

INSTITUTIONAL ADVISORY & SOLUTIONS

# HIGHER BOND YIELDS & THE FED MODEL

## Implications for Future Stock-Bond Relative Returns

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A rapid rise in bond yields prompts arguments that stocks become relatively less attractive in terms of future total returns. This view is motivated by the so-called "Fed Model" which argues that risky stocks should offer investors a higher yield than less risky bonds.<sup>1</sup> Stocks are relatively "overvalued" when their earnings yield approaches or falls below bond yields. While declining earnings yield signals that stock prices are too high and future stock total returns may be muted, higher bond yields signify stronger future bond total returns since bond yields are a good forecast of their future total returns if held to maturity.

**We explore the historical record of the Fed Model to explain future stock-bond relative total returns. This may be useful information for investors because relative expected returns are an important input to asset allocation decisions. Using the past 50y of data, has the Fed Model provided a reliable signal for future stock-bond relative, risk-adjusted, total return?**

<sup>1</sup> It is often claimed that the Fed Model was first defined in a 1997 Fed report titled "Monetary Policy Report to the Congress Pursuant to the Full Employment and Balanced Growth Act of 1978." The term was coined by Dr. Edward Yardeni, although was never formally endorsed by the Fed. Researchers have raised concerns about the ability of the model to forecast future stock returns, both its theoretical validity and empirical support. A key criticism is its comparison of a *real* number (S&P 500 earnings yield, inverse of the 12m forward P/E ratio) to a *nominal* one (nominal 10y Treasury yield, Y). Consequently, we define the Fed Model using the real (*i.e.*, inflation-adjusted) 10y Treasury yield. Additionally, we replace the 12m forward P/E ratio with Shiller's Cyclically Adjusted Price-Earnings (CAPE) Ratio as it provides a longer history for our study. CAPE takes a 10y average of inflation-adjusted earnings to smooth out volatility of earnings over different periods of a business cycle. See C. Asness (2003), "Fight the Fed Model," *The Journal of Portfolio Management*, 30 (1) 11-24; J. Estrada (2009), "The Fed Model: The Bad, the Worse, and the Ugly," *The Quarterly Review of Economics and Finance*, 49 (2) 214-238; and J. Y. Campbell and R. J. Shiller (1988), "Stock Prices, Earnings and Expected Dividends," *Journal of Finance*, 43 (3) 661-676.

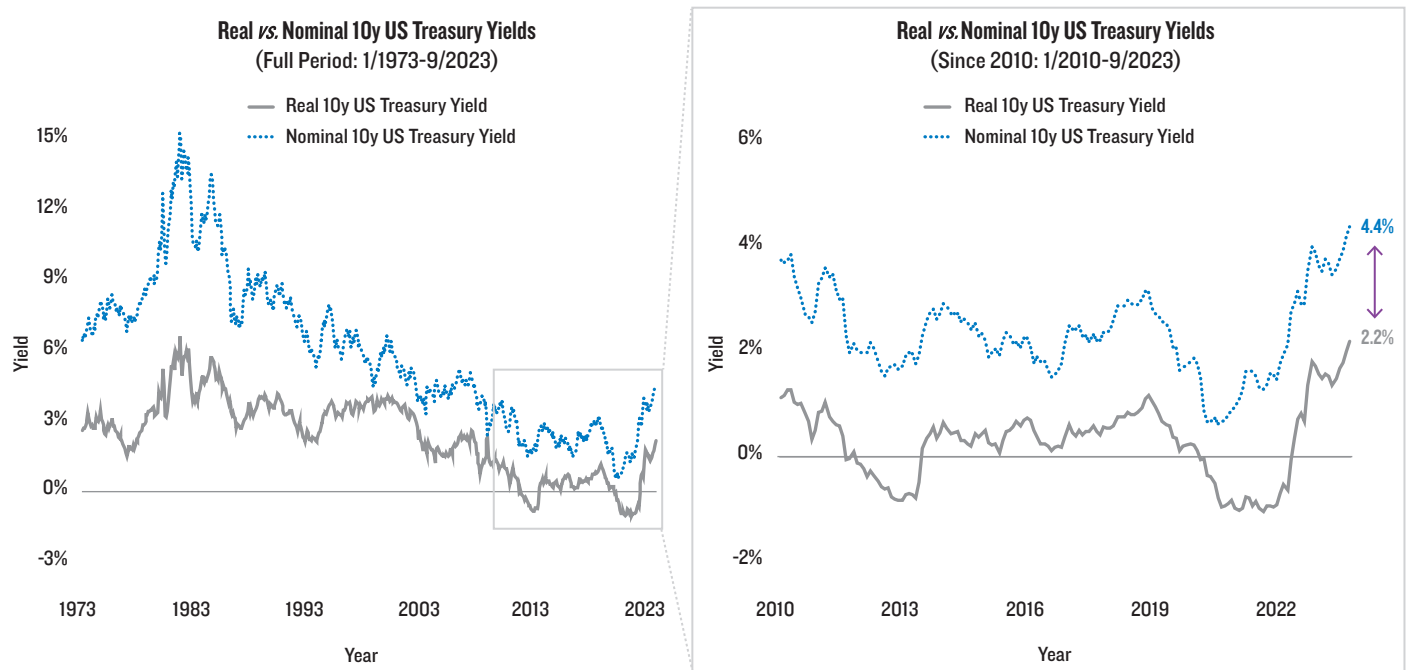
## CIO Takeaways

1. The recent stock-bond real yield difference of 1.1%/y (as of September 2023) has historically been associated with *stocks outperforming bonds* in terms of average return by 2.4%/y (*vs.* the historical average of 4.4%/y outperformance) over the subsequent 10y.
2. However, in terms of *volatility-adjusted* return (*i.e.*, annualized mean/vol ratio), the recent stock-bond real yield difference has been associated with *bonds outperforming stocks* by 0.07 (*vs.* the historical average of stocks outperforming bonds by 0.23) over the subsequent 10y.

