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The Stock-Bond Correlation

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The correlation between stocks and bonds is one of the most important inputs to the asset allocation decision. However, it is difficult to estimate reliably, and can change drastically with macroeconomic conditions.[1] From 1927 to 2012, the correlation between the S&P 500 and long-term Treasuries – as calculated by calendar year based on monthly data – has changed sign 29 times, and has ranged from −93% to +86%.

The stock-bond correlation may be challenging to estimate, but PIMCO has developed an econometric model that helps explain the historical relationship between equities and Treasury bonds. For modeling convenience, we model bond yields and the cyclically adjusted earnings yield of equities instead of returns. While several factors influence the stock-bond correlation, our analysis reveals the importance of four key macroeconomic factors: real interest rates, inflation, unemployment and growth. We find stocks and bonds have the same sign sensitivity to the real (inflation-adjusted) policy rate and to inflation, while their sensitivity to growth and unemployment have *opposite* signs. Hence, depending on which factors dominate, the correlation can be either positive or negative.

Importantly, our model incorporates both short run (cyclical) and long run dynamics, which enables us to estimate correlations for various horizons. Cyclical and long run correlations may differ for a variety of reasons. For example:

- In the short run, stocks and bonds tend to respond in opposite directions to fluctuations in investor risk appetite. During flight-to-safety episodes we observe the familiar negative correlation. However, in the long run, secular trends in growth, inflation and interest rates may have similar effects on stock and bond returns, inducing a positive correlation.
- The negative beta between stocks and inflation may be less pronounced over longer horizons as dividends gradually catch up to inflation. (In general, the negative beta between stocks and inflation is considered a puzzle, and it tends to occur at very high inflation levels. Since there is a broad consensus that price stability should be one of the key objectives of a central bank, high inflation in a country is likely the result of deeper macroeconomic imbalances.)

- Starting valuation levels may play an important role. Consider the environment in early May 2013, when valuation in bonds (and perhaps stocks) may have been stretched by the Federal Reserve's balance sheet activities. If the central bank has made both asset classes over-valued, joint mean reversion in valuations should generate a positive – or less negative – correlation, even if business-cycle-related factors generate a negative correlation dynamic.

Our framework addresses the term structure of correlation through an error correction model. This approach accounts for both long and short run dynamics. The long run dynamics are estimated between the levels of the macroeconomic factors as well as valuations for stocks and bonds, while the short run dynamics capture the impact of quarterly changes in the macroeconomic factors, as well as transitory deviations from the long run level relationships (the "error correction" component).

PIMCO's econometric model also addresses the current environment and generates stock-bond correlation forecasts over horizons ranging from one quarter to two years. Since the financial crisis of 2008, the short run correlation has been very negative. One important question our framework seeks to answer is whether higher interest rates or rising inflation in the future may make this correlation less negative, or perhaps positive. If this were to happen, traditional investment paradigms may shift. For example, risk parity approaches that lever up bond positions to hedge equity holdings could be challenged.

Based on our model, we expect a correlation of roughly –25% at the quarterly frequency – hence, we expect bonds to continue to diversify equity risk, albeit less than in the recent past. We expect this diversification effect to be diminished over longer horizons. However, under our central scenario the correlation is not expected to rise above 0%, even over a two-year horizon.

Our sensitivity analysis also reveals some "tail risks." For example, if inflation volatility increases by 50% of its current level and other factors remain the same, the correlation in two-year returns could rise to as much as +20%.

Previous research

The effect of macroeconomic factors on the stock-bond correlation has been studied before. The concept of duration – a risk measure used frequently for bonds but rarely for other asset classes – provides an intuitive way to think about the stock-bond correlation. Shiller and Beltratti (1993) explain that under a naïve present value model, the return correlation between stocks and bonds should be positive, because both represent discounted cash flow streams; rising rates should lead to declining valuations for both asset classes, while declining rates should lift all valuations.

