 percent risk premium, 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.[4] Hence, under so-called normal conditions—encompassing booms and recessions, bull and bear markets, and "ordinary" economic stresses—a good explanation is hard to find for why expected long-term real returns should ever reach double digits or why the expected long-term risk premium of stocks over bonds should ever exceed about 5 percent. 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 versus "Hoped-For" Returns

Throughout this article, we deal 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 that an investor might *hope* to earn. The distinction is subtle; both represent expectations, but one is 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.[5]

When we refer to expected returns or expected risk premiums, we are referring to the estimated future returns and risk premiums that an objective evaluation—based on past rates of growth of the economy, past and prospective rates of inflation, current stock and bond yields, and so forth—might have supported at the time. We explicitly do not include any extrapolation of past returns per se, because past returns are driven largely by changes in valuation levels (e.g., changes in yields), which in an efficient market, investors should not expect to continue into the indefinite future. By the same token, we explicitly do not presume any reversion to the mean, in which high yields or low yields are presumed to revert toward historical norms. We presume that the current yield is "fair" and is an unbiased estimator of future yields, both for stocks and bonds.

Few investors subjectively expect returns as low as the objective returns produced by this sort of analysis. In a recent study by Welch (2000), 236 financial economists projected, on average, a 7.2 percent risk premium for stocks relative to T-bills over the next 30 years. If we assume that T-bills offer the same 0.7 percent real return in the future that they have offered over the past 75 years, then stocks must be expected to offer a compounded geometric average real return of about 6.6 percent.[6] Given a dividend yield of roughly 1.5 percent in 1998–1999, when the survey was being carried out, the 236 economists in the survey were clearly presuming that dividend and earnings growth will be at least 5 percent a year above inflation, a rate of real growth three to five times the long-term historical norm and substantially faster than plausible long-term economic growth.

Indeed, even if ir vestors take seriously the real return estimates and risk premiums produced by the sort of objective analysis we propose, many of them will continue to believe that their own investments cannot fail to do better. Suppose they agree with us that stocks and bonds are priced to deliver 2–4 percent real returns before taxes.[7] Do they believe that *their* investments will produce such uninspired pretax 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, most investors will be wrong in their (our?) subjective expectations.

What Were Investors Expecting in 1926

Are we being reasonable to suggest that, after a 75-year span with 8 percent real stock returns and a 5 percent excess return over bonds (the Ibbotson findings), an 8 percent real return or a 5 percent risk premium is abnormal? Absolutely. The relevant question is whether the investors of 1926 would have had reason to *expect* these extraordinary returns. In fact, they would not. What they got was different from what they should have expected, which is a normal result in a world of uncertainty.

At the start of 1926, the beginning of the returns covered in the Ibbotson data, investors had no reason to expect the 8 percent real returns that have been earned over the past 75 years nor that these returns would provide a 5 percent excess return over bonds. As we will describe, these outcomes were the consequence of a series of historical accidents that uniformly helped stocks and/or helped the risk premium.

Consider what investors might objectively have expected at the start of 1926 from their long-term investments in stocks and bonds. In January that year, government bonds were yielding 3.7 percent. The United States was on a gold standard, government was small relative to the economy as a whole, and the price level of consumer goods, although volatile, had been trendless throughout most of U.S. history up to that moment; thus, 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 3.7 percent government bond yield. Accordingly, the *real* return that investors would have expected on their government bonds was 3.7 percent, plain and simple.

Meanwhile, the dividend yield on stocks was 5.1 percent. We can 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 P/E multiples or dividend yields.

What did the investors expect of stocks in early 1926? The time was the tail end of the era of "robber baron" capitalism. As Chancellor (1999) observed, investors were accustomed to the fact that company managers would often dilute shareholders' returns if an enterprise was successful but that the shareholder was a full partner in any business decline. More important was the fact that 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 for return calculations in those days.

Investors generally did not yet consider stocks to be "growth" investments, although a few people were beginning to acknowledge the full import of Smith's extraordinary study *Common Stocks as Long-Term Investments*, which had appeared in 1924. Smith demonstrated how stocks had outperformed bonds over the 1901–22 period.[8] His work 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 more than 100 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 that 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 could reasonably have expected on average, or from the market as a whole, was the 5.1 percent dividend yield, give or take a little. Thus, stock investors would have expected roughly a 1.4 percent risk premium over bonds, not the 5 percent they actually earned in the next 75 years. The market exceeded objective expectations as a consequence of a series of historical accidents:

- *Historical accident #1: Decoupling yields from real yields.* The Great Depression (roughly 1929–1939) introduced a revolutionary increase in the role of government in peacetime economic policy and, simultaneously, drove the United States (and just about the 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 change 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 year-end 2001 were 3.4 percent (the Treasury Inflation-Indexed Securities, commonly called TIPS, yield[9]), but nominal yields were 5.8 percent. This rise in nominal yields (with real yields holding steady) has cost bondholders 0.4 percent a year over 75 years. That accident alone accounts for nearly one-tenth of the 75-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 fourfold increase in the value assigned to each dollar of dividends contributed 180 bps to annual stock 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 percent yields in 1984). This accident explains fully one-third of the 75-year excess return.
- *Historical accident #3: Survivor bias.* Since 1926, the United States has fought no wars on its own soil, nor has it experienced revolution. Four of the fifteen largest stock markets in the world in 1900 suffered a total loss of capital, a –100 percent return, at some point in the past century. The markets are China, Russia, Argentina, and Egypt. Two others came close—Germany (twice) and Japan. Note 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 considered this likelihood to be 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 shareholders to passing much of the economic growth through to shareholders. This shift has led to 1.4 percent a year 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 75-year excess return.[10]

In short, the equity investors of 1926 probably expected to earn a real return little different from their 5.1 percent yield and expected to earn little more than the 140 bp yield differential over bonds. Indeed, an objective investor might have expected a notch less because of the greater frequency with which investors encountered dividend cuts in those days.