## Higher Bond Yields & Market Reactions

Nominal 10y US Treasury yields have risen sharply since March 2022 driven by the Fed's rate hikes to combat inflation.<sup>2</sup> As of September 2023, the nominal and real 10y yields were 4.4%/y and 2.2%/y, respectively (Figure 1). While they are not extreme based on data since the 1970s, these levels have not been experienced in over a decade. The rise in yields has prompted considerable public commentary suggesting that bonds are now more attractive than stocks and that investors may wish to allocate accordingly (Figure 2). Based on history, do these higher bond yields signify that bonds outperform stocks in either the short or long term?

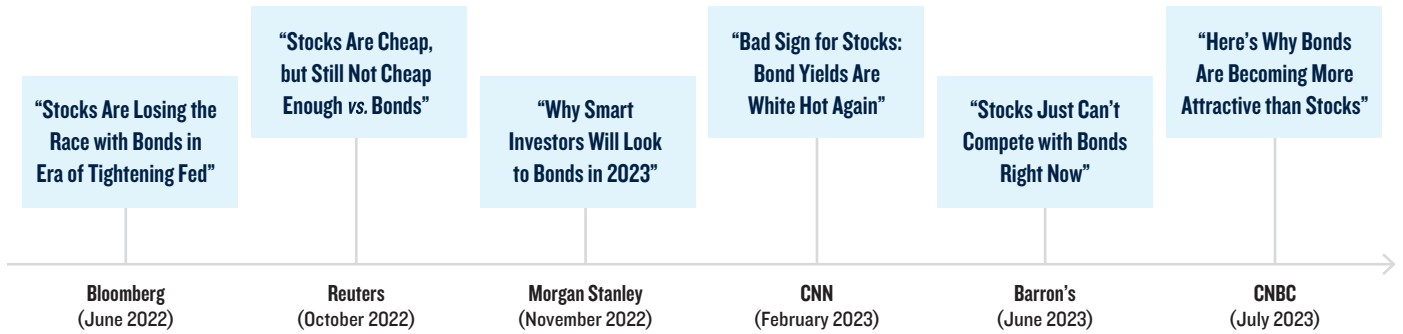
Figure 1: 10y US Treasury Yields; Nominal & Real; 1/1973 – 9/2023



Note: For 1/2003-9/2023 the real 10y Treasury yield is calculated by subtracting the 10y Treasury breakeven inflation rate from the nominal 10y Treasury yield. For earlier periods (*i.e.*, 1/1973-12/2002), we use real 10y Treasury yield estimates from Barclays. All numbers (except for Barclays data) are averages of business days within a month. Source: Barclays, Federal Reserve Bank of St. Louis, FRED and PGIM IAS. Provided for illustrative purposes only.

<sup>2</sup> The Fed hiked rates 11 times for a total of 525bp between March 2022 and July 2023.

**Figure 2: Market Commentary on Higher Bond Yields; 6/2022 – 9/2023**



Source: Barron's, Bloomberg, CNBC, CNN, Morgan Stanley, Reuters and PGIM IAS. Provided for illustrative purposes only.

## Using the Fed Model as a Stock-Bond Relative Value Indicator

Researchers have proposed several potential measures of stock-bond relative value in the spirit of the Fed Model (Figure 3). These include: 1) replacing earnings yield with dividend yield (since earnings are partially reinvested and will not be fully received by investors) and 2) adding stock and bond volatilities to adjust yields by a measure of relative risk.

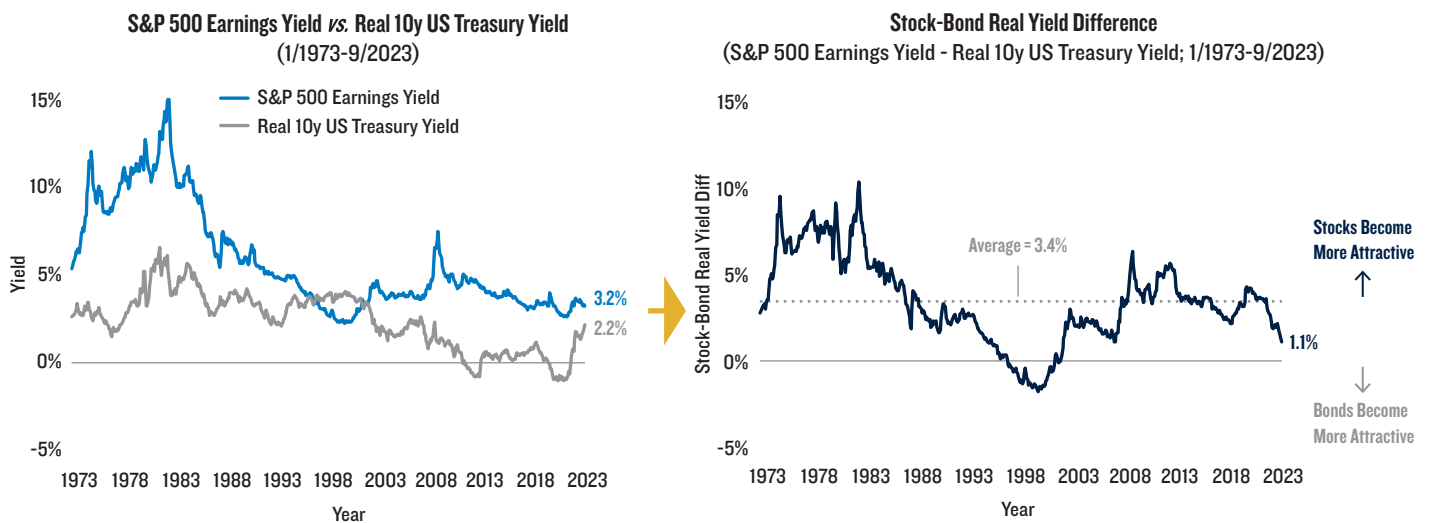
**Figure 3: Measures of Stock-Bond Relative Value in the Spirit of the Fed Model**