However, Shiller and Beltratti (1993) emphasize that "*the dividend stream that is discounted for stocks is radically different from the principal and coupon stream accruing to bond holders.*" Over time, changes in how investors value future risky cash flows drive a significant portion of equity volatility. Leibowitz, Sorensen, Arnott and Hanson (1989) explain how simply looking at equity duration from the perspective of discounted cash flow models leads to results that are divorced from empirical reality, due to the complicated links between the discount rate, the nominal interest rate, inflation and the growth rate. (For a more detailed discussion on the concept of equity duration, see Leibowitz, 1993).

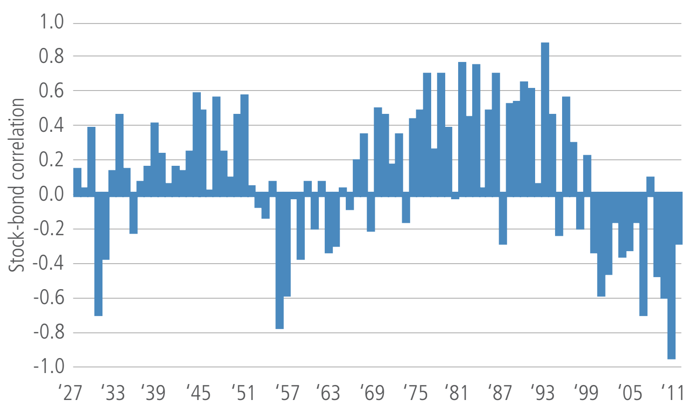
In a similar vein, Li (2002) documents large variations in the correlation between stocks and Treasuries over time. She shows that common exposure to macroeconomic factors drives this correlation, and she identifies uncertainty about expected inflation as the key factor, followed to a lesser extent by the real interest rate.

Similarly, Andersson, Krylova, and Vahamaa (2004) identify inflation as a key factor driving the equity-bond correlation. The authors find that prices tend to move in the same direction when inflation expectations are high. In addition, they and others such as Gulko (2002) identify a "flight-to-safety" effect, according to which the correlation becomes significantly negative during equity market drawdowns. In general, they show that when implied volatility (as measured by the CBOE Volatility Index or VIX) is high, stock and Treasury returns become more negatively correlated. In the same vein, Baele, Bekaert, and Inghelbrecht (2009) test for a wide range of factors and find that liquidity is important for the stock-bond correlation, and suggest this factor may be correlated with the flight-to-safety effect.

Historical perspective on the impact of interest rates and inflation

Previous studies may disagree on the key factors that drive the stock-bond correlation simply because they rely on different time periods in history. In Figure 1 we show the history of the correlation between the S&P 500 (S&P 90 for periods prior to the release of the S&P 500) and long Treasuries (from Ibbotson) from June 1927 to June 2013. Correlations are estimated on a non-overlapping one-year basis, using monthly returns (12 data points).

FIGURE 1: HISTORY OF THE STOCK-BOND CORRELATION (YEARLY ESTIMATES)



Source: Ibbotson, PIMCO, Bloomberg. Data as of June 1927 – June 2013. Bonds are represented by long Treasuries (Ibbotson) which should not be interpreted as a full sample representation of the bond market. Different asset class proxies will have different results.

The full sample average of the realized correlation is 10%. However, there is a substantial variation around this mean: The correlation estimates vary in the range of –93% to +86% with a standard deviation of 40%. Also, the correlation was below –50% in seven years, and above +50% in 14 years, which indicates a greater tendency for the correlation to "spike" up versus going down. It is also remarkable that the persistently positive estimates of this correlation in the 1970s and 1980s gave way to persistently negative values since the mid-1990s. This, however, is not just a current phenomenon. Negative correlations were observed during the 1950s as well as during the Great Depression, and in general during periods when the business cycle dominated asset returns.