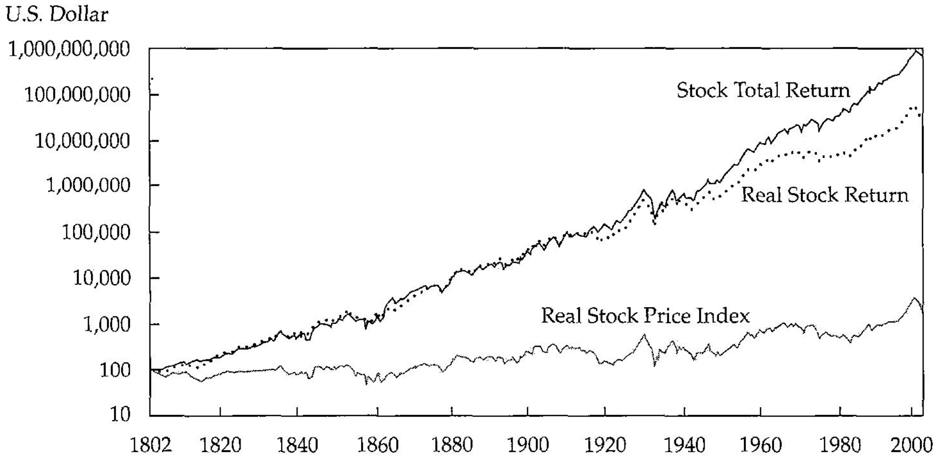
What Expectations Were Realistic in the Past?

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. From this exercise, we can gauge what risk premium an investor might reasonably have expected at any point in history, not simply an isolated snapshot of early 1926. A brief review of the sources of stock returns over the past two centuries should help lay a foundation for our work on return expectations and shatter a few widespread misconceptions in the process. The sources of the data are given in Appendix A.[11]

Step I: How Well Does Economic Growth Flow into Dividend Growth? Over the past 131 years, since reliable earnings data became available in 1870, the average earnings yield has been 7.6 percent and the average real return for stocks has been 7.2 percent; 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. In the absence of changing valuation levels, real returns are systematically *lower* than earnings yields.

Figure 1 shows stock market returns since 1802 in a fashion somewhat different from that shown in most of the literature. The solid line in Figure 1 shows the familiar cumulative total return for U.S. equities since 1802, in which each $100 invested grows, with reinvestment of dividends, to almost $700 million in 200 years. To be sure, some of this growth came from inflation; as the line "Real Stock Return" shows, $700 million will not buy what it

Figure 1. Return from Inflation and Dividends: Growth of $100, 1801–2001

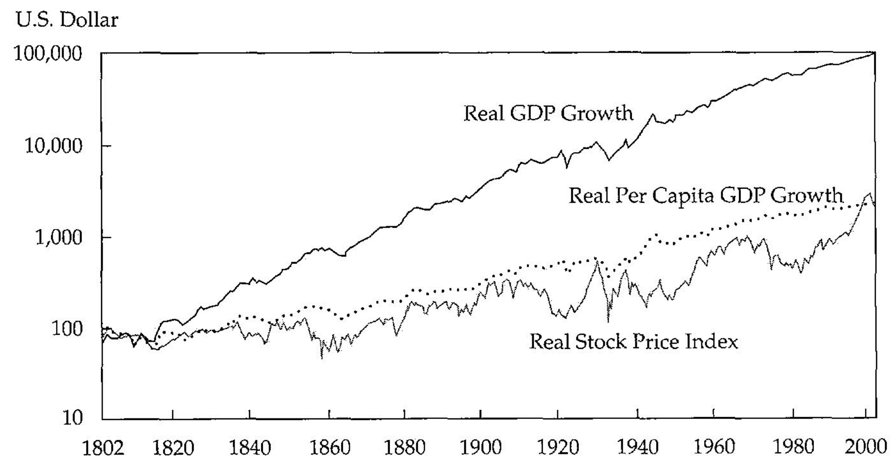


would have in 1802, when one could have purchased the entire U.S. GNP for less than that sum.[12] By removing inflation, we show in the "Real Stock Return" line that the $100 investment grew to "only" $37 million. Thus, adjusted for inflation, our fortune is much diminished but still impressive. Few portfolios are constructed without some plans for future spending, and the dividends that stocks pay are often spent. So, the "Real Stock Price Index" line shows the wealth accumulation from price appreciation alone, net of inflation and dividends. This bottom line (literally and figuratively) reveals that stocks have risen just 20-fold from 1802 levels. Put another way, if an investor had placed $100 in stocks in 1802 and received and spent the average dividend yield of 4.9 percent for the next 200 years, his or her descendants would today have a portfolio worth $2,099, net of inflation. So much for our $700 million portfolio!

Worse, the lion's share of the growth from $100 to $2,099 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 the $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 percent, the $100 portfolio would be worth today, net of inflation and dividends, just $550. These data put the lie to the conventional view that equities derive most of their returns from capital appreciation, that income is far less important, if not irrelevant.

Figure 2 allows a closer look at the link between equity price appreciation and economic growth. It shows that the growth in share prices is much more closely tied to the growth in real *per capita* GDP (or GNP) than to growth in real GDP per se. The solid line shows that, compounding at about 4 percent in the 1800s and 3 percent in the 1900s, the economy itself delivered an impressive 1,000-fold growth.

Figure 2. The Link between Stock Prices and Economic Growth, 1802–2001



But net of inflation and dividend distributions, stock prices (the same "Real Stock Price Index" line in Figure 1) fell far behind, with cumulative real price appreciation barely 1/50 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 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.

Finally, the "Real Per Capita GDP Growth" line in Figure 2 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) than does real GDP itself.

Going one step further, **Figure 3** shows the internal growth of real dividends—that is, the growth that an index fund would expect to see in its own real dividends in the absence of additional investments, such as reinvestment of dividends.[13] Real dividends exhibit *internal* growth that is similar to the growth in real per capita GDP. Because growth in per capita GDP is a measure of productivity growth, the internal growth that can be sustained in a diversified market portfolio should closely match the growth of *productivity* in the economy, not the growth in the economy per se. Therefore, the dotted line traces per capita real GDP growth, the "Real Stock Price Index" line shows real stock prices, and the bottom line shows real dividends (× 10).[14] Figure 3 reveals the remarkable resemblance between real dividend growth and growth in real per capita GDP.