1	Original Fed Model: $E/P - Y$
2	Inflation & CAPE-adjusted (our focus): $E/P^* \text{ (based on CAPE)} - R \text{ (real 10y Treasury yield)}$
3	Use dividend yield instead of earnings yield: $D/P - Y$
4	Add stock & bond volatilities: $E/P - Y + Vol(s) - Vol(b)$

Source: PGIM IAS. Provided for illustrative purposes only.

Figure 4 shows the results based on our chosen version of the Fed Model (#2 in Figure 3). Given the increase in the real 10y yield, stock-bond real yield difference has fallen but remains positive at 1.1%/y (as of September 2023). While positive, the 1.1%/y stock-bond real yield difference is well below its historical average of 3.4%/y.

**Figure 4: Stock-Bond Real Yield Difference; 1/1973 – 9/2023**



Note: S&P 500 earnings yield is the inverse of the Cyclically Adjusted Price-Earnings Ratio (CAPE Ratio); for 1/2003-9/2023 the real 10y Treasury yield is derived by subtracting the 10y Treasury breakeven inflation rate from the nominal 10y Treasury yield. For earlier periods (i.e., 1/1973-12/2002), we use real 10y Treasury yield estimates from Barclays. All numbers (except for Barclays data) are averages of business days within a month. Source: Barclays, Datastream, Federal Reserve Bank of St. Louis, FRED, Haver Analytics, Robert Shiller, S&P, US Treasury and PGIM IAS. Provided for illustrative purposes only.

## Stock-Bond Relative Value & Future Relative Returns

We explore the historical linear relationship between future stock-bond relative average return (dependent variable) and stock-bond real yield difference (independent variable) using the following regression:

$$\text{Stock-Bond Relative Average Return}_{t+x(\text{years})} = \alpha + \beta \times \text{Stock-Bond Real Yield Difference}_t + \varepsilon$$

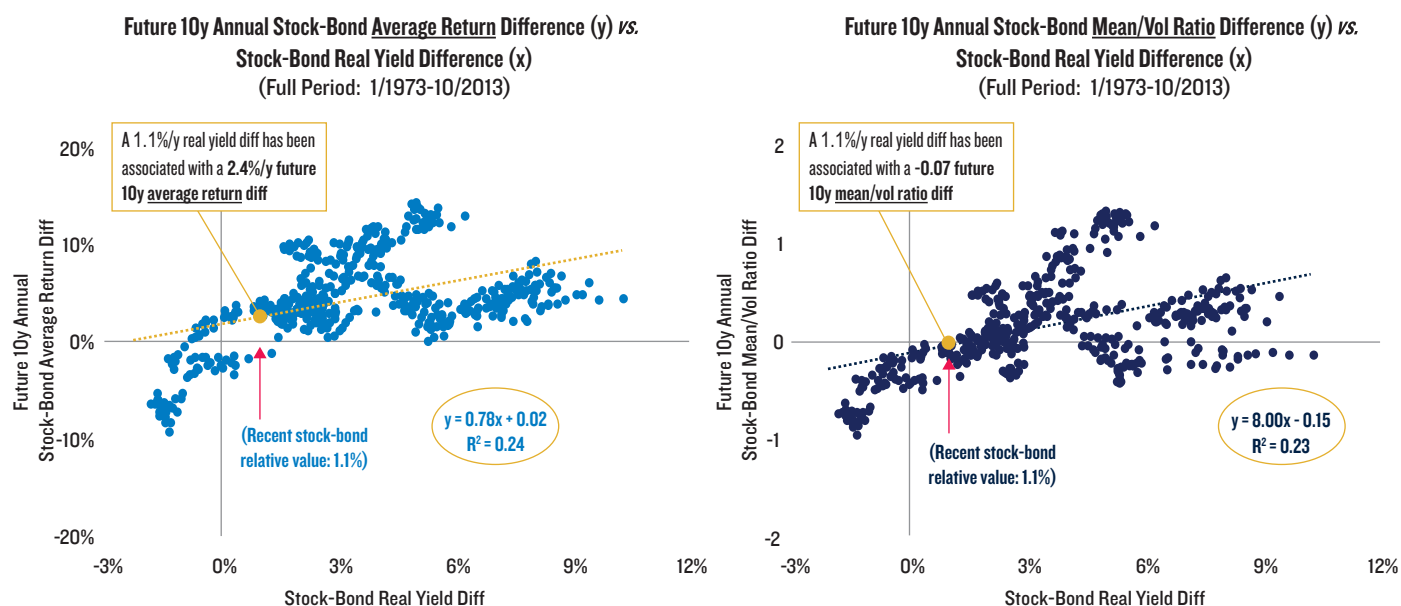
We measure future relative average return (*i.e.*, future stock *real total* average return – future bond *real total* average return) at both 5y and 10y future horizons. For both regressions we find the estimated betas are consistently positive (as expected) and statistically significant (after adjusting for heteroscedasticity and autocorrelation arising from overlapping observations).