Does inflation help explain these long-term observations? Equation (1) describes a simple regression that evaluates the effect of the level of real rates and inflation. We model the non-overlapping 12-month realized correlation ($\hat{\rho}$) as a function of inflation (π) and the level of real rates (r). Inflation is measured as the trailing year-over-year changes in CPI (Consumer Price Index), averaged over the 12 months during the year. Real rates are estimated as the average one-month T-bill rate over the year, minus contemporaneous inflation. We also add a breakpoint dummy variable (D_{1997}) to evaluate whether inflation and real rates correctly capture the regime shift from positive to negative correlation, which the data in Figure 1 suggest occurred around 1997. Our data sample starts in 1951 to focus on the period following the Treasury-Fed accord that recognized the independence of the Federal Reserve to conduct monetary policy.

$$\hat{\rho}(t) = \alpha + \boldsymbol{\beta}_1 \pi(t) + \boldsymbol{\beta}_2 r(t) + \boldsymbol{\beta}_3 D_{1997} + \varepsilon(t) \qquad (1)$$

In Figure 2 we show our results for this regression. This analysis confirms the real interest rate is a key factor explaining the variation in the bond-equity correlation. Moreover, both the real rate and inflation components are significant. Both higher inflation and higher real rates have been associated with elevated stock-bond correlations, and these effects are statistically and economically significant. These positive coefficients are likely due to the fact that the return sensitivities of both asset classes to inflation and real rates have the same sign. Hence, if these factors dominate, the correlation should increase.

The average correlation in the entire sample is +7%. Correlations used in this analysis are focused on short run business cycle fluctuations, which tend to generate low or negative stock-bond correlations when rates and inflation volatilities are muted – as evidenced by the intercept (α) of –0.15. There is also strong evidence of a structural downward shift in the correlation post 1997: The coefficient on the dummy variable suggests unconditional correlations are 28% lower in the post 1997 period. This decline in the correlation since the mid-1990s is not fully explained by the lower rates and lower inflation in that period.

FIGURE 2: REGRESSION RESULTS

	α	β_1 (Inflation)	β_2 (Real rates)	β_3 (1997)	P^2
Coefficient	-0.15	0.07	0.07	-0.28	0.39
Std. Error	0.10	0.02	0.02	0.11	

Source: PIMCO, Haver, Bloomberg. June 1951 - June 2013.

Error correction model

The duration-based view of equity prices (as a discounted present value of fixed future cash flows) ignores the business cycle variation of risk premium as well as the link between growth and rates. To address this issue and provide a more comprehensive framework, our error correction model adds two business-cycle-related factors: GDP growth and unemployment.[2] Our model also incorporates both short run and long run dynamics. Instead of modeling the stock-bond correlation directly – which can limit the estimation power due to limited data – we seek to explain variations in stock and bond valuations (yields). From these relationships we build forecasts of the stock-bond correlation under different environments.

Specifically, we use an error correction mechanism to model the behavior of the 10-year nominal Treasury bond yield (y_b) and the cyclically adjusted equity earnings yield (y_e). The cyclically adjusted earnings yield is defined as the inverse of the cyclically adjusted price-earnings ratio (CAPE) for the S&P 500 Index as reported by Robert Shiller.[3]

We relate y_b and y_e to the following four macroeconomic variables:

1. Professional forecasts of one-year GDP growth, g,
2. Unemployment rate, u,
3. Professional forecasts of change in CPI over the next one year, π, and
4. Deviation of the short rates (federal funds rate) from their target using a simple Taylor rule,[4] m.

GDP and inflation forecasts are from the Survey of Professional Forecasters, unemployment data are from Haver and federal fund rates are from Bloomberg. All variables in our model are expressed as *deviations from their full sample averages*; hence, we refer to them as unemployment gap, growth gap, inflation gap and policy rate gap. A positive gap means that the variable is higher than its average over the full sample. Unemployment *forecasts* (as opposed to *realized* data) are not available from the Survey of Professional Forecasters. Also, in our model, unemployment is a state variable describing current conditions, and its level is relatively stable; hence, we do not expect that using unemployment forecasts would change our results.

Because the parameters of the Taylor rule may have changed over time, we calibrate our model on quarterly data starting in Q1 1988 and ending in Q2 2013. We chose this period for a few reasons, namely to focus on the Greenspan and Bernanke eras, include the recession of the early 1990s, and we calibrate our model on data from when the Taylor rule was in effect. Nonetheless, different calibration periods (not reported here) would not change our conclusions materially.

