Are 60/40 Portfolio Returns Predictable?

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EXECUTIVE SUMMARY

- Long-horizon asset class returns are reasonably predictable using simple models of expected return.
- However, equity returns over the last decade far exceeded model-based predictions.
- We posit a framework for the drivers of potential mean-reversion in equity returns.
- We believe increases in real bond yields and a decline in corporate profit growth are the most likely candidates to prompt an equity market correction.

"Returns are unforecastable," according to the conventional wisdom. In his book A Random Walk Down Wall Street, Burton G. Malkiel famously proclaimed that a monkey throwing darts at the Wall Street Journal could select a portfolio no better or worse than so-called experts. However, such claims of unpredictability usually center around the notion of relative returns, comparing performance to some benchmark or model of expected returns. Indeed, a well-specified expected return model should be characterized by a set of residual returns, which are unforecastable.

However, these proclamations generally do not hold when one is describing the absolute level of expected returns. Expected returns associated with holding long positions in broad-based asset classes should be closely related to current and expected levels of certain state variables. Expected returns for bonds, for example, should be closely linked to the term structure of interest rates. Expected returns for equities should be driven by real bond yields, inflation and expectations for profit growth.

In this paper, we put forth basic models for stock and bond total returns. We view these simple models as sensible starting points for an overall valuation framework and show that, despite their inherent limitations, the efficacy with which they forecast estimated future returns may be meaningful. We go on to demonstrate that differences between realized future returns and ex ante forecasts can be explained to some degree by innovations in certain macro-related variables, such as inflation and real interest rates. However, U.S. equity returns over the past decade have been significantly higher than those predicted by values from our model and cannot be fully explained by these same variables. Based on this observation, we posit a framework in which the fundamental drivers of equity returns may mean-revert to levels more aligned with their historical averages, and we analyze the consequences for future equity returns.

A SIMPLE MODEL OF STOCK AND BOND RETURNS

The basic model of Gordon (1962) for the price of an equity security can help provide insight into the primary drivers of expected equity returns. Under the assumption of constant returns and growth rates, the expected nominal return on equities can be expressed as

$$r^{eq} = \frac{D}{P} + G + \pi^e \qquad (1)$$

where D/P is the forward equity dividend yield, G is the expected (long-run) real dividend growth rate, and π^e is expected inflation. If corporations retain earnings at a rate b, the real earnings growth rate is proportional to the company's real return on equity r^{eq}_{real}, so that $G=b\cdot r^{eq}_{real}$. Then the nominal growth rate of earnings can be expressed as $G_{nom}=r^{eq}_{real}\cdot b+\pi$, where π is realized inflation.

Assuming $\pi = \pi^e$, the nominal expected equity return can therefore be expressed as the sum of the earnings yield and expected inflation:

$$r^{eq} = \frac{E}{P} + \pi^e \quad (2)$$

While the Gordon model posits constant returns and constant growth rates, the real world is not nearly as simple. Ample evidence shows that expected returns are time-varying (Campbell (1991), Cochrane (1992)). In the appendix, we derive a more generalized equation with time-varying expected returns, to allow for a more flexible structure than Equation 2. Adding time subscripts to account for time variation in Equation 2, the realized equity return at horizon k can therefore be expressed as

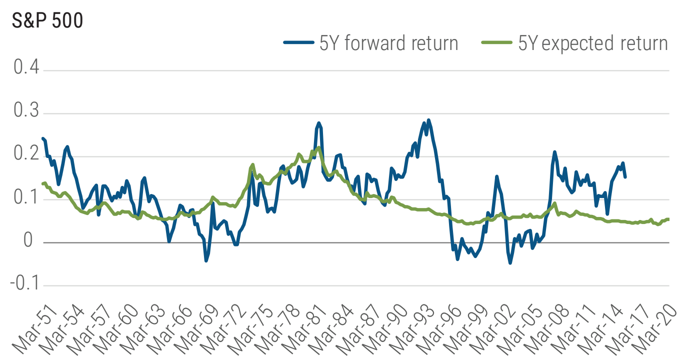
$$r^{eq}_{t+k} = \left(\frac{E}{P}\right)_t + \pi^e_{t+k} + \varepsilon_{t+k}. \quad (3)$$

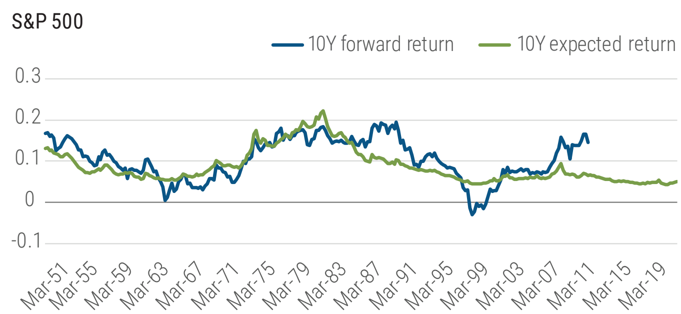
Equation 3 shows that the nominal equity expected return is equal to the sum of the earnings yield and expected inflation but is conditional on the value of these variables at different points in time. ε_{t+k} is a residual term that accounts for returns not explained by the model.

The expected value of Equation 3 is simply the earnings yield plus expected inflation and therefore implicitly assumes no change in the future equity earnings yield – which, of course, is unlikely to be true in practice. However, Equation 3 should serve as a sensible starting point for evaluating equity expected returns. Additionally, the equation makes clear that **equities are real assets**, because nominal returns are linear in expected inflation. This requires the assumption that inflation is passed through one-to-one to earnings growth. In practice, the extent of inflation pass-through will vary with time, and the effect of changes in long-term inflation expectations may impact equity discount rates, resulting in overall valuation changes. Indeed, we show in subsequent analyses that the influence of inflation shocks on equity returns can be counter to the simple formulation in Equation 3.