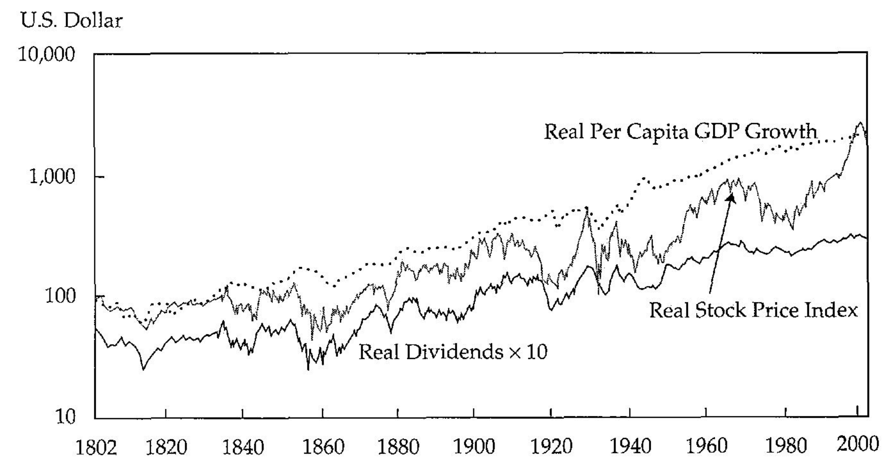
When we measure the internal growth of real dividends as in Figure 3, we see that real dividends have risen a modest fivefold from 1802 levels. In other words, the real dividends for a $100 portfolio invested in 1802 have grown merely 0.9 percent a year net of inflation. To be sure, the price assigned to each dollar of dividends has quadrupled, which leads to the 20-fold real price gain in the 200 years.

Although real dividends have tracked remarkably well with real per capita GDP, they have consistently fallen short of GDP gains. Not only have real dividends failed 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, at an average of about 70 bps a year, relative to per capita economic growth.

In short, more than 85 percent of the return on stocks over the past 200 years has come from (1) inflation, (2) the dividends that stocks have paid, and (3) the rising valuation levels (rising P/Es and falling dividend yields) since 1982, not from growth in the underlying fundamentals of real dividends or earnings.[15] Furthermore, real dividends and real per capita GDP both grew 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 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

Figure 3. Dividends and Economic Growth, 1802–2001



profits. The problem is that reported earnings often do not follow this theoretical definition. For example, 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 U.S. SEC is 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 most of his or her internal rate of return. Finally, with earnings growth barely 0.3 percent faster than dividend growth over the past 131 years, an analysis based on earnings would reach conclusions nearly identical to our conclusions based on dividends.

Finance theory tells us that capital is fungible; that is, equity and debt, retained earnings and dividends—all should flow to the best use of capital and should (in the absence of tax-related arbitrages and other nonsystematic disruptions) produce a similar risk-adjusted return on capital. Thus, 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 percent (corresponding to a P/E of 20), it can pay out all of the earnings and thereby deliver a 5 percent 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 percent earnings yield should also be the expected real return. Now, if the company, instead, pays a 2 percent yield and retains earnings worth 3 percent of the stock price, the company ought to achieve 3 percent real growth in earnings; otherwise, it should have distributed the cash to the shareholders. How does this theory stand up to reality?

Over the past 200 years, dividend yields have averaged 4.9 percent, yet real returns have been far higher, 6.6 percent. Since 1870, earnings yields have averaged 7.6 percent, close to the real returns of 7.2 percent over that span. This outcome is consistent with the notion of fungible capital, that the return on capital reinvested in an enterprise ought to match the return an investor might otherwise have earned on that same capital if it had been distributed as a dividend. However, if we take out the changes in valuation levels since 1982 (regardless of whether dividend yields or P/Es are used for those levels), the close match between earnings yield and real stock returns evaporates.

Moreover, with an average earnings yield of 7.6 percent and an average dividend yield of 4.7 percent since 1871, the average "retained earnings yield" has been nearly 3 percent. This retained earnings yield should have led to real earnings and dividend growth of 3 percent; otherwise, management ought to have paid this money out to the shareholders. Instead, real dividends and earnings grew at annual rates of, respectively, 1.2 percent and 1.5 percent. Where did the money go? The answer is that during the era of "pirate capitalism," success often led to dilution: Company managers issued themselves more stock![16]

Furthermore, retained earnings often chase poor internal reinvestment opportunities. If existing enterprises experienced only 1.2–1.5 percent internal growth of real dividends and earnings in the past two centuries, most of the 3.6 percent economic growth the United States has enjoyed has clearly not come from reinvestment in existing enterprises. In fact, it 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.[17]

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 used are from indexes, which are a particular kind of sampling of the market. Old companies fading from view lose their market weight as the newer and faster growing companies gain a meaningful share in the economy. The 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, an index need only change the divisor whenever a new enterprise is added, whereas we cannot add a new enterprise to our portfolio without cost. The index changing the divisor is mathematically the same as selling a little bit of *all other* holdings to fund the purchase of a new holding, but when we add a new enterprise to our portfolios, we must commit some capital to effect the purchase. Whether through reinvestment of dividends or infusion of new capital, this 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—which produces 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.[18]

The dynamics of the capitalist system inevitably lead 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; in time, earnings begin to decline; then, expansion slows, profit margins improve, and the whole thing repeats itself. We can see this drama playing out in the relationship between payout ratios in any given year and earnings growth: Since 1984, the payout ratio has explained more than half of the variation in five-year earnings growth rates with a t-statistic of 9.51.[19]

Few observers have noticed 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—which is why we find the current fashion of forecasting the future by extrapolating the past to be so 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 even better, because in the absence of changes in valuation levels, the earnings yield systematically overstates future real stock returns.

If long-term real growth in dividends had been 0.9 percent, real stock returns would have been only 90 bps higher than the dividend yield if it were not for the enormous jump in the price-to-dividend ratio since 1982. Even if we adjust today's 1.4 percent dividend yield sharply upward to include "dividends by another name" (e.g., stock repurchases), making a case for real returns higher than the 3.4 percent currently available in the TIPS market would be a stretch.[20]

Step II: Estimating Real Stock Returns. To estimate the historical equity risk premium, we must 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. Future long-term real stock return is defined as[21]

$$RSR(t) = DY(t) + RDG(t) + \Delta PD(t) + \varepsilon, \quad (1)$$

where

$DY(t)$ = percentage dividend yield for stocks at time t

$RDG(t)$ = percentage real dividend growth rate over the applicable span starting at time t

$\Delta PD(t)$ = percentage change in the price assigned to each dollar of dividends starting at time t

ε = error term for sources of return not captured by the three key constituents (this term will be small because it will reflect only compounding effects)