Equations (2) and (3) show the model dynamics we assume for the 10-year Treasury yield.

$$y_b(t) = \alpha_b + \boldsymbol{\beta}_1\, g(t) + \boldsymbol{\beta}_2\, u(t) + \boldsymbol{\beta}_3\, \pi(t) + \boldsymbol{\beta}_4 m(t) + \delta_b(t) \quad (2)$$

$$\Delta y_b(t) = \rho_b \delta_b(t-1) + \boldsymbol{\gamma}_1\, \Delta g(t) + \boldsymbol{\gamma}_2\, \Delta u(t) + \boldsymbol{\gamma}_3\, \Delta\pi(t) + \boldsymbol{\gamma}_4\, \Delta m(t) + \varepsilon_b(t) \quad (3)$$

The long run dynamics $y_b(t)$ are based on relationships between levels, while the short run dynamics $\Delta y_b(t)$ are based on changes, and include the beginning-of-period gap ("error") between model-predicted levels and actual levels $\delta_b(t-1)$.

Similarly, the equity yield dynamics $y_e(t)$ are given by Equations (4) and (5).

$$y_e(t) = \alpha_e + \boldsymbol{\theta}_1\, g(t) + \boldsymbol{\theta}_2\, u(t) + \boldsymbol{\theta}_3\, \pi(t) + \boldsymbol{\theta}_4 m(t) + \delta_e(t) \quad (4)$$

$$\Delta y_e(t) = \rho_e \delta_e(t-1) + \boldsymbol{\varphi}_1\, \Delta g(t) + \boldsymbol{\varphi}_2\, \Delta u(t) + \boldsymbol{\varphi}_3\, \Delta\pi(t) + \boldsymbol{\varphi}_4\, \Delta m(t) + \varepsilon_e(t) \quad (5)$$

In Figure 3 we report the parameter estimates alongside t-statistics in both the levels regression and the error correction model.[5]

As expected, the coefficients on the business cycle variables (GDP and unemployment) have opposite signs for bond and equity earnings yields, both in terms of levels and changes. For example, in the regression based on changes, a 1% increase in the GDP gap would increase the yield on the 10-year Treasury bond by 45 basis points, while it would decrease earnings yields by 42 basis points (stock prices would increase). Hence, when those variables dominate the macroeconomic environment, we can expect a negative stock-bond correlation. Also as expected, albeit perhaps less intuitively, the coefficients on inflation have the same sign for stocks and bonds, based on both the short run changes *and* the long run level dynamics. Historically, stocks have not been a good hedge for inflation.[6]

Therefore, when inflation dominates over the influence of the other factors, we should expect the stock-bond return correlation to be positive.

Lastly, bond and equity yields have opposite sensitivities to the fed funds policy gap, based on the levels regression. This result is likely due to the Federal Reserve's policy to keep rates low (good for bonds) when unemployment is high (bad for stocks) and vice versa.

FIGURE 3: ERROR CORRECTION MODEL (ECM) RESULTS

Level regression	Nominal 10 year yield			Earnings yield		
Variable	**Coef.**	**Value**	**T-Stat**	**Coef.**	**Value**	**T-Stat**
Constant	α_β	0.05	67.22	α_ε	0.04	86.67
GDP growth	β_1	0.41	2.79	θ_1	-0.47	-5.05
Unemployment	β_2	-0.84	-7.89	θ_2	0.77	11.33
Inflation	β_3	1.72	14.90	θ_3	1.07	14.37
Rates (Policy gap)	β_4	0.50	6.18	θ_4	-0.26	-4.90
R-square		84%			82%	

Changes	Nominal 10 year yield			Earnings yield		
Variable	**Coef.**	**Value**	**T-Stat**	**Coef.**	**Value**	**T-Stat**
Δ GDP growth	γ_1	0.45	2.99	φ_1	-0.42	-4.28
Δ Unemployment	γ_2	-0.45	-1.90	φ_2	0.42	2.61
Δ Inflation	γ_2	0.90	3.01	φ_3	0.30	1.38
Δ Rates (Policy gap)	γ_4	0.39	3.27	φ_4	0.02	0.27
ECM	ρ_b	-0.20	-3.06	ρ_e	-0.31	-4.02
R-square		23%			29%	

Source: PIMCO. Bloomberg, Survey of Professional Forecasters, and Haver. Data as of Q1 1988 – Q2 2013.
Hypothetical example for illustrative purposes only.