We use the inverse of the Shiller price-to-earnings (P/E) ratio as a proxy for the earnings yield, and we follow Cieslak and Povala (2015) to estimate expected inflation at different horizons. Exhibit 1 compares the time-series expected values for equity expected returns in Equation 3 with forward (future) returns at the five-year and 10-year horizons. Visually, the series appear highly related. Although future realized returns vary considerably around the expected return, the general pattern of realized returns being below average when expected returns are low, and vice versa, seems apparent. Furthermore, realized deviations from the expected return are notably smaller at the 10-year horizon. In both graphs, we observe significant negative performance relative to the expected return in the late 1990s that followed the implosion of the tech bubble, and notable outperformance versus the expected return in the years following the 2008 global financial crisis (GFC).

Exhibit 1: Realized versus expected equity returns at the 5- and 10-year forecast horizons





Source: PIMCO and Bloomberg as of 1 January 2022. **Hypothetical example for illustrative purposes only.**

For a default-free bond index, we can approximate the future return over horizon k as

$$r^{bd}_{t+k} = y_t - D_t * \Delta y_{t,t+k} \quad (4)$$

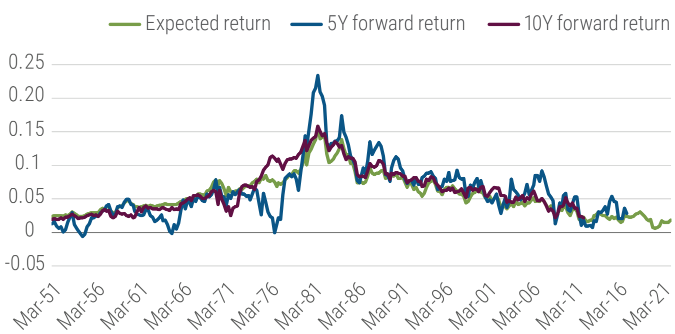
where y_t is the yield to maturity of the bond at time t, D_t is the bond's modified duration, and $\Delta y_{t,t+k}$ is the change in the bond yield over horizon k. For a bond held to maturity – absent defaults – the realized return will generally equal its yield. For a rebalanced bond portfolio, however, the realized return over any given interval of time will be a more complex function of the bond's duration and the evolution of interest rates. However, if one assumes no change in yields – consistent with the "random walk" view of bond yields – then the expected return on a bond is approximately equal to its yield:

$$r^{bd} = y \tag{5}$$

Exhibit 2 shows the time-series of expected returns from Equation 5 for a monthly rebalanced 10-year Treasury index alongside forward (realized) five-year and 10-year total returns. Like the case for equities, Exhibit 2 also shows a clear pattern of realized returns moving in line with bond yields. Following the significant underperformance of Treasuries relative to starting yields in the 1970s, Treasury bonds materially outperformed their starting yield in the '80s as runaway inflation became increasingly contained and bond yields fell. Similar to equities, deviations from the expected return model are notably tempered at a 10-year forward horizon in comparison to a five-year horizon.

Exhibit 2: Realized versus expected 10-year U.S. government bond returns at 5- and 10-year horizons

10-year U.S. Treasury bond



Source: PIMCO and Bloomberg as of 1 January 2022. **Hypothetical example for illustrative purposes only.**

LONG-HORIZON REGRESSIONS

To more formally assess the efficacy of our simple models in explaining future returns, we run long-horizon regressions of future realized returns on expected returns as described in Equations 3 and 5. We view our regressions as being in the spirit of the extensive literature on long-horizon regressions, which is usually centered around the dividend yield as a measure of current valuation (Cochrane (2005)). However, these studies generally use the dividend yield to explain both forward returns and future dividend growth, and generally find dividend yields to be more predictive of the returns than of cash flow growth. Our simpler formulation effectively "endogenizes" dividend growth to be equal to a firm's return on equity (ROE) times the retention ratio. Therefore, we focus solely on the ability of our models to explain long-term future returns.

To better understand the empirical accuracy of Equations 3 and 5, we estimate the following regression for both equities and government bonds:

$$R_{t,t+k} = \hat{a} + \hat{b}E_t\left[r_{t,t+k}\right] + \varepsilon_{t,t+k} \tag{6}$$

where $R_{t,t+k}$ is the realized total return over horizon k and $E_t[r_{t,t+k}]$ is the expected return for each asset class as defined in Equations 3 or 5 at the start of each period.[1] If our basic models of expected return are indeed unbiased predictors of future returns, then the expected values for $\hat{a}$ and $\hat{b}$ are 0 and 1, respectively. Exhibit 3 shows the regression results for bonds, equities and a standard 60/40 portfolio.[2]

1 Academic studies using long-horizon regressions usually use log excess returns on log dividend yields. This is done because log-linear approximations can be obtained under certain assumptions, which lend themselves nicely to linear regressions. We find that taking logs makes little difference in our regressions. As such, we present our results using raw returns.

2 The 60/40 returns were computed by rebalancing between the S&P 500 and Global Financial Data's 10-Year US Treasury Total Return Index at a monthly frequency.