Viewed from the perspective of forecasting 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, valuation change should be positive when the market is inexpensive and negative when the market is richly priced. If markets are efficient, 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 1802–14 bear market and depression, during which real per capita GDP, real dividends, and real stock prices all contracted 40–50 percent? How can we objectively put ourselves in the position of an investor almost 200 years ago? For this purpose, we 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 have shown 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 capitalism (the share of economic growth that is tied to new enterprises not yet available in the stock market) or plus a premium for hidden dividends, such as stock buybacks. So, real dividend growth is given by

$$RDG(t) = RGDP(t) + DGR(t) + \varepsilon, \quad (2)$$

where

$RGDP(t)$ = percentage real per capita GDP growth over the applicable span starting at time t

$DGR(t)$ = annual percentage dilution of real GDP growth as it flows through to real dividends starting at time t

ε = error term for compounding effects (it will be small)

Basically, in Equation 2, we are substituting $RGDP(t) + DGR(t)$ for $RDG(t)$ and rolling the $\Delta PD(t)$ term into the error term (to avoid getting into the debates about valuation and regression to the mean). With these two changes, and converting to an expectations model, our model for expected real stock market returns, *ERSR*, becomes

$$ERSR(t) = EDY(t) + ERGDP(t) + EDGR(t), \quad (3)$$

where

$EDY(t)$ = *expected* percentage dividend yield for stocks at time t

$ERGDP(t)$ = *expected* percentage real per capita GDP growth over the applicable span starting at time t

$EDGR(t)$ = *expected* annual percentage dilution of real per capita GDP growth as it flows through to real dividends starting at time t

A 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. The result is a dividend yield that is artificially depressed, real per capita GDP growth that is artificially depressed, and long-term dividend growth relative to GDP growth that is artificially depressed, all three of which lead, in recessionary troughs, to understated expected real stock returns. The simplest way to deal with this issue 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 the three constituents of expected real stock returns.[22]

We illustrate how we constructed an objective real stock return forecast for the past 192 years in **Figure 4**; Panel A spans 1810 to 2001, and Panel B shows the same data after 1945. To explain these graphs, we will go through them line by line.

The easiest part of forecasting real stock returns, the "Estimated Real Stock Return" line in Figure 4, is the dividend yield: It is a known fact. We have adjusted dividends to correct for the artificially depressed dividends during recessions to get the $EDY(t)$ term shown as the "Dividend Yield" line in Figure 4. This step allows us to 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 because the deepest recessions are often deeper than the average recessions of the prior 40 years. Against an average dividend yield of 4.9 percent, we found an average *expected* dividend yield of 5.0 percent.

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, then one sensible way to forecast dividend growth is to forecast economic growth and then forecast how rapidly this dilution will take place.[23] Stated 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 resulting line, "Dilution of GDP Growth in Dividends," in the two graphs of Figure 4 represents the $EDGR(t)$ term in our model (Equation 3). Note the persistent tendency for dividend growth to lag GDP growth: Real dividends have grown at 1 percent a year over the past 192 years, whereas the real economy has grown at 3.8 percent a year, and even real per capita GDP has grown at 1.8 percent a year. Why should real dividends have grown so much more slowly than the economy?

First, much of the growth in the economy has come from innovation and entrepreneurial capitalism. More than half of the capitalization of the Russell 3000 today consists of enterprises that did not exist 30 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.

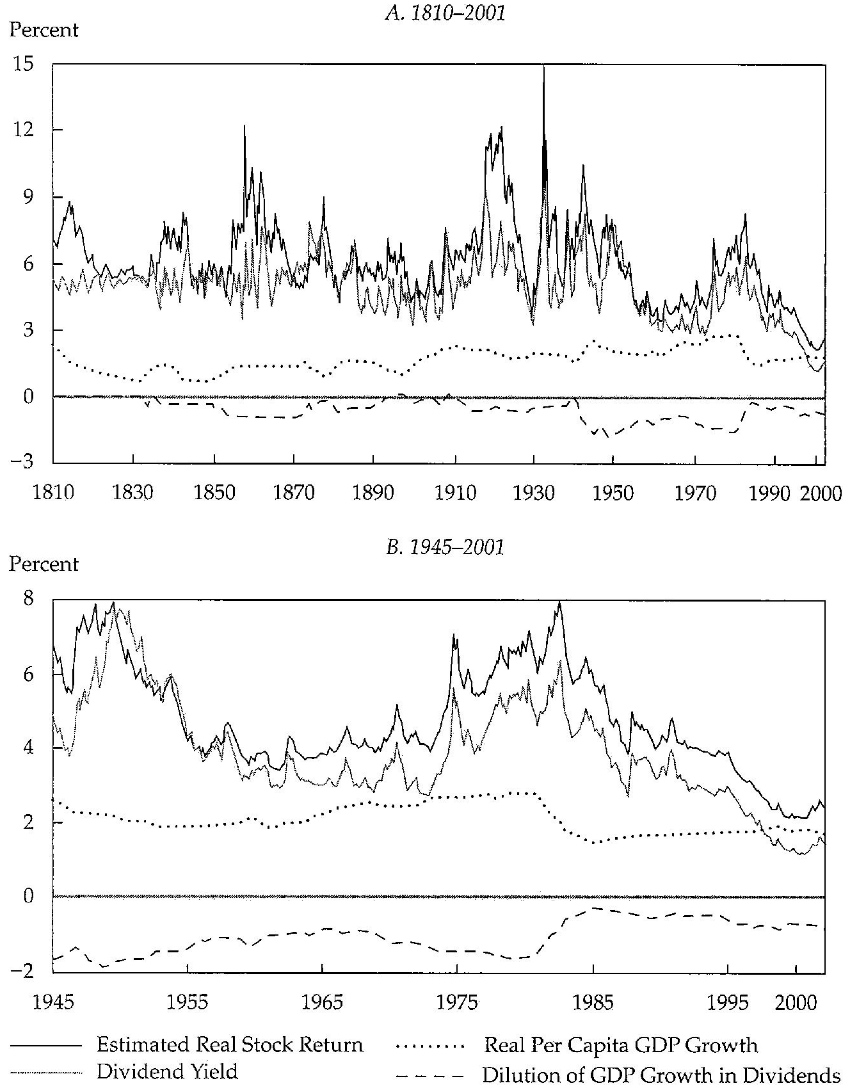
Second, as was demonstrated in Bernstein (2001b), retained earnings are often not reinvested at a return that rivals externally available investments; earnings and dividend growth are faster when payout ratios are high than when they are low, perhaps because corporate managers are then forced to be more selective about reinvestment alternatives.[24]

Finally, as we have emphasized, corporate growth typically leads to more shares outstanding, which automatically imposes a drag on the growth in dividends per share.