FIGURE 4: ACTUAL VERSUS FITTED 10-YEAR TREASURY YIELD

Source: PIMCO, Bloomberg. Data as of Q1 1988 – Q2 2013.
Hypothetical example for illustrative purposes only.

FIGURE 5: ACTUAL VERSUS FITTED CYCLICALLY ADJUSTED S&P 500 EARNINGS YIELD

Source: PIMCO, Shiller, Bloomberg. Data as of Q1 1988 – Q2 2013.
Hypothetical example for illustrative purposes only.

The actual and fitted levels (from the levels regressions) of the 10-year Treasury yield and equity earnings yield are shown in Figures 4 and 5. While the recent fit has not been satisfactory (the central bank policy has clearly pushed rates levels below their model-implied values), overall the model captures a reasonable proportion of the dynamics for both stock and bond valuations over the period studied.

Forward-looking correlations

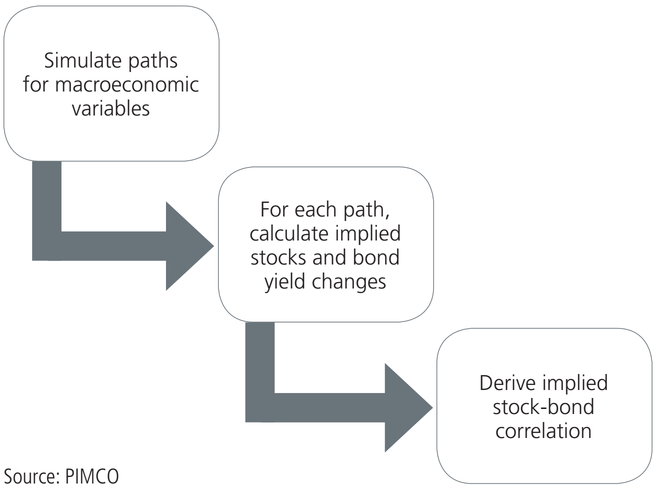
Based on our models for stock and bond yields, we use a simulation model to build forward-looking estimates of their correlation as a function of various macroeconomic projections. We focus on yields as opposed to returns for econometric convenience, but the correlation of returns should be very close to the correlation in yields. Even at the two-year horizon, stock returns have a correlation greater than 95% with changes in cyclically adjusted earnings yields. And for Treasuries, changes in yield are a very common approximation for returns per unit of duration. Hence, for the purposes of estimating the stock-bond correlation, using changes in valuations is roughly equivalent to using returns (or at least well within the margin of error for any model-based forecast).

In Figure 6 we show the multi-step process we use to generate model-implied correlations. We follow three broad steps:

1. We simulate (through a Monte Carlo simulation) 1,000 paths for growth, unemployment, inflation, and policy rates.
2. Next we derive 1,000 simulated paths in stock and bond yields, based on our econometric model (using the coefficients on levels and changes from Figure 3).
3. From these simulated changes we calculate the stock-bond correlation at various time horizons.

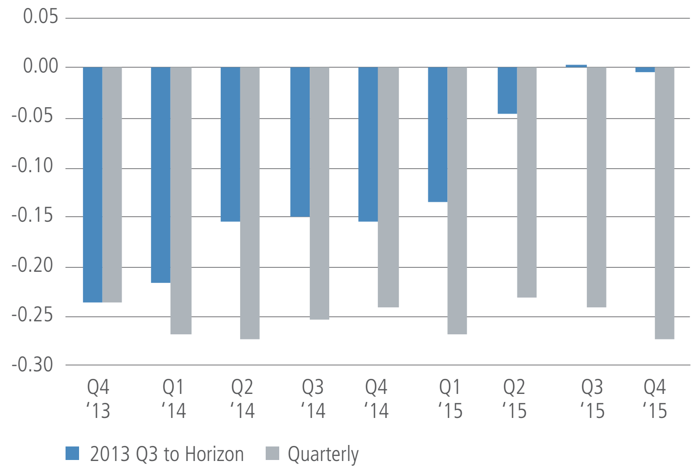
The mean outcomes for the macroeconomic variables are based on FOMC projections, and their dynamics (autocorrelations, volatilities and correlations) are calculated on historical data from Q1 1988 to Q2 2013. Our framework includes error terms in the simulated macroeconomic variables' paths and in the implied stock and bond yield changes. (The appendix provides details on this simulation process and the underlying parameters.)