Exhibit 3: Regression parameter estimates for equities, bonds and 60/40

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coeff.	3.7%	2.7%	1.7%	5.5%	3.8%	2.3%	-1.5%	-1.5%	-0.5%
	t-stat	(1.93)	(1.69)	(1.53)	(1.71)	(1.40)	(1.13)	(-1.67)	(-1.88)	(-1.19)
Expected return	Coeff.	0.74	0.84	0.92	0.65	0.79	0.88	1.33	1.30	1.13
	t-stat	(3.32)	(4.82)	(9.34)	(2.48)	(3.69)	(5.26)	(7.38)	(9.98)	(24.26)
R^2		18.3%	35.8%	68.4%	8.9%	20.9%	52.2%	59.5%	77.1%	88.5%

Source: PIMCO and Global Financial Data as of April 2022. **Hypothetical example for illustrative purposes only.** The equity index is the S&P 500, and the bond index is Global Financial Data's USD 10-year Government Bond Index. All returns are total returns.

Consistent with much of the literature on long-horizon regressions, we find that returns are reasonably forecastable at long horizons. The slope coefficient on equities ranges from 0.65 at a three-year horizon to 0.88 at 10 years, with the slope increasing toward 1 with the investment horizon. While the slope coefficients for bonds are greater than 1 at all horizons, they also converge toward 1 as the time horizon increases. All slope coefficients are highly statistically significant when estimated using Newey-West (1987) corrected standard errors with lags equal to the regression horizon. The intercept terms are all positive for equities and negative for bonds, but both sets of intercepts gravitate toward zero as the horizon increases, and none is statistically significant. Furthermore, while the t-stats on the expected returns are all significantly higher than 2, most of the t-stats versus the coefficient equaling 1 are less than 2 in absolute value; the exception is bonds at the five- and 10-year horizons.[3] R-squareds (R^2s) all increase with the horizon, but the interpretation is complicated by the use of overlapping data. Acknowledging the statistical complexities of overlapping data in long-horizon regressions (Ang and Bekaert (2007), Hodrick (1992)), these results broadly indicate that our simple models of expected return are sensible as unbiased predictors of forward returns, with no convincing reason to believe that $\hat{a}$ and $\hat{b}$ are meaningfully different from 0 and 1, respectively.[4]

Academic studies using long-horizon regressions of the type employed here usually utilize excess realized returns, or the return over and above the "risk-free rate." In some sense, this is a bit of a mystery, as dividend yields should forecast some combination of future cash flows and total rather than excess returns. In contrast, our regressions are based on total returns. We do this for two reasons. First, the simple models that we have posited are indeed intended to estimate future total return, not excess. Second, asset allocators care most about the predictability of total returns. Predicting excess returns is of little use to investors if the models have poor predictability for the risk-free rate component of return.

As it turns out, including the risk-free rate component of total return is significant. Exhibit 4 shows the same results as Exhibit 3, but the dependent variable is measured as excess returns. Although the broad conclusions one would reasonably derive from Exhibit 4 are similar to those of Exhibit 3, the models' explanatory power is significantly diminished when excess returns are used. This is most evidenced by the notable reduction in R^2 at 10-year horizons, particularly for bonds for which the risk-free rate usually contributes materially to total return. Therefore, our results indicate that Equations 3 and 5 embed substantial information about the risk-free rate component of future returns. This is good news for investors who care about total returns and their inherent predictability.

Finally, researchers have found that the efficacy of valuation measures such as dividend yield as a predictor of future returns has waned since the 1990s as growth-driven markets have largely outperformed and valuation has, presumably, become less relevant. For example, Lettau and Ludvigson (2001) generally finds lower overall explanatory power for the dividend yield using data updated through the third quarter of 1998. However, using our methodology, along with a much more current data window, we find no such breakdown in predictability. Exhibit 5 shows regressions using the same methodology as in Exhibit 3 but splits the sample between pre-1991 and post-1991 periods. We generally find that the models of expected return put forth in Equations 3 and 5 have similar predictive power over both time periods. In both the pre- and post-1991 samples, the coefficients on expected return are positive and statistically significant. In fact, equity R^2s are higher in the post-1991 sample at five- and 10-year

3 T-statistics versus 1 not shown.

4 In the appendix, we estimate standard errors using Newey-West, Hodrick and non-overlapping data. Consistent with Ang and Bekaert (2007), the Hodrick standard errors are higher than for Newey-West. However, standard errors using non-overlapping data are more consistent with Newey-West. The debate over which standard errors to use in long-horizon regressions is robust, and we do not attempt to resolve it here.

Exhibit 4: Regression parameter estimates for equities, bonds and 60/40 using excess returns

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coeff.	1.6%	1.1%	1.3%	1.5%	0.6%	1.1%	0.3%	0.6%	0.5%
	t-stat	(0.74)	(0.72)	(0.81)	(0.44)	(0.24)	(0.58)	(0.26)	(0.69)	(0.50)
Expected return	Coeff.	1.01	1.06	0.94	1.15	1.24	1.01	0.97	0.65	0.80
	t-stat	(1.84)	(2.36)	(3.73)	(1.97)	(2.84)	(3.84)	(1.97)	(1.66)	(2.95)
R^2		9.8%	18.2%	28.0%	12.2%	23.9%	35.9%	5.5%	4.0%	11.5%

Source: PIMCO and Global Financial Data as of April 2022. **Hypothetical example for illustrative purposes only.** The equity index is the S&P 500, and the bond index is Global Financial Data's USD 10-year Government Bond Index.

horizons. Interestingly, the coefficients on the expected return for equities are much larger than 1 in the post-1991 sample. This indicates not only that our models of expected return have been positively related to future total returns but that the effect has been *amplified* relative to the pre-1991 period.