Figure 5 shows the results for future 10y relative average return using data since January 1973. The recent 1.1%/y measure of real yield difference has historically been associated with a 2.4%/y future 10y average return difference – *i.e.*, stocks outperforming bonds by 2.4%/y (*vs.* the historical average of 4.4%/y outperformance) over the subsequent 10y. A real yield difference of -2.0%/y is the estimated *inflection point* for bonds to outperform stocks over the subsequent 10y. Dramatic structural market changes (*e.g.*, COVID) may make the historical estimated relationship less relevant, but it can still be viewed as a valuable reference point.

In truth, we located the inflection point by extrapolating the linear regression line. The real yield difference has never reached this inflection point over our study period (bottoming at -1.8%/y in January 2000). However, as Figure 5 shows, when the real yield difference was below -0.8%/y bonds often tended to outperform stocks over the subsequent 10y. The real yield difference still has 190bp/y further to fall from the recent level of 1.1%/y before bonds are expected to have better future 10y returns than stocks. So, despite the rise in bond yields does all the public commentary have it wrong?

In terms of future *volatility-adjusted* return (*i.e.*, annualized mean/vol ratio), however, public commentary may have it right. The recent real yield difference has historically been associated with the future relative mean/vol ratio being slightly negative (-0.07 *vs.* the historical average of 0.23), implying bonds performing slightly better than stocks (Figure 5). Historically, a real yield difference of +1.9%/y (*i.e.*, well above the recent 1.1%/y real yield difference) has been the *inflection point* for bonds to outperform stocks over the subsequent 10y on a volatility-adjusted basis.

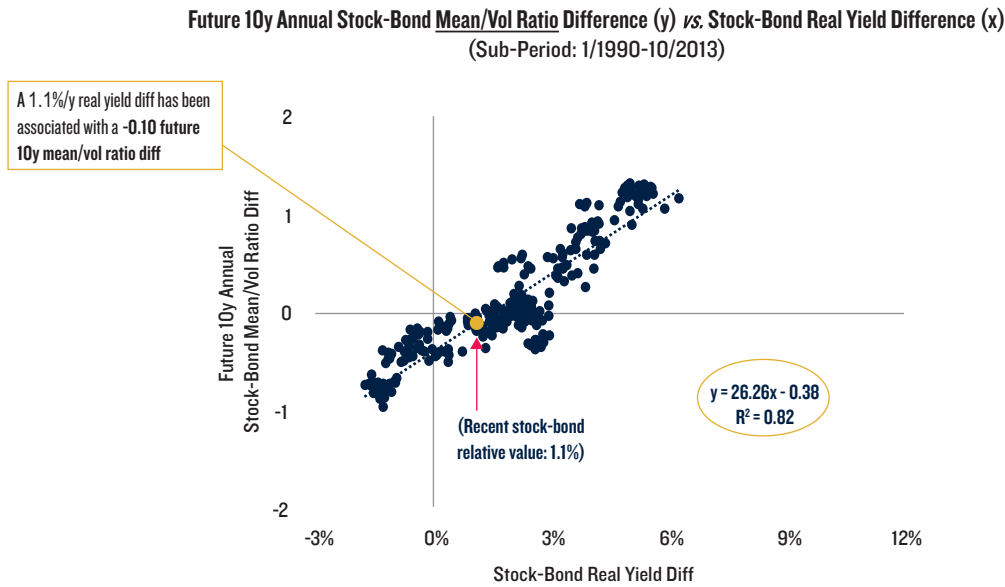
**Figure 5: Future 10y Stock-Bond Return Difference (since 1973); 1/1973 – 10/2013**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

We pause to note that the historical record includes an anomalous period of 1980-1990 when future 10y relative mean/vol ratio was not positively correlated with the real yield difference. This deviation may be attributed to distorted stock valuations during stock market crashes (Black Monday in October 1987 and a mini-crash in October 1989) and recessions (January-July 1980, July 1981-November 1982, and July 1990-March 1991). Consequently, we re-examine the Fed Model regression using data since 1990. While the goodness-of-fit ( $R^2$ ) improves considerably from ~20% to ~80%, the findings remain the same: The recent real yield difference historically corresponds to future 10y bond returns being higher than stock returns on a volatility-adjusted basis (Figure 6).