FIGURE 6: PROCESS TO DERIVE FORWARD-LOOKING CORRELATIONS



Source: PIMCO

FIGURE 7: TERM STRUCTURE OF CORRELATIONS, COMPARED WITH QUARTERLY CORRELATIONS



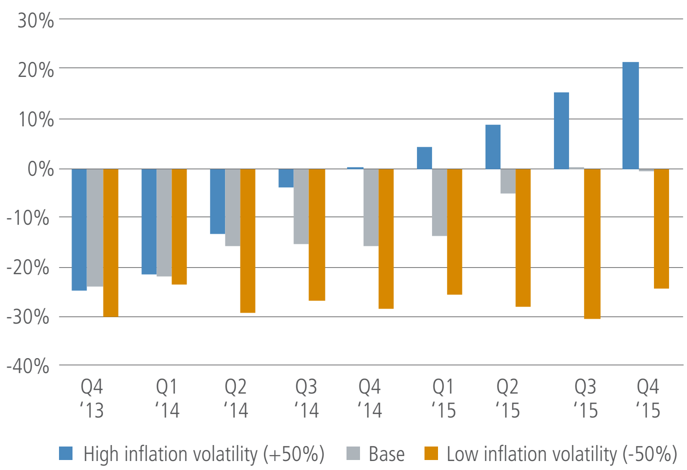
Source: PIMCO. Data as of Q3 2013.
Hypothetical example for illustrative purposes only.

In Figure 7 we show the projected stock-bond correlation over various horizons, and compare these results with correlation estimates for quarterly returns. For example, the correlation "to Horizon" for Q2 2014 is –0.15. This estimate is from 1,000 simulated nine-months outcomes (three quarters). The "Quarterly" correlation of –0.25 is for quarter-over-quarter correlations from 1,000 paths with three observations each: Q4 2013, Q1 2014 and Q2 2014. The chart shows that the short run correlation (which is dominated by the business cycle) is negative and close to –0.2. However, as the investment horizon increases, the correlation approaches zero.

This term structure effect is due to the significant role that inflation plays in the levels regressions. Over time, higher inflation translates into higher nominal yields and higher earnings yields in the model. A volatility decomposition based on our simulation suggests that roughly 70% of the volatility in the long-term nominal yield is driven by inflation, whereas about 50% of the volatility in the long-term earnings yield is due to inflation.

A sensitivity analysis of the impact of inflation volatility on our model-implied correlations is shown in Figure 8. Correlations become more negative (for all horizons) if we reduce inflation volatility by 50% of its initial value, and generally increase if we increase inflation volatility by 50%, holding all other factors constant (we provide details on all simulation parameters in the appendix). This analysis reveals model-implied correlations are quite sensitive to inflation volatility. If inflation volatility decreases significantly, the correlation should remain negative, even at the two-year horizon. Importantly, it shows some "tail risks" in the hedging effect of bonds on equity risk. If inflation volatility increases significantly, the stock-bond correlation rises to +20% for two-year returns. At this correlation level, bonds would still provide diversification benefits to risk assets, but perhaps not as much as investors are currently assuming in their asset allocation decisions.

FIGURE 8: TERM STRUCTURE OF CORRELATIONS – SENSITIVITY ANALYSIS TO INFLATION VOLATILITY



Source: PIMCO. Data as of Q3 2013.
Hypothetical example for illustrative purposes only.