As a sensible estimate of the future dividend/GDP shortfall, the rational investor of any day might forecast dividend growth by using the prior 40-year shortfall in dividend growth relative to per capita GDP or might choose to use the cumulative (by now, 200-year) history. We chose the simple expedient of averaging the two.

The dilution effect we found from the 40-year and cumulative data for real dividends and real per capita GDP averages –60 bps. So, in the past 40 years, the dilution of dividend growth is almost

Figure 4. Estimating Real Stock Returns



exactly the same as the long-term average, –80 bps. With a standard deviation of just 0.5 percent, this shortfall of dividend growth relative to economic growth is the steadiest of any of the components of real stock returns or real bond returns. It has never been materially positive on a long-term sustained basis; it has never risen above +10 bps for any 40-year span in the entire history since 1810.

The history of dividend growth shows no evidence that dividends can ever grow materially faster than per capita GDP. Indeed, they almost always grow more slowly. Suppose real GDP growth in the next 40 years is 3 percent a year and population growth is 1 percent a year. These assumptions would appear to put an *upper limit* on real dividend growth at a modest 2 percent a year, 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 percent, even with relatively robust, 2.5–3.0 percent, real GDP growth.

Now consider the third part of forecasting real stock returns in this fashion—the forecast of long-term real per capita GDP growth, *ERGDP*(t) in our model. How much real per capita GDP growth would an investor have expected at any time in the past 200 years? Again, a simple answer might come from the most recent 40 years' growth rate; another might come from the cumulative record going back as far as we have dividend and GDP data, to 1802. These historical data are shown in the "Real per Capita GDP Growth" line in Figure 4. And again, we chose the simple expedient of averaging the average of the two. Real per capita GDP growth has been remarkably stable over the past 200 years, particularly if we adjust it to correct for temporary dips during recessions. If we examine truly long-term results, the 40-year real growth rate in real per capita GDP has averaged 1.8 percent with a standard deviation of only 0.9 percent.[25]

Note from Figure 4 that the total economy grew faster during the 19th century than the 20th century whereas stock returns (and the underlying earnings and dividends) grew faster in the 20th century than the 19th. 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. First, the base from which industrial growth started in the 19th century was so much smaller that much faster new enterprise creation occurred then than in the 20th century. Second, with nearly 3 percent growth in the population from 1800 to 1850, the growing talent and labor pool fueled a faster rate of growth than the 1.25 percent 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. Population growth fuels growth in human capital, in available labor, and in both demand *and* supply of goods and services. As a result, when population growth is rapid, the 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.

The simple framework we have presented for estimating real stock returns reveals few surprises. As Panels A and B of Figure 4 show, the expected stock return is the sum of the three constituent parts graphed in the other lines. We estimate that expected real stock returns for the past 192 years averaged about 6.1 percent with the following constituent parts: an expected yield averaging 5.0 percent plus real per capita GDP growth of 1.7 percent a year minus an expected *shrinkage* in dividends relative to real per capita GDP averaging –0.6 percent. Meanwhile, investors actually earned real returns of 6.8 percent. Most of this 70 bp difference from the 6.1 percent 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 previously.

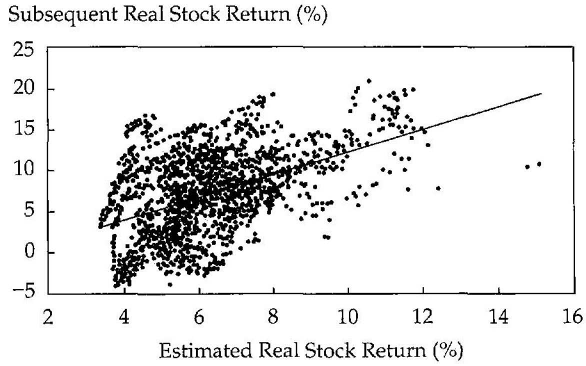
Expectations for real stock returns have soared above 6 percent often enough that many actuaries even today consider 8 percent a "normal" real return for equities. Our estimate for real stock returns, however, exceeds 8 percent only during the depths of the Great Depression, in the rebuilding following the War of 1812, the Civil War, World War I, and World War II, and in the Crash of 1877. In the past 50 years, expected real stock returns above 7 percent 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.

When viewed from the vantage point of this formulation for expected real stock returns, the full 192-year record shows that expected real stock returns fell below 3.5 percent only once before the late 1990s, at the end of 1961 just ahead of the difficult 1962–82 span, real stock prices fell by more than 50 percent. 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 then, the best estimate for real dividend growth was rarely more than 1 percent, so the best estimate for real stock returns was approximately the dividend yield plus 100 bps—considerably less than the earnings yield! From the 1950s to date, as Panel B of Figure 4 shows, the shortfall of dividends relative to GDP growth improved (perhaps because the presence of the SEC discourages company managers 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 it is still a modest 2.4 percent.

Figure 5 shows the strong correlation between our formulation for expected real stock returns and the actual real returns that stocks have delivered over the subsequent 10-year span. The correlation is good—at 0.62 during the modern market era after World War II and 0.46 for the full 182 years.[26] 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), the correlations grow to 0.95 and 0.60 for the post-1945 period and the full 182 years, respectively.

Figure 5. Estimated and Subsequent Actual Real Stock Returns, 1802–2001



The regression results given in Panel A **Table 1** show that the coefficient in the regression is larger than 1.00. So, that 100 bp increase in the expected real stock return, *ERSR*, is worth more than 100 bps in the subsequent 10-year actual real stock return, *RSR*. The implication is that some tendency for reversion to the mean does exist and that it will magnify the effect of unusually high or low expected real stock returns. This suggestion has worrisome implications for the recent record low levels for expected real stock returns.

Because rolling 10-year returns (and expected returns in our model) are highly serially correlated, the *t*-statistics given in Panel A of Table 1 are not particularly meaningful. One way to deal with overlapping data is to eliminate the overlap by using nonoverlapping samples—in this case, examining only our 19 nonoverlapping samples beginning December 1810. The Panel B results, with a coefficient larger than 1.00, confirm the previous results (and approach statistical significance, even with only 17 degrees of freedom).[27] One worrisome fact, in light of the recent large real stock returns, is that the nonoverlapping real stock returns by decades have a –31 percent serial correlation. Although it is not a statistically significant correlation, it is large enough to be interesting: It suggests that spectacular decades or wretched decades may be considerably more likely to reverse than to repeat.