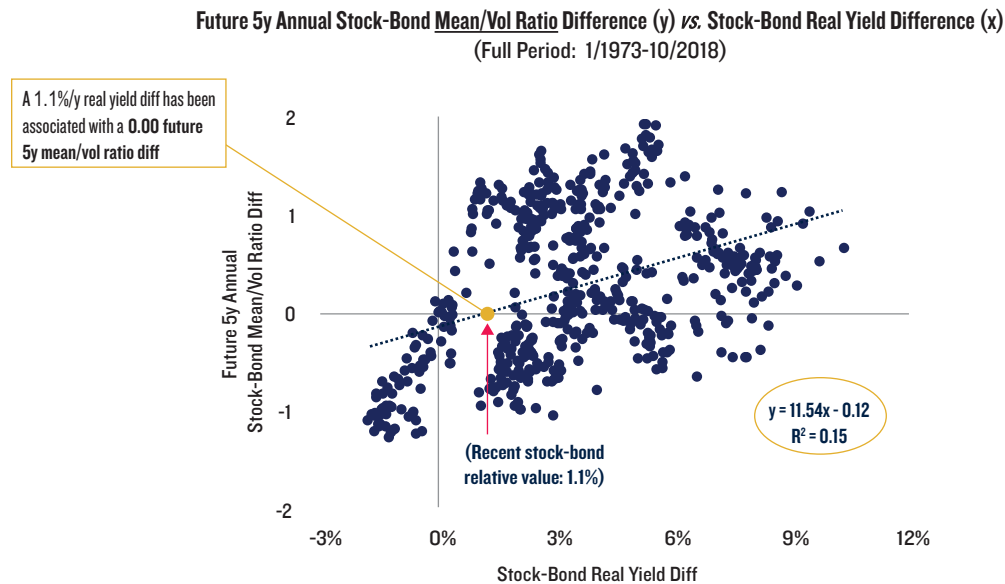
**Figure 6: Future 10y Stock-Bond Mean/Vol Ratio Difference (since 1990); 1/1990 – 10/2013**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

Figures 7 & 8 present results for future 5y relative mean/vol ratio conditional on the real yield difference.<sup>3</sup> The recent real yield difference historically corresponds to bonds performing similar as stocks on a volatility-adjusted basis. The real yield difference is better at explaining future relative mean/vol ratio over a longer horizon (e.g., 10y vs. 5y), as evidenced by the increasing  $R^2$  as the horizon lengthens.<sup>4</sup>

**Figure 7: Future 5y Stock-Bond Mean/Vol Ratio Difference (since 1973); 1/1973 – 10/2018**



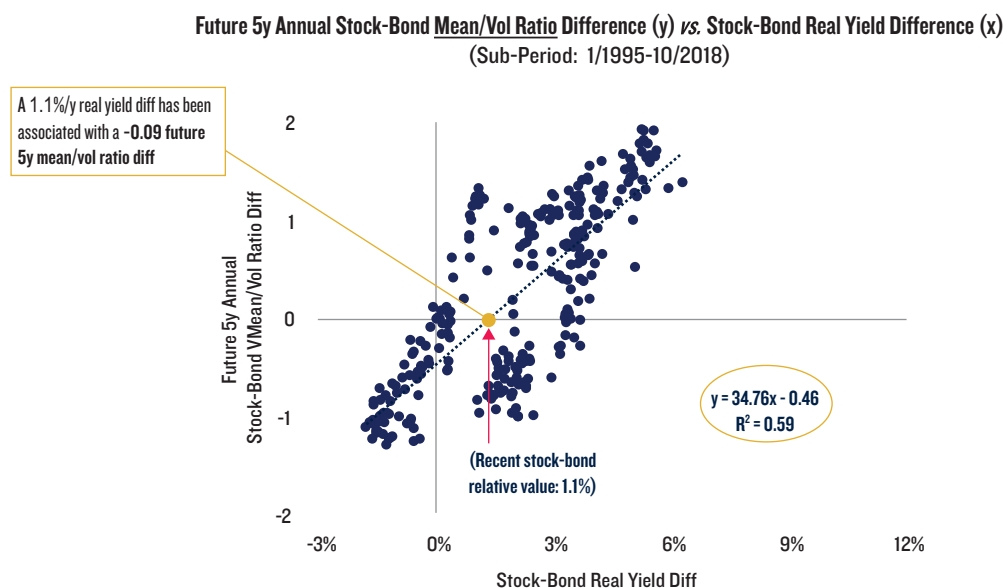
Same note and sources as for Figure 4. Provided for illustrative purposes only.

3 Note that for future 5y relative mean/vol ratio we continue to use CAPE (trailing 10y earnings divided by current stock price) and real 10y Treasury yield for consistency. Alternatively, we could consider using CAPE with trailing 5y earnings and real 5y Treasury yields. Figures A1-A2 show the results for future 3y ( $R^2 = 8\%$ ) and 1y ( $R^2 = 4\%$ ) relative returns.

4 We re-examine the linear relationship between future 10y relative mean/vol ratio and real yield difference during periods of Fed tightening and easing, respectively. Figure A3 provides the results which should be interpreted with caution since the sample sizes are much smaller than the full history.



**Figure 8: Future 5y Stock-Bond Mean/Vol Ratio Difference (since 1995); 1/1995 – 10/2018**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

For a robustness check, we compare our version of the Fed Model with alternative approaches described in Figure 3. To ensure a consistent comparison, we select a common timeframe (February 2004 to October 2013) when data are available for all measures. Figure 9 shows our version of the Fed Model has the best explanatory power.