Investment implications

The stock-bond correlation is a cornerstone of strategic asset allocation, and investors should understand its sensitivity to macroeconomic factors. Applications that primarily rely on point estimates of correlation, such as mean-variance optimizations, can be misleading if the investor does not take into account current conditions and possible macroeconomic regime shifts.

We have presented an econometric framework to seek to better understand and predict the correlation between stocks and Treasuries. Based on projections of macroeconomic variables, our framework provides forward-looking estimates of correlations over various time horizons.

Although many other factors beyond the scope of our framework matter, growth, unemployment, inflation and real rates are key drivers of macroeconomic risk and are responsible for a significant portion of the dynamics of stocks and bonds.

In the short run, we expect the correlation to remain negative as long as business cycle variables dominate the effects of rates and inflation. In the long run, bonds may still diversify stocks, but the correlation may be higher and even positive due to the influence of inflation and the smoothing of business cycle and risk aversion effects.

This analysis challenges conventional wisdom for asset allocation. Over the last 15 years, many investors have been able to ignore inflation risk and have taken for granted the very negative correlation between stocks and Treasuries. In the next decade, particularly in light of aggressive and expansive central bank monetary policy, the importance of the inflation risk factor may indeed resurface. If so, many of the correlation dynamics that investors have become accustomed to may be less relevant.

Lastly, our framework is not meant to be a substitute for a forward-looking investment process. While our model assumes linear relationships, the flight-to-safety effect during extremely negative growth shocks may overwhelm any other effect and produce a negative correlation between stocks and Treasuries, despite inflation shocks.

In summary, our framework is meant to underscore the importance of assessing potential macroeconomic regime shifts when making asset allocation decisions, which should be augmented by judgment, experience and evaluation of risk-factor-specific variables.

Appendix:

Monte Carlo simulation methodology and parameters

To simulate the behavior of key macroeconomic variables, we use projected Federal Open Market Committee (FOMC) data as mean outcomes for each variable. These forecasts are provided on an annual basis, but we convert them by interpolating linearly to quarterly means. The annual projections as of June 2013 are shown in Figure A1. The gaps are estimated as differences from the sample average (Q1 1988 – Q2 2013). The historical statistics for the macroeconomic variables are shown at the bottom of Figure A1.

FIGURE A1: FOMC PROJECTIONS AND HISTORICAL DATA FOR MACROECONOMIC VARIABLES

	Real GDP growth	Unemployment	Inflation rate	Real policy rate	Rates implied by Taylor rule
FOMC Projections					
2013	2.45%	7.25%	1.00%	0.25%	-0.74%
2014	3.25%	6.65%	1.70%	0.45%	1.51%
2015	3.35%	6.00%	1.80%	1.35%	2.96%
Gaps					
2013	-0.22%	1.20%	-1.46%	0.99%	–
2014	0.58%	0.60%	-0.76%	-1.06%	–
2015	0.68%	-0.05%	-0.66%	-1.61%	–
Historical Data (Q1 1988 to Q2 2013)					
Mean Levels	2.67%	6.05%	2.46%	1.39%	–
Min	0.79%	3.90%	1.30%	-1.73%	–
Max	4.01%	9.90%	4.66%	5.21%	–
Std. deviation	0.61%	1.58%	0.81%	2.04%	–
Mean Changes	0.01%	-0.06%	-0.02%	-0.04%	–
Min	-0.93%	-2.00%	-0.66%	-1.94%	–
Max	1.10%	1.00%	0.37%	0.74%	–
Std. deviation	0.33%	0.52%	0.18%	0.46%	–

Sources: FOMC (data as of June 2013), Haver, Bloomberg, PIMCO. Historical data from Q1 1988 – Q2 2013.

FIGURE A2: PARAMETERS OF STOCHASTIC PROCESSES FOR MACROECONOMIC VARIABLES

	Correlations and volatilities of ε's				Parameters		
Correlation	**GDP**	**Unemployment**	**Inflation**	**Rates**	**Volatility**	**α**	**β**
GDP	100%				0.6%	25%	-18%
Unemployment	-25%	100%			0.4%	71%	-3%
Inflation	-1%	-22%	100%		0.4%	6%	-4%
Rates	-3%	62%	-40%	100%	1.0%	40%	-5%

Source: PIMCO. Data as of Q1 1988 – Q2 2013.