RETURN DIFFERENCES VERSUS MODELS

Although the models described in Equations 3 and 5 do a reasonable job of estimating long-horizon returns, as shown in Exhibits 1 and 3, the realized deviations from expected returns can at times be meaningful. This is particularly true in the case of equities, given their inherent long duration and resulting high sensitivity to innovations in market-wide discount rates. For example, as shown in Exhibit 1, equity markets have performed significantly better in recent years than their expected return. To better understand these linkages, in this section we investigate the portion of realized returns that are unexplained by Equations 3 and 5.

For bonds, slippage between forecasts and realized returns is driven almost entirely by innovations in market-wide bond yields. Equation 5 implicitly assumes that bond yields remain unchanged, so naturally future changes in yields will cause differences between realized and expected returns.

Equities should be similarly influenced by changes in bond yields, as they represent the risk-free rate component of discount rates. Additionally, equities should respond to shocks to the growth rate of earnings, increasing when earnings growth is high, and vice versa. To ascertain the degree to which these factors influence residual returns for equities and bonds, we run regressions of the differences between realized returns and forecasted returns on changes in real bond yields, earnings growth rate shocks and

Exhibit 5: Regression parameter estimates for equities, bonds and 60/40, pre- and post-1991 samples

Pre-1991 sample

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coeff.	1.5%	0.5%	1.1%	3.9%	2.2%	2.6%	-4.1%	-3.6%	-1.1%
	t-stat	(0.69)	(0.33)	(0.75)	(1.39)	(0.86)	(0.95)	(-4.06)	(-4.42)	(-3.32)
Expected return	Coeff.	0.90	0.98	0.96	0.73	0.85	0.84	1.57	1.49	1.19
	t-stat	(3.89)	(6.07)	(8.96)	(3.45)	(5.09)	(4.71)	(8.54)	(12.40)	(33.06)
R^2		32.5%	56.6%	74.5%	16.9%	37.2%	55.2%	69.5%	84.9%	90.1%

Post-1991 sample

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coeff.	0.4%	-3.7%	-1.7%	-8.4%	-18.6%	-11.9%	0.2%	0.3%	0.6%
	t-stat	(0.07)	(-0.57)	(-0.46)	(-0.68)	(-1.86)	(-3.14)	(0.18)	(0.77)	(1.37)
Expected return	Coeff.	1.54	2.21	1.60	3.06	4.58	3.13	1.26	1.17	0.99
	t-stat	(1.34)	(2.11)	(3.07)	(1.60)	(3.19)	(5.51)	(7.26)	(13.34)	(12.44)
R^2		8.7%	27.6%	39.2%	11.4%	39.6%	65.5%	51.3%	75.8%	84.6%

Source: PIMCO and Global Financial Data as of April 2022. **Hypothetical example for illustrative purposes only.** The equity index is the S&P 500, and the bond index is Global Financial Data's USD 10-year Government Bond Index. All returns are total returns.

inflationary shocks. Specifically, we estimate regression models of the following form for equities, bonds and a 60/40 portfolio:

$$R_{t,t+k} - E_t[R_{t,t+k}] = \hat{\alpha} + \hat{\beta}_1 \Delta y^r_{t,t+k} + \hat{\beta}_2 e^{sur}_{t,t+k} + \hat{\beta}_3 \pi^{sur}_{t,t+k} + \epsilon_{t,t+k} \quad (7)$$

where $E_t[R_{t,t+k}]$ is the expected return from Equations 3 and 5 for the period between t and $t+k$, $\Delta y^r_{t,t+k}$ is the realized change in the 10-year real bond yield, $e^{sur}_{t,t+k}$ is the realized earnings surprise, and $\pi^{sur}_{t,t+k}$ is the realized inflation surprise. All of the right-hand variables are *contemporaneous* with the left-hand variables, as our purpose is to explain – rather than predict – a portion of the non-model future returns.[5]

The results from regression Equation 7 for equities, bonds and the 60/40 portfolio are shown in Exhibit 6. As expected, both the change in real yields and unexpected inflation have a negative and statistically significant impact on the unexplained component of bond returns. The coefficient on the real yield change can be interpreted as the (negative of the) effective bond duration, which will differ from a bond's analytical duration. The real yield coefficient becomes significantly smaller in magnitude with horizon. At longer time horizons, the total return of a rebalanced bond portfolio is less affected by changes in yields and will be driven more by the path of interest rates and the corresponding coupon income. The coefficients on the inflation surprise are all negative and statistically significant, particularly at shorter horizons, implying that bonds are most sensitive to inflation shocks at a three- to five-year horizon. At a 10-year horizon, market yields will generally respond to innovations in the persistent component inflation; therefore, shocks to inflation should have a diminishing impact on bond returns over time.

Like bonds, equities also show a negative relationship with inflation surprise, and the results are highly statistically significant – though not at a 10-year horizon. Interestingly, equities exhibit even greater near-term inflation sensitivity than bonds, with inflation loadings more than two times higher. However, while the signs on the inflation coefficient are what we might expect for bonds, the results for equities run counter to Equation 3, which models equity returns with full inflation pass-through to earnings. The negative coefficients on inflation surprise show that reality is more complex, as even at a five-year horizon equities have a negative and statistically significant loading on inflation surprise. This may challenge the notion of equities as "real assets," as their positive linkage to inflation is dubious at best. At long horizons, however, inflationary shocks appear to be less problematic for equity investors.