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

Step III: Estimating Future Real Bond Returns. On the bond side, real realized returns are equal to the nominal yield minus inflation (or plus deflation) and plus or minus yield change times duration:

$$RBR(t) = BY(t) - INFL(t) + \Delta BY(t)DUR(t) + \varepsilon, \quad (4)$$

where

$BY(t)$ = percentage bond yield at time t

$INFL(t)$ = percentage inflation over the applicable span starting at time t

$\Delta BY(t)DUR(t)$ = annual change in yield over the applicable span times duration at time t (under the assumption that rolling reinvestment is in bonds of similar duration)

ε = error term (compounding effects lead to a small error term in this simple formulation)

As with stocks, we prefer to take current yields as a fair estimate of future bond yields. So, we eliminate the variable that focuses on changes in yields, $\Delta BY(t)DUR(t)$. We also need to shift our focus from measuring past real bond returns to forecasting future real bond returns. Therefore, our model is

$$ERBR(t) = BY(t) - EINFL(t), \quad (5)$$

where $BY(t)$ is the percentage bond yield at time t and $EINFL(t)$ is the expected percentage inflation over the applicable span starting at time t.

Equation 5 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 1864 would have expected at a time when inflation had averaged 20 percent over the prior three years because of wartime shortages?

Table 1. Regression Results: Estimated Real Stock Return versus Actual 10-Year Real Stock Return
(*t*-statistics in parentheses)

Period	*a*	*b*	R^2	Correlation	Serial Correlation
A. Raw data: RSR(t) = a + b[ERSR(t – 120)]					
1810–2001	–1.51%	1.38%	0.214	0.46	0.992
	(–4.2)	(24.4)			0.990
1945–2001	–7.80	3.15	0.391	0.62	0.996
	(–8.8)	(19.0)			0.995
B. Using 19 nonoverlapping samples, beginning December 1810					
1810–2000	–0.35%	1.22%	0.182	0.430	–0.315
	(–0.1)	(1.9)			0.021

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; 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 0 (reflecting the possibility of victory by the South) but less than the 20 percent three-year inflation rate (reflecting the probability of victory by the North).

We based the estimate for expected future inflation on an *ex ante* regression forecast of 10-year future inflation based, in turn, on recent three-year inflation.[28] **Figure 6** shows how the expected rate of inflation has steadily become more closely tied to recent actual inflation in recent decades. Bond yields responded weakly to bursts of inflation up until the time of the Great Depression; they responded 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 was virtually nonexistent—even negative—in peacetime. Figure 6 shows 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. And more recently, double-digit inflation characterized the "stagflation" of 1978–1981 that followed the Vietnam War and the oil shocks of the 1970s. The most notable changes since the Great Depression, especially since World War II, involve the magnitude and perceived role of government and loss of the automatic brakes once applied by the gold standard. From the end of World War II to the great inflationary crisis at the end of the 1970s, the dread of unemployment that was inherited from the Great Depression was the driving factor in both fiscal and monetary policy.

With the introduction of TIPS in January 1997, we finally have a U.S. government bond that pays a real return, which allows us to simplify the expected real bond returns to be the TIPS yield itself from that date forward; that is,

$$ERBR(t) = YTIPS(t), \qquad (6)$$

where $YTIPS(t)$ is the percentage TIPS yield at time t.

Figure 7 shows how the current government bond yield (the "Bond Yield" line) minus expected inflation ("Estimated Inflation") leads to an estimate of the real bond return and hence the long-term expected real bond return ("Estimated Real Bond Yield"), which is the estimate through March of 1998 and the TIPS yield thereafter.[29] From the Equation 5 (or, more recently, Equation 6) formulation, expected real bond returns averaged 3.7 percent over the full period, 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. Investors may not always have viewed government debt as the rock-solid investment, however, that it is generally considered today.

The 3.7 percent real bond return consists of an average nominal bond yield of 4.9 percent minus an expected inflation rate of 1.2 percent. For comparison, the average actual inflation rate has been 1.4 percent. In the years after World War II, the rate of peacetime inflation embedded in investors' memory banks 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. As a result, bonds were badly priced for reality during most of

Figure 6. Estimating Future Inflation, 1810–2001

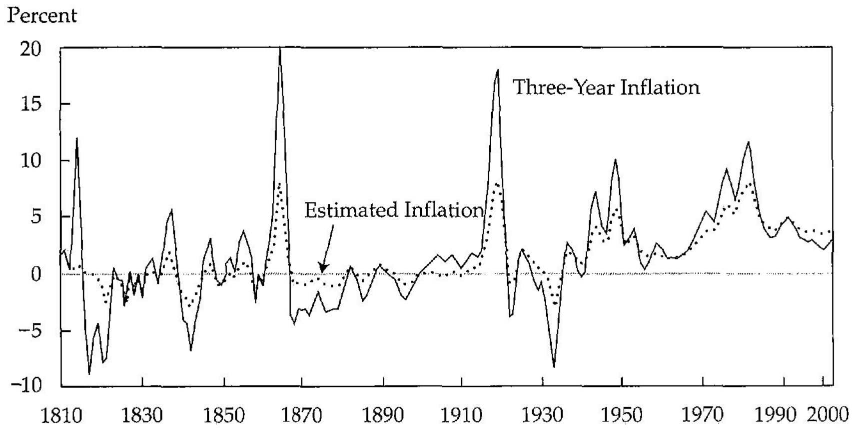
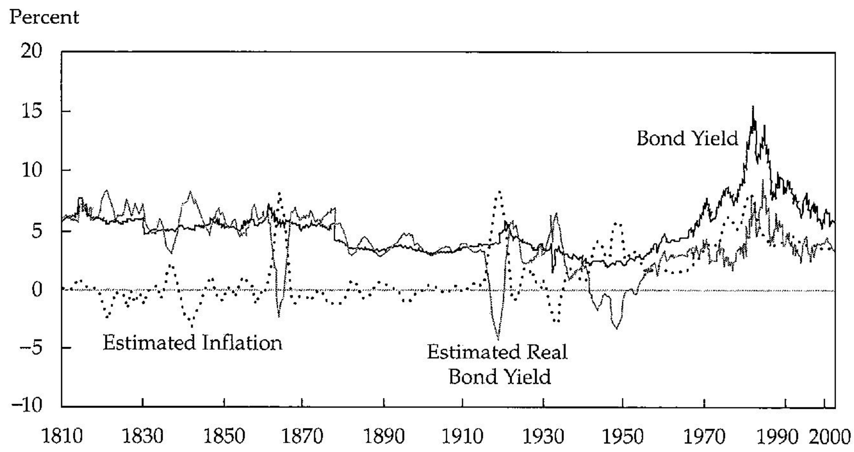


Figure 7. Estimating Real Bond Yields, 1810–2001



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; as can be seen in Figure 7, our model captures this phenomenon. Expectations are lower than actual outcomes during this span.