We estimate the autocorrelation dynamics, the volatilities and the correlations of these variables based on historical data from Q1 1988 to Q2 2013. To do so we estimate a simple model for the changes in the macro variables, as shown in Equation (6).

$$\Delta y_j(t) = \alpha \Delta y(t-1) + \beta y(t) + \varepsilon_j(t+1) \qquad (6)$$

Figure A2 shows our estimated parameters alongside the correlations and volatilities of the error terms (ε_j).

The realizations of the driving macroeconomic variables are jointly simulated 1,000 times from Q3 2013 through Q4 2015 with correlation and volatility structure dictated by parameters in Figure A2 and average realizations along the path given by the FOMC projections in Figure A1.

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1 See, for example: Wainscott (1990), Li (2002), Gulko (2002), Andersson, Krylova and Vahamaa (2004), Baele, Bekaert and Inghelbrecht (2009).

2 The intuition for using an error correction model to model stock and bond yields as a function for GDP growth, inflation, unemployment and the policy rate is as follows: Bond yields are risk-adjusted expected values of average policy rates, which depend on unemployment, real growth and inflation. Stock prices are discounted values of dividends, where both the numerator and the denominator of this valuation are sensitive to these variables. Importantly, the dynamics of unemployment, growth, inflation and policy are interlinked and jointly determined. As such, a forecast of the stock-bond correlation requires us to estimate the long-term and short-term sensitivity of bond and equity yields to the macroeconomic drivers.

3 This data is taken from http://www.econ.yale.edu/~shiller/data.htm. While CAPE earnings are inflation-adjusted, we focus on the change in P/E as proxy for equity return correlation – essentially a “nominal” concept.

4 The Taylor rule is defined as follows: Fed Funds Rate = Target Real Rate + 0.5 x (Inflation – Target) – 2 x (Unemployment – Target). We use a Target Real Rate of 1.4%, Target Inflation of 2.5% (the sample mean), and an Unemployment Target of 6%.

5 Due to the borderline non-stationary nature of most of the macro variables involved, the t-statistics and R-squares in the levels regression should not be interpreted as a very reliable estimate of “significance.” However, a co-integration test confirms that the variables are indeed co-integrated.

6 Whether stocks are negatively correlated to inflation – in other words, whether stocks hedge inflation – is debated in the literature (for a review and discussion, see Johnson and Page (2012)). Do inflation shocks tend to occur when other equity factors are at play? If so, then in order to expect a negative correlation, investors must be confident the recurrent – but perhaps not universal – factors that give rise to the negative correlation between inflation and stocks are prevalent in the current environment. Empirically it appears the correlation is negative for a wide range of time periods, horizons and countries. See, for example, Fama and Schwert (1977), Fuller and Petry (1981), Geske and Roll (1983), Stulz (1986), Wilson and Jones (1987), Hughes (1992), Asikoglu and Ercan (1992), Marshall (1992), Weigel (1994), Erb, Harvey, and Viskanta (1995), Watkins and Hartzell (1998), Bhardwaj, Hamilton, and Ameriks (2011), Feinman (2005) and Amenc, Martellini, and Ziemann (2009).

The above information contains hypothetical examples and is for illustrative purposes only. Hypothetical and simulated examples have many inherent limitations and are generally prepared with the benefit of hindsight. There are frequently sharp differences between simulated results and the actual results. There are numerous factors related to the markets in general or the implementation of any specific investment strategy, which cannot be fully accounted for in the preparation of simulated results and all of which can adversely affect actual results. No guarantee is being made that the stated results will be achieved.

All investments contain risk and may lose value. Investing in the bond market is subject to certain risks, including market, interest rate, issuer, credit and inflation risk. Equities may decline in value due to both real and perceived general market, economic and industry conditions. The correlation of various indexes or securities against one another or against inflation is based upon data over a certain time period. These correlations may vary substantially in the future or over different time periods that can result in greater volatility. It is not possible to invest directly in an unmanaged index.

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