Equities show a positive and statistically significant loading on earnings surprise. This is perhaps as expected, given that earnings are the fundamental driver of equity valuations. Nonetheless, the results in Exhibit 6 show that equities are highly sensitive to the unexpected component of earnings growth. But in contrast to inflation surprise and real bond yield change, the coefficient on earnings surprise gets larger in magnitude with horizon, and the statistical significance is similar across horizons. Given the long-duration nature of equity cash flows, one may expect equities to be characterized by a negative and

Exhibit 6: Residual return regressions for equities, bonds and 60/40

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coeff.	2.0%	1.8%	1.2%	2.5%	2.1%	1.2%	0.7%	0.6%	0.4%
	t-stat	(2.54)	(3.00)	(3.48)	(1.88)	(2.06)	(1.92)	(5.64)	(3.75)	(1.84)
Real yield change	Coeff.	-1.30	-0.21	0.67	1.98	3.09	2.78	-5.72	-4.51	-1.59
	t-stat	(-0.97)	(-0.21)	(0.55)	(0.85)	(1.63)	(1.37)	(-13.60)	(-8.41)	(-1.47)
Real earnings surprise	Coeff.	0.11	0.13	0.14	0.18	0.24	0.26	-0.01	-0.02	-0.03
	t-stat	(3.23)	(4.10)	(3.21)	(2.95)	(3.91)	(3.24)	(-0.55)	(-1.83)	(-1.06)
Inflation surprise	Coeff.	-1.20	-0.98	-0.33	-1.53	-1.29	-0.44	-0.79	-0.56	-0.20
	t-stat	(-4.10)	(-4.28)	(-2.17)	(-3.11)	(-3.30)	(-1.81)	(-14.23)	(-9.24)	(-3.12)
R^2		31.9%	40.6%	32.3%	24.0%	35.0%	31.5%	90.6%	81.8%	24.2%

Source: PIMCO and Global Financial Data as of April 2022. **Hypothetical example for illustrative purposes only.** The regressions are run from the period January 1951–April 2022. The equity index is the S&P 500, and the bond index is Global Financial Data's USD 10-year Government Bond Index.

5 The 10-year real bond yield is the nominal 10-year U.S. Treasury yield from Global Financial Data minus the Cieslak-Povala expected inflation. Real earnings surprise is the realized real earnings growth minus the expected real earnings growth, with expected real earnings growth measured as the 30-year trailing realized real earnings growth. Earnings data is taken from Robert Shiller's website. The inflation surprise is the realized inflation minus the Cieslak-Povala expected inflation.

statistically significant loading on the real yield change. In fact, the coefficients on the real yield change are all positive but statistically insignificant. Empirically, it tends to be the case that equities do well when real yields are rising, and vice versa, as central bank policy is generally pro-cyclical in nature. However, the linkage is weak statistically, as the t-stats on real yield change are low at all forecast horizons.

EQUITIES AND CURRENT VALUATIONS

Given our historical results in the previous section, which show strong U.S. equity performance over the past several years, an obvious question is, "Where do we go from here?" As shown in Exhibits 1 and 2, equity markets have significantly outperformed the model of earnings yield plus expected inflation in recent years, while bonds have more or less generated returns in line with their yield. Is there any reason to believe that this discrepancy for equities is likely to mean-revert over some horizon? To better understand this question, we revisit the Gordon model for the value of an equity security:

$$P = \frac{D}{r^{EQ} - g} \tag{8}$$

where P is the value of an equity security, D is the next period's dividend, r^{EQ} is the expected return, and g is the equity dividend growth rate. For our purposes here, we treat each variable in Equation 8 as **real.** Taking the log of the equation and differentiating produces

$$\frac{dP}{P} = \frac{dD}{D} - \frac{1}{r^{EQ} - g}\left[dr^{EQ} - dg\right] \tag{9}$$

Equation 9 shows that the equity return is affected positively by changes in the dividend growth rate and the next period's dividend, and negatively related to changes in the equity expected return. Both the dividend growth rate and the equity expected return amplify returns by $(r^{EQ} t g)^{(-1)}$, which, as shown in Equation 8, is equal to the forward price-to-dividend ratio. Hence, Equation 9 can be expressed as

$$\frac{dP}{P} = \frac{dD}{D} - \frac{P}{D}\left[dr^{EQ} - dg\right] \tag{10}$$

Thus, changes in the dividend growth rate and the required return will have a disproportionally large change on stock returns relative to the next period's dividend change. This can be easily seen by the fact that the required return and growth rate are scaled by the price-dividend ratio, which, given the current U.S. equity dividend yield of about 1.5%, implies that the impact of changes is amplified by approximately 70 times.[6]

Predicting changes in the drivers of equity returns necessitates the development of a framework for thinking about a "natural habitat" for the equity expected return and dividend growth rate. In this spirit, we further decompose the denominator of Equation 8 into three subcomponents, as

$$r^{EQ} - g = \left(r^{EQ} - r^{f}\right) + \left(r^{f} - g^{GDP}\right) + \left(g^{GDP} - g\right) \tag{11}$$

where r^f is the real "risk-free asset" yield and g^{GDP} is real GDP growth. Each of the components in Equation 11 has an economic interpretation, and we take some liberty in couching each of them as a **risk premium**. The **equity risk premium,** $r^{EQ}–r^f$, is the required return in excess of the risk-free rate necessary to compensate investors for incurring equity risk. The **bond risk premium**, $r^f–g^{GDP}$, is the difference between the real government bond yield and real GDP. Although the conventional definition of the bond risk premium is different from what we have used here, there is a clear positive economic linkage between the rate of GDP growth and the risk-free rate of interest in the economy.[7] Finally, we term $g^{GDP}–g$ as the **equality risk premium** because it can be interpreted as the difference between labor income growth and corporate profit growth. Because labor income represents approximately 70% of U.S. GDP, when this gap is small it broadly implies that both labor income and investment capital are experiencing similar growth rates. Ignoring the dD/D term in Equation 10, given its relatively small importance, and defining each risk premium in Equation 11 more compactly as α, β and γ, respectively, we can express Equation 10 as