**Figure 9: Explanatory Power of Various Versions of the Fed Model; 2/2004 – 10/2013**

	Measures of Stock-Bond Relative Value in the Spirit of the Fed Model	Explanatory Power (R <sup>2</sup> ) for Future 10y Mean/Vol Ratio Difference
1	Original Fed Model: E/P – Y	80%
2	Inflation & CAPE-adjusted (our focus): E/P* (based on CAPE) – R (real 10y Treasury yield)	90%
3	Use dividend yield instead of earnings yield: D/P – Y	88%
4	Add stock & bond volatilities: E/P – Y + Vol(s) – Vol(b)	45%

Note: D/P is calculated as the inverse of the I/B/E/S 12m forward price/dividend ratio (data is available since 2/2004). E/P is calculated as the inverse of the I/B/E/S 12m forward price/earnings ratio. Vol(s) and Vol(b) are calculated as the trailing 10y volatilities of monthly returns for S&P 500 and 10y US Treasury bond, respectively. Other notes and sources are the same as in Figure 4. Provided for illustrative purposes only.

A savvy reader may be justified in asking “What if the recent stock-bond real yield difference corresponds to very low or even negative returns for both stocks and bonds such that it would be better to hold cash instead?” On average, the recent real yield difference (1.1%/y) has historically been associated with an 8.6%/y future 10y stock real total average return, a 5.0%/y future 10y bond real total average return but only a 0.7%/y future 10y cash real average return. The associated future 10y real total return mean/vol ratios were, however, relatively close: 0.65 for stocks, 0.77 for bonds and 0.78 for cash.

## Stock-Bond Net Returns

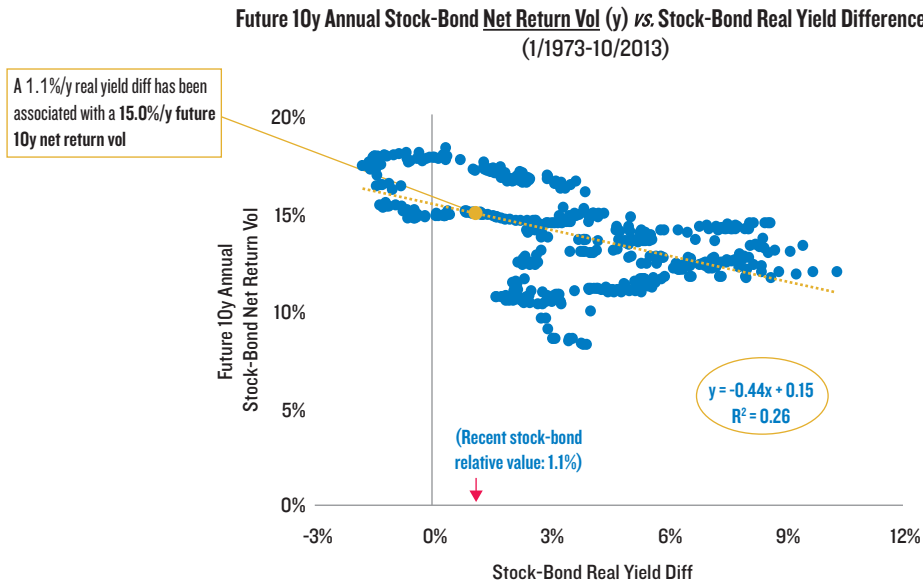
A shortcoming of our relative volatility-adjusted return measure is that we calculate and then subtract one volatility-adjusted return from another. However, it is easy to imagine the time series for stock and bond returns both being highly volatile but the time series of their net return being less so. Consequently, to make a proper evaluation an investor would want to know the future return and volatility of the *net* position. After all, for an investor to take advantage of future expected return differentials they will likely sell (or, underweight) one asset and buy (or, overweight) the other.

For the 10y horizon, we can use Figure 5 to show that future average net return (long stocks/short bonds on a 1:1 market value basis, rebalanced monthly) has tended to rise with the real yield difference. Figure 10 shows that net returns have exhibited lower volatility

as the real yield difference increases. To put it another way, as the real yield difference *narrows*, net returns have tended to be *lower* on average (yet, positive) with *higher* volatility, producing *lower* mean/vol ratio (Figure 11). In contrast, when the real yield difference *widens*, net returns have tended to be *higher* on average with *lower* volatility, producing *higher* mean/vol ratio.<sup>5</sup>

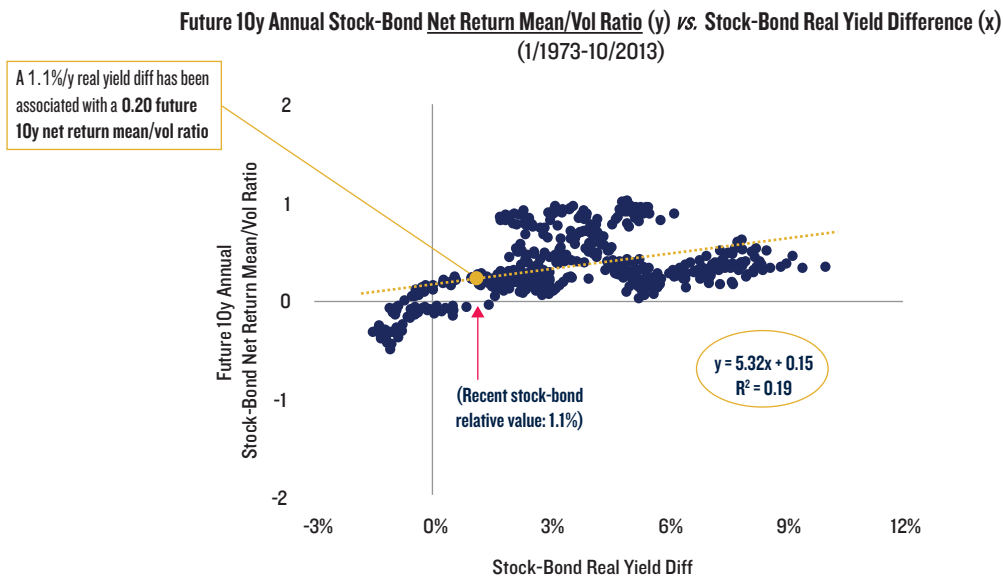
Figure 11 tells the investor that the recent real yield difference, although well above the inflection point advocating adding stocks by selling bonds, has historically exhibited a below average net return mean/vol ratio (0.20 *vs.* the historical average of 0.36).