Figure 7 also shows several regimes of real yield with distinct structural change from one regime to the next. From the time the United States was in its infancy until the end of Reconstruction in the late 1870s, investors would not have viewed U.S. government bonds as a secure investment. They would have priced these bonds to deliver a 5–7 percent real yield, except during times of war. The overall stability of the yields is impressive: Unlike the history of stock prices, the surprise elements have been small.

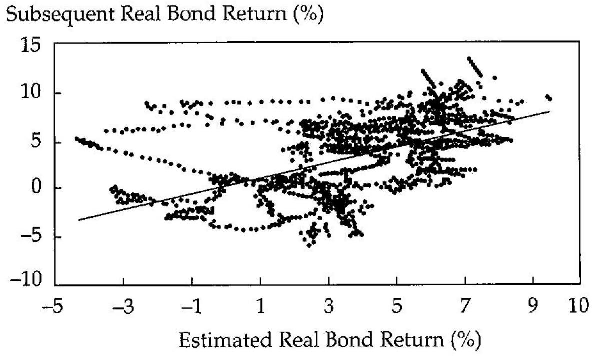
Once the United States had survived the Civil War and the security of U.S. government debt had been demonstrated repeatedly, investors began to price government debt at a 3–5 percent real yield. As Figure 7 shows, this level held, with a brief interruption in World War I, until the country went off the gold standard in 1933. This record 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.

For the next 20–25 years, the nation struggled with the Great Depression, World War II, and the war's aftermath. Investors slowly began to realize that deflationary price drops did not rebound fully after the trough of the Depression and that inflationary price increases did not retreat after the end of the war. The changed role of government plus the end of the gold standard had altered the picture, perhaps irrevocably. During this span, investors priced bonds to offer a 2–4 percent *notional* yield but a rocky –3 percent to +3 percent real yield. As Figure 7 shows, bond investors woke up late to the fact that inflation was now a normal part of life.

From the mid-1950s to date, investors have struggled with more structural inflation and more inflation uncertainty than ever before. Although investors sought to price bonds to deliver a real yield, inflation consistently exceeded their expectations. Only during the down cycle of the inflation roller coaster of 1980–1985 did bonds finally provide real yields to their owners. After this experience, bond investors developed an anxiety about inflation far greater than objective evidence would support. The result was a brief spike in real bond returns in 1984, as Figure 7 shows, with bond yields still hovering at 13.8 percent, even though three-year inflation had fallen to 4.7 percent (and our regression model for future inflation would have suggested expected inflation of 4.6 percent). The "expected" real yield was a most unusual 9.2 percent because investors were not yet prepared to believe that double-digit inflation was a thing of the past.

Another interesting fact is evident in **Figure 8**: The expected real bond returns produced by our formulation are highly correlated with the actual real returns earned over the subsequent decade. For 1810 to 1991, the expected real bond return has a 0.52 correlation with the actual real bond return earned over the next 10 years; from 1945 to date, the correlation rises to an impressive 0.63. Panel A of **Table 2** shows that the coefficient is reliably positive but not reliably more than 1.00, which suggests that, unlike expected real stock returns, no powerful tendency for reversion to the mean is at work in real bond yields. When we used the 19 available nonoverlapping samples (Panel B), we found the resulting correlation to be 0.64, which is a statistically significant relationship.[30]

Figure 8. Estimated and Subsequent Actual Real Bond Yield, 1802–2001



Why is the bond model a better predictor, when raw data are used, than the stock model for the two-century history? Two reasons seem evident. First, stocks have been more volatile than bonds for almost all 200 years of U.S. data. Therefore, any model for expected real stock returns should have a larger error term. Second, stocks are by their very nature longer term than bonds: A 10-year bond expires in 10 years; stocks have no maturity date.

The bond market correlations would be even better 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 scatterplot in Figure 8. At these times, many U.S. investors apparently subordinated their own interests in a strong real yield to the needs of the nation: Long Treasury rates were essentially pegged during World War II 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:

$$ERP(t) = ERSR(t) - ERBR(t), \tag{7}$$

where $ERSR(t)$ is the expected real stock return starting at time t and $ERBR(t)$ is the expected real bond return starting at time t.

Figure 9 shows the results of this simple framework for estimating the risk premium over the past 192 years. Many observers may be startled to see that this estimate of the forward-looking risk premium for stocks has rarely been above 5 percent in the past 200 years; the exceptions are war, its aftermath, and the Great Depression. The historical average risk premium is a modest 2.4 percent, albeit with a rather wide range. The wide range is more a result of the volatility of expected real bond returns than the volatility of expected real stock returns, which are surprisingly steady except in times of crisis.[31]

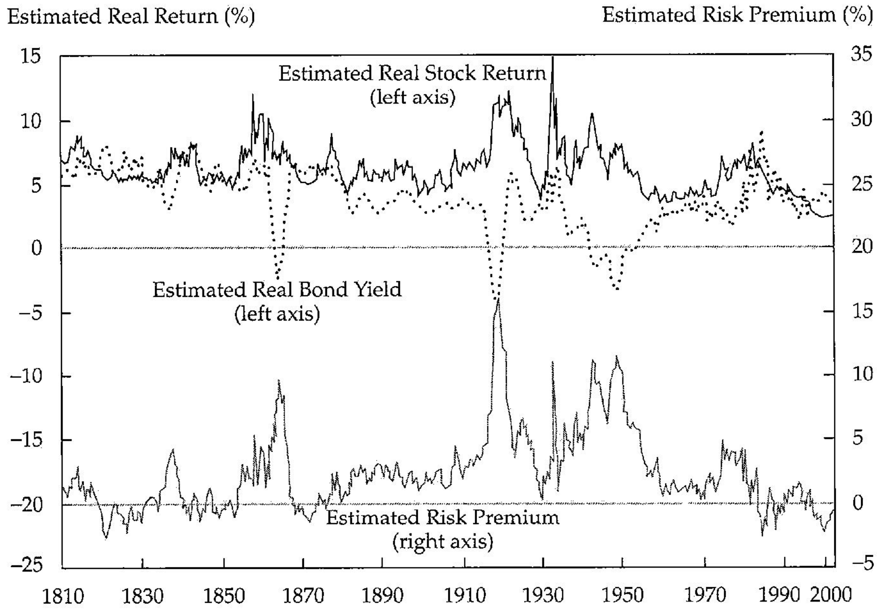
Over the past 192 years, our model (Equation 3) suggests that an objective evaluation would have pegged expected real stock returns at about 6.1 percent on average, only 120 bps higher than the average dividend yield. Investors have earned fully 70 bps more than this objective expectation, but they did not have objective reasons to expect to earn as much as they did. Our model suggests that an objective evaluation would have pegged expected real bond returns at about 3.7 percent. Investors have earned 20 bps less because of 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 percent (240 bps) during this history (6.1 percent expected real stock returns minus 3.7 percent expected real bond returns), not the oft-cited 5 percent realized excess return that