$$\frac{dP}{P} = -\frac{P}{D}\left[d\alpha + d\beta + d\gamma\right] \tag{12}$$

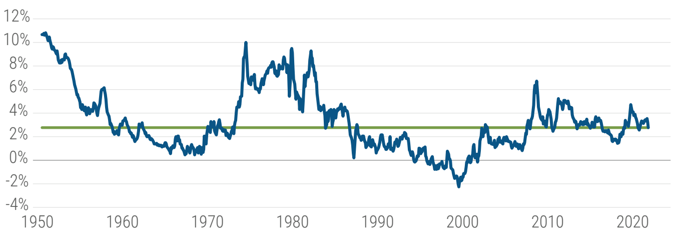
6 The first-order approximation shown in Equation 9 overstates the negative returns associated with increases in the equity discount rate. This is because the long-duration nature of equities implies that they are highly convex in each of these variables. Thus, the actual return will be less negative than that suggested by Equation 9.

7 From a theoretical perspective, real interest rates should be high when income growth is high, as investors require higher interest rates in order to defer consumption into the future.

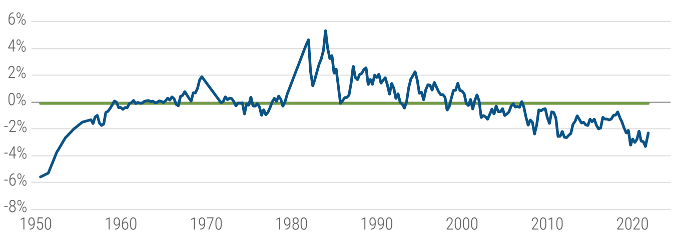
Exhibit 7 shows the time-series graphs for α, β and γ since 1951, along with their average values. Additionally, we present a table showing the distribution of values for each variable. Alpha is measured as the difference between the inverse of the Shiller P/E ratio and the estimated 10-year real bond yield.[8] Beta is the difference between the estimated real 10-year bond yield and forecasted 10-year GDP growth.[9] Finally, gamma is the 10-year expected real GDP growth minus expected real earnings growth.[10]

Exhibit 7: Historical and average estimates for alpha, beta and gamma

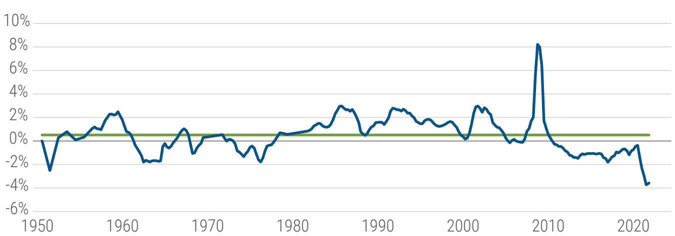
Alpha (equity risk premium)



Beta (bond risk premium)



Gamma (equality risk premium)



The equity risk premium, or alpha, was generally at its median level based on history to 1951, although it was somewhat below its mean value by approximately 0.2 standard deviations. Because alpha measures the risk premium of equities relative to the risk-free asset, we conclude that equities were generally fairly valued relative to bonds as of 30 April 2022. However, if we extended the data to samples going back further than 1951, equities would appear somewhat rich, as the ex ante equity risk premium was much higher in periods before the U.S. Treasury-Federal Reserve Monetary Accord of 1951. However, both the bond risk premium (beta) and the equality risk premium (gamma) are currently at levels far below their historical averages.

Low real interest rates instituted by the Federal Reserve in the post-GFC era, and the dramatic cut to short-term rates following the onset of the COVID-19 crisis in March 2020, have resulted in real interest rates today that are well below real GDP. As such, the bond risk premium currently resides in the 10th percentile of history, using data since 1951. Relatively stagnant wage growth over this same time period has resulted in a far higher rate of corporate earnings growth relative to GDP. Low real interest rates globally, as well as quantitative easing programs initiated after both the 2008 financial crisis and the 2020 COVID-19 outbreaks, have arguably favored corporate profit growth over labor income growth. As a result, gamma currently resides at the lowest level in our sample going back 70 years. Indeed, barring a significant but short-lived increase in gamma during the heart of the GFC, due to the precipitous fall in real earnings growth, the variable has been well below its historical average since around 2002.

30 April 2022	Current	Percentile	Median	Mean	Standard deviation
Alpha (equity risk premium)	2.75%	50%	2.76%	3.27%	2.63%
Beta (bond risk premium)	-2.30%	10%	-0.08%	-0.10%	1.51%
Gamma (equality risk premium)	-3.59%	0%	0.57%	0.55%	1.63%

Source: PIMCO, Global Financial Data and Robert Shiller's website. Data covers period from January 1951 through April 2022.
Hypothetical example for illustrative purposes only.

8 To estimate the real bond yield, we use the 10-year government bond yield from Global Financial Data and subtract the Cieslak-Povala expected 10-year inflation at each point in time.

9 Expected 10-year real GDP growth is estimated as a function of the trailing 10-year real GDP growth. Using annual data from 1992 to 2021, we fit a linear model that uses the trailing 10-year real GDP growth to match the Survey of Professional Forecasters' 10-year expected real GDP growth. Once the model is fitted, we use the predicted values from the model to calculate the expected 10-year real GDP growth on a quarterly frequency from 1951 to 2022.