**Figure 10: Future 10y Net Return Vol (since 1973); 1/1973 – 10/2013**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

**Figure 11: Future 10y Stock-Bond Net Return Mean/Vol Ratio (since 1973); 1/1973 – 10/2013**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

The stock-bond real yield difference has narrowed considerably over the past two years. Based on the historical record, the recent real yield difference suggests that stocks will continue to outperform bonds in terms of future 10y average return, but to a much lesser degree than the historical average outperformance. However, in terms of future 10y volatility-adjusted return (*i.e.*, mean/vol ratio), the recent real yield difference suggests that bonds will outperform stocks.

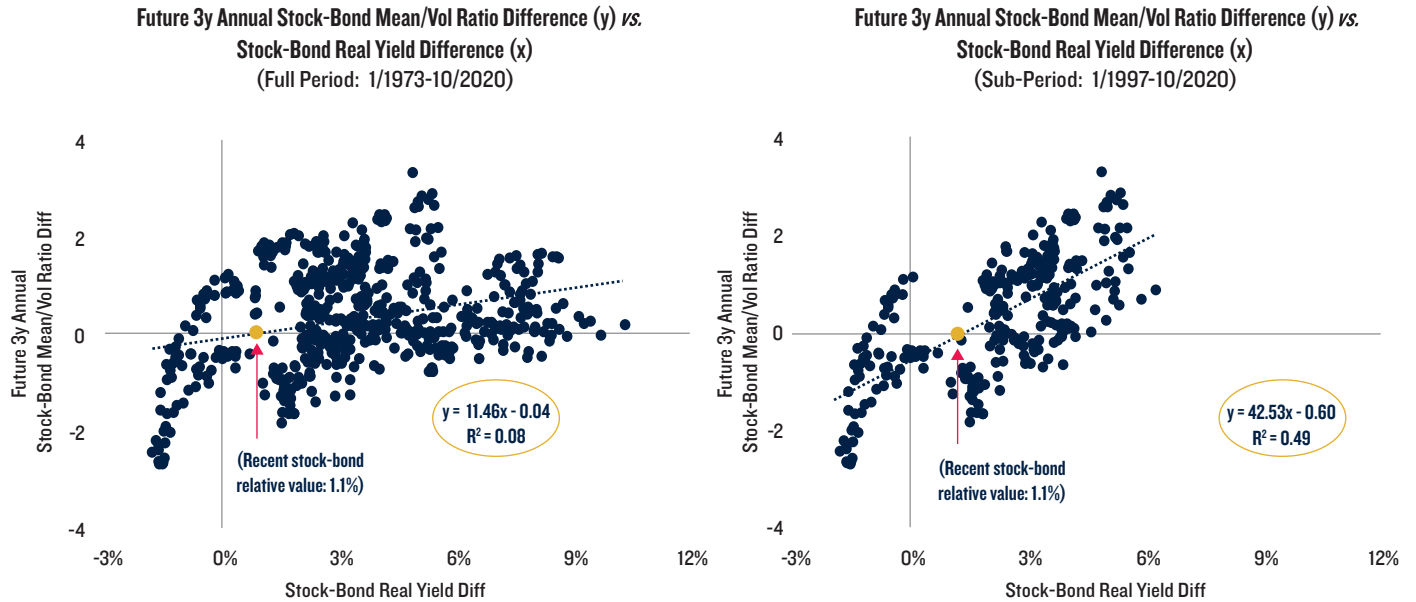
<sup>5</sup> Same conclusions (qualitatively) apply to the 5y horizon.