Table 2. Regression Results: Estimated Real Bond Return versus Actual 10-Year Real Bond Return
(t-statistics in parentheses)

Period	a	b	R^2	Correlation	Serial Correlation
A. Raw data: RBR(t) = a + b[ERBR(t – 120)]					
1810–2001	0.45%	0.81%	0.266	0.52	0.999
	(3.5)	(28.1)			0.997
1945–2001	–0.74	1.05	0.399	0.63	0.997
	(–4.0)	(19.3)			0.980
B. Using 19 nonoverlapping samples, beginning December 1810					
1810–2001	–1.81%	1.31%	0.4120	0.64	0.182
	(–1.1)	(3.5)			0.677

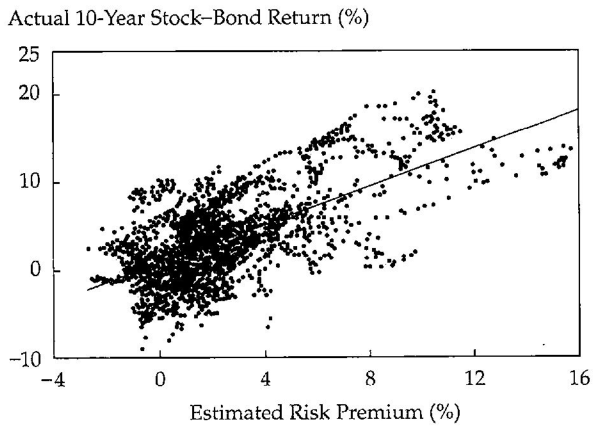
Figure 9. Estimating the Equity Risk Premium, 1810–2001



much of the investment world now depends on. Investors have *earned* a higher 3.3 percent (330 bps) excess return for stocks (6.8 percent actual real stock returns minus 3.5 percent for bonds), but the reason is the array of happy accidents for stocks and one extended unhappy accident for bonds.

All of this analysis is of mere academic interest, however, unless we can establish a link between our estimated risk premium and actual subsequent relative returns. Indeed, such a link does exist. The result of 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 for the full span. This strong link is clear in **Figure 10**, for 1810–2001, and **Table 3**

Figure 10. Risk Premium and Subsequent 10-Year Excess Stock Returns: Correlations, 1810–1991



(where, for convenience, we have defined the 10-year excess return of stocks relative to bonds as *ERSB*); each 100 bp change in the equity risk premium is worth modestly more than 100 bps in subsequent annual excess returns for stocks relative to bonds over the next 10 years. As with the expected stock return model (Equation 3), the link for 20-year results is stronger, with correlations over the full span and since 1945 of, respectively, 0.64 and 0.95.

This strong link between objective measures of the risk premium and subsequent stock–bond excess returns is also clear for the 1945–2001 period shown in **Figure 11**, 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. Figure 11 shows that the excess returns on stocks relative to bonds became negative in the late 1960s on a 10-year basis, following low points in the risk premium, and again touched zero 10 years after the 1981 peak in bond yields.

We can also see in Figure 11 how the gap in 10-year results opened up sharply for the 10 years of the 1990s; it opened to unprecedented levels, even wider than in the early 1960s. Prior to this gap opening, the fit between the risk premium and subsequent excess returns is remarkably tight. The question is whether this anomaly is sustainable or is destined to be "corrected." History suggests that such anomalies are typically corrected, especially when the theoretical case to support them is so weak. This reminder should be sobering to investors who are depending on a large equity risk premium.

Table 3. Regression Results: Estimated Equity Risk Premium versus Actual 10-Year Excess Return of Stocks versus Bonds
(*t*-statistics in parentheses)

Period	*a*	*b*	R^2	Correlation	Serial Correlation
A. Raw data: ERSB(t) = a + b[ERP(t – 120)]					
1810–2001	0.91%	1.08%	0.430	0.66	0.993
	(8.8)	(40.6)			0.995
1945–2001	2.85	1.41	0.621	0.79	0.995
	(15.4)	(30.4)			0.996
B. Using 19 nonoverlapping samples, beginning December 1810					
1810–2001	0.84%	1.36%	0.490	0.70	0.055
	(0.8)	(4.0)			0.371

As with the models for real stock returns and for real bond returns, we also used nonoverlapping spans to take out the effect of the strong serial correlation in the estimated risk premium. For the 19 nonoverlapping spans (Panel B of Table 3), the correlation for the full period jumps to 0.70, with a highly significant *t*-statistic of 4.0.[32]

Conclusions

We have advanced several provocative assertions.

- The observed real stock returns and the excess return for stocks relative to bonds in the past 75 years have been extraordinary, largely as a result of 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 that have doubled, tripled, and quadrupled relative to 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 percent real returns or 5 percent risk premium that stocks subsequently delivered. The estimated equity risk premium at the time was above average, however, which makes 1926 a better-than-average starting point for the historical risk premium.
- The real internal growth that companies generated in their dividends averaged 0.9 percent a year over the past 200 years, whereas earnings growth averaged 1.4 percent a year over the past 131 years.
- Dividends and earnings growth was slower than the increase in real per capita GDP, which averaged 1.6 percent over the past 200 years and 2.0 percent over the past 131 years. This internal growth is far less than the consensus expectations for future earnings and dividend growth.

Figure 11. Risk Premium and Subsequent 10-Year Excess Returns, 1945–2001