10 Measured as the 30-year trailing realized real earnings growth.

Because the alpha term is in line with history, while both beta and gamma are well below their historical means, we view increases in the bond risk premium or the equality risk premium as the most likely candidates to precipitate an equity market sell-off. Although beta could increase due to either an increase in bond yields or a decrease in the long-run GDP growth rate, given historically low bond yields today, a rise in yields would seem to be the greatest risk. On the other hand, we view potential increases to the gamma term as more likely to come from a decline in corporate profit growth relative to GDP, given the stark contrast between profit growth and overall economic growth in recent years.

With the bond risk premium and the equality risk premium at historically low levels, it is useful for investors to understand the potential implications of increases in these variables. As shown in Equation 12, an increase in any of the three terms – alpha, beta or gamma – will, in theory, have the same impact on equity returns. To better understand the potential effect that an increase in any one of these variables may have on equity returns, Exhibit 8 shows the impacts of various increases in one of these terms at different investment horizons.[11] The first column in Exhibit 8 indicates the shock to one of the three terms, and the cells represent the annualized-to-horizon returns associated with each shock. Shocks are assumed to occur at the end of the first year and be zero thereafter. As expected, increasingly large shocks lead to more negative returns initially. However, because discount rates are higher, subsequent to the shock, long-run returns are higher as well. However, the break-even periods are in excess of 10 years, highlighting the long-duration nature of equities.

CONCLUSION

Our research finds that long-horizon total returns are reasonably predictable using simple models of expected return. Under certain simplifying assumptions, the classic Gordon model for the value of an equity security produces expected returns equal to the earnings yield plus expected inflation. The random-walk model for bond yields implies that a bond's expected return is equal to its yield. Although these basic formulations of expected return by no means perfectly predict future returns, rigorous statistical analyses indicate that these models contain real information and therefore should prove useful to asset allocators as a starting point for a broader valuation framework.

In the post-GFC era, equities have significantly outperformed the basic expected return model posited here. Furthermore, this outperformance cannot be completely explained by contemporaneous changes in real bond yields, earnings growth or inflation. To assess the potential impact of reversion of equity prices to some "equilibrium" level, we posit a conceptual framework for the drivers of the discount rate for the Gordon model. Given today's valuation levels for the bond risk premium and the equality risk premium, we view a rise in real rates and/or a decline in the rate of corporate profit growth to be the most likely candidates for mean reversion.

Exhibit 8: Impact of shocks to alpha, beta and gamma for various investment horizons

Shock size (bps)	Horizon (years)				
	1	3	5	10	20
0	5.64%	5.64%	5.64%	5.64%	5.64%
50	-2.00%	3.35%	4.46%	5.30%	5.72%
100	-8.42%	1.36%	3.44%	5.03%	5.83%
150	-13.87%	-0.38%	2.56%	4.83%	5.98%
200	-18.54%	-1.91%	1.80%	4.68%	6.15%
250	-22.58%	-3.26%	1.15%	4.59%	6.35%

Source: PIMCO. **Hypothetical example for illustrative purposes only.**

11 We use the full pricing equation (8) rather than the linear approximation equation (9) to estimate the values in Exhibit 8.

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APPENDIX

Earnings yield and time-varying returns

The definition of the gross returns is

$$R_{t+1} = \frac{P_{t+1}+D_{t+1}}{P_t} \quad \text{(A1)}$$

where P is the price and D is the cash flow during the period. Multiplying by $R_{(t+1)}^{(-1)}$ yields the identity

$$1 = R_{t+1}^{-1}R_{t+1} = R_{t+1}^{-1}\frac{P_{t+1}+D_{t+1}}{P_t} \quad \text{(A2)}$$

Multiplying by the dividend-to-price ratio and manipulating produces

$$\frac{D_t}{P_t} = (R_{t+1})\left(\frac{D_t}{D_{t+1}}\right)\left(\frac{1}{1+P_{t+1}/D_{t+1}}\right) \quad \text{(A3)}$$

This formulation shows that the current dividend yield must explain future returns, future dividend growth or future prices. More specifically, when the dividend yield is "high," it must imply some combination of higher returns, lower cash flow growth or lower future price-dividend ratios.

Let b be the earnings retention ratio so that $D_t = E_t(1-b)$. If the retention ratio is constant, then $D_t/D_{t+1} = E_t/E_{t+1}$. Therefore, Equation A3 can be written in terms of the earnings yield as

$$\frac{E_t}{P_t} = (R_{t+1})\left(\frac{E_t}{E_{t+1}}\right)\left(\frac{1}{1-b+P_{t+1}/E_{t+1}}\right) \quad \text{(A4)}$$

or

$$\frac{E_t}{P_t} = \frac{R_{t+1}}{G_{t+1}}\left(\frac{1}{1-b+P_{t+1}/E_{t+1}}\right) \quad \text{(A5)}$$

where G_{t+1} is the gross earnings growth rate. As with the dividend yield, the current earnings, yield is a statement about future returns, future earnings growth or future prices. As is customary, we impose the "no-bubble condition," which says that the P/E ratio should not move continually higher. Therefore, we can express the log earnings yield as

$$ln\left(\frac{E_t}{P_t}\right) = c + ln(R_{t+1}) - ln(G_{t+1}) \quad \text{(A6)}$$

where $c = -ln(1 - b + \overline{P}/\overline{E})$. Hence, $\overline{P}/\overline{E}$ can be interpreted as the long-run average price-to-earnings ratio. Given the well-documented research that there is little relationship between the valuation measures and future cash flow growth, we focus on the ability of the earnings yield to explain future returns. As noted in the paper, we find little difference in the regression results between log and nonlog, and therefore use nonlog regressions largely for purposes of intuition.