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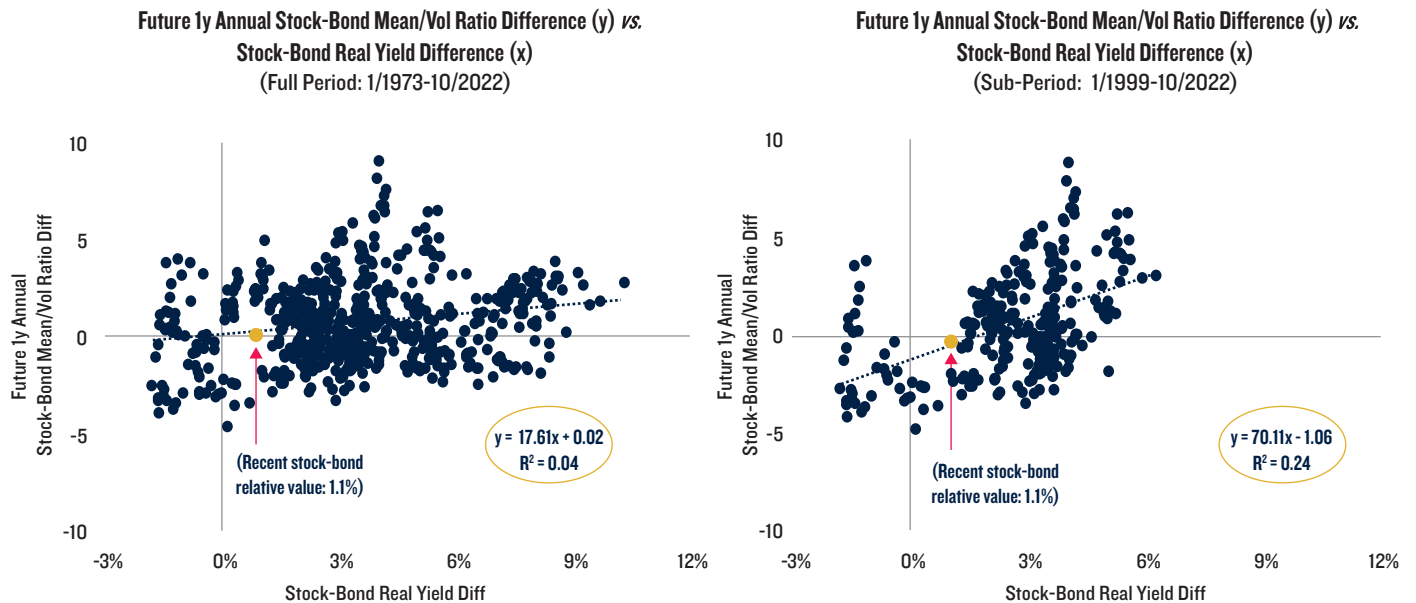
## Appendix: Additional Analysis on Stock-Bond Future Relative Returns

**Figure A1: Future 3y Stock-Bond Mean/Vol Ratio Difference (since 1973 or 1997); 1/1973 – 10/2020**



Same note and sources as for Figure 4. Provided for illustrative purposes only.

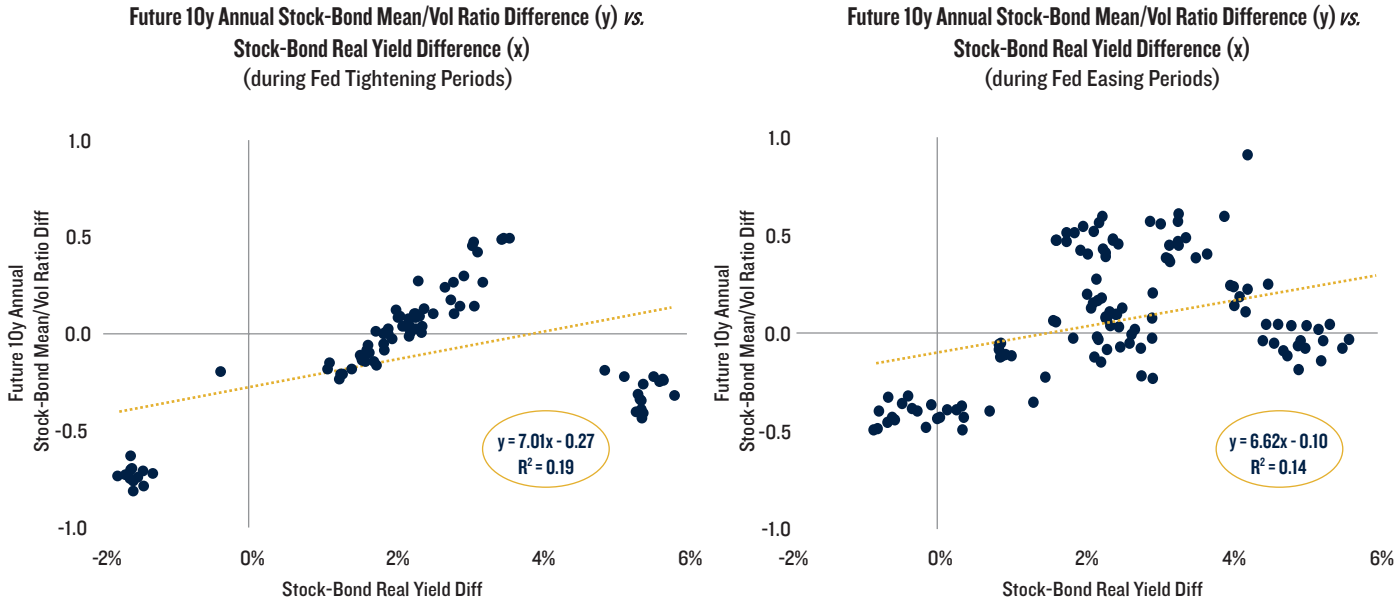
**Figure A2: Future 1y Stock-Bond Mean/Vol Ratio Difference (since 1973 or 1999); 1/1973 – 10/2022**



Same note and sources as for Figure 4. Provided for illustrative purposes only.



**Figure A3: Future 10y Stock-Bond Mean/Vol Ratio Difference (during Fed Tightening or Easing Periods); 1/1973 – 10/2013**



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