Standard error correction for long-horizon regressions

As observations in long-horizon regressions overlap, the regression errors will be serially correlated and the standard errors will be biased downward. In this paper we use the method of Newey and West (1987) to correct the standard errors, utilizing a lag equal to the horizon in the regressions. Following Ang and Bekaert (2007), we also include the correction proposed by Hodrick (1992). Additionally, we produce standard errors for regressions with non-overlapping data. Overlapping standard errors are computed by running non-overlapping regressions starting in 1951 and averaging the standard errors. In Exhibit 9, we show the standard errors corrected by the different methodologies. While Hodrick standard errors are higher than Newey-West, Newey-West standard errors are more similar to the non-overlapping standard errors.

Exhibit 9: Robust standard errors and parameter estimates for equities, bonds and 60/40

The table shows the regression parameter estimates and standard errors corrected using different methods. ** are statistically significant at a 5% level and * at 10%. The regression is run for the period January 1951–April 2022. The equity index is the S&P 500, and the bond index is Global Financial Data's 10-Year US Treasury Total Return Index. All returns are total returns.

		60/40 Portfolio			Equity			Bonds		
		3	5	10	3	5	10	3	5	10
Intercept	Coefficient	3.7%	2.7%	1.7%	5.5%	3.8%	2.3%	-1.5%	-1.5%	-0.5%
	NW SE	1.9%*	1.6%*	1.1%*	3.2%*	2.7%*	2.0%*	0.9%*	0.8%*	0.4%*
	Hodrick SE	2.3%	3.8%	7.9%	3.2%	5.5%	11.9%	1.7%	2.7%	4.9%
	Non-overlapping SE	3.6%	2.0%	1.3%	5.6%	3.0%	2.0%	1.6%	0.9%	0.5%
Expected return	Coefficient	0.74	0.84	0.92	0.65	0.79	0.88	1.33	1.30	1.13
	NW SE	0.22**	0.17**	0.10**	0.26**	0.21**	0.17**	0.18**	0.13**	0.05**
	Hodrick SE	0.32**	0.53**	1.03	0.33*	0.57	1.17	0.35**	0.55**	0.95
	Non-overlapping SE	0.28**	0.27**	0.31**	0.34*	0.36**	0.45*	0.25**	0.21**	0.12**

* 10% confidence level

** 5% confidence level

Source: PIMCO, Bloomberg and Global Financial Data as of 4 April 2022. **Hypothetical example for illustrative purposes only.** The regression is run for the period January 1951–April 2022. The equity index is the S&P 500, and the bond index is Global Financial Data's 10-Year US Treasury Total Return Index. All returns are total returns.

The "risk-free rate" can be considered the return on an investment that, in theory, carries no risk. Therefore, it is implied that any additional risk should be rewarded with additional return. A "risk-free asset" refers to an asset which in theory has a certain future return. U.S. Treasuries are typically perceived to be the risk-free asset because they are backed by the U.S. government. All investments contain risk and may lose value.

The analysis in this paper is based on hypothetical modeling. HYPOTHETICAL PERFORMANCE RESULTS HAVE MANY INHERENT LIMITATIONS, SOME OF WHICH ARE DESCRIBED BELOW. NO REPRESENTATION IS BEING MADE THAT ANY ACCOUNT WILL OR IS LIKELY TO ACHIEVE PROFITS OR LOSSES SIMILAR TO THOSE SHOWN. IN FACT, THERE ARE FREQUENTLY SHARP DIFFERENCES BETWEEN HYPOTHETICAL PERFORMANCE RESULTS AND THE ACTUAL RESULTS SUBSEQUENTLY ACHIEVED BY ANY PARTICULAR TRADING PROGRAM.

ONE OF THE LIMITATIONS OF HYPOTHETICAL PERFORMANCE RESULTS IS THAT THEY ARE GENERALLY PREPARED WITH THE BENEFIT OF HINDSIGHT. IN ADDITION, HYPOTHETICAL TRADING DOES NOT INVOLVE FINANCIAL RISK, AND NO HYPOTHETICAL TRADING RECORD CAN COMPLETELY ACCOUNT FOR THE IMPACT OF FINANCIAL RISK IN ACTUAL TRADING. FOR EXAMPLE, THE ABILITY TO WITHSTAND LOSSES OR TO ADHERE TO A PARTICULAR TRADING PROGRAM IN SPITE OF TRADING LOSSES ARE MATERIAL POINTS WHICH CAN ALSO ADVERSELY AFFECT ACTUAL TRADING RESULTS. THERE ARE NUMEROUS OTHER FACTORS RELATED TO THE MARKETS IN GENERAL OR TO THE IMPLEMENTATION OF ANY SPECIFIC TRADING PROGRAM WHICH CANNOT BE FULLY ACCOUNTED FOR IN THE PREPARATION OF HYPOTHETICAL PERFORMANCE RESULTS AND ALL OF WHICH CAN ADVERSELY AFFECT ACTUAL TRADING RESULTS.

Because of limitations of these modeling techniques, we make no representation that use of these models will actually reflect future results, or that any investment actually will achieve results similar to those shown. Hypothetical or simulated performance modeling techniques have inherent limitations. These techniques do not predict future actual performance and are limited by assumptions that future market events will behave similarly to historical time periods or theoretical models. Future events very often occur to causal relationships not anticipated by such models, and it should be expected that sharp differences will often occur between the results of these models and actual investment results.

Return assumptions are for illustrative purposes only and are not a prediction or a projection of return. Return assumption is an estimate of what investments may earn on average over a 5 year period. Actual returns may be higher or lower than those shown and may vary substantially over shorter time periods. Return assumptions are subject to change without notice.

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