Risk of loss: Should investors shift from bonds because of the prospect of rising rates?

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Executive summary. Many investors, whether individual or institutional, hold a diversified bond portfolio primarily to mitigate the volatility inherent in stocks or other risky assets.[1] However, with yields presently at or near historic lows, more investors view the bond market as abnormally risky. Indeed, the preponderance of thought is that if and when interest rates rise, the fixed income portion of an investor's aggregate portfolio may face volatility and loss. Coincidentally, the phrase "bond bubble" is gaining currency.

Given many investors' concerns, we offer some perspective on the prospective risk of higher interest rates to a broadly diversified bond portfolio.[2] First, we dissect the math of nominal bond returns during and after a hypothetical rise in interest rates. We then compare this risk with

Authors
Christopher B. Philips, CFA
Francis M. Kinniry Jr., CFA
David J. Walker, CFA

1 We recognize that investors may also hold bonds for the income they produce as part of a portfolio spending plan. However, for this discussion, we elected to focus on the diversified total return investor.

2 For this discussion, when we refer to "bonds," we are only concerned with a broadly diversified, high-quality bond portfolio. Portfolios focused on corporate bonds (including high-yield bonds) or laddered portfolios of individual bonds can face additional risks, such as credit risk (widening spreads and/or default) for corporate bonds, or liquidity and concentration risk for smaller laddered portfolios. For a more detailed discussion on the role of individual bonds versus bond funds, see Bennyhoff (2009) and Donaldson (2009).

the risks inherent in the stock market. We move on to evaluate the past experiences of investors in U.S. bonds in different interest rate scenarios. Finally, we take a global perspective by examining the experience of foreign investors in nine countries. Ultimately, we find that most bond investors are likely best served by maintaining their strategic allocation to fixed income and that significant changes may not leave them substantially better off. Indeed, despite a potential or even likely rise in interest rates, investors should continue to view bonds as a diversifier for the riskier assets in their portfolio.

Math drives bond returns

Bonds are unique compared with other investments such as equities in that a given return stream is well defined due to the highly certain income stream. As a result of this dependence on income, bonds are uniquely affected by movements in interest rates. Rising rates lead to higher yields and lower prices (i.e., capital losses) and vice versa. The sensitivity of a bond's price to changes in interest rates is measured by duration, a concept explored by Bennyhoff and Zilbering (2010).

Because duration is the common metric for evaluating risk between two comparable fixed income investments, we often generalize the relationship between "interest rate movements" and performance. The rule of thumb is that if interest rates increase 1 percentage point (100 basis points), a bond's (or fund's) value will drop by approximately the bond's (or the fund's weighted average) duration. Of course, this formula presumes an instantaneous, parallel shift in the yield curve, an assumption that is extremely rare historically (Davis et al., 2010). This is because the factors driving increases in near-term rates (monetary policy set forth by the Federal Reserve) and long-term rates (inflation expectations) are quite different. However, for ease of presentation, we presume a parallel shift in yields. In addition, we assume that all income received is reinvested.

As of July 1, 2010, the yield on the Barclays Capital U.S. Aggregate Bond Index stood at 2.9%, with a weighted average duration of 4.6 years. In the most simplistic of examples, a 1 percentage point rise in yields during a 12-month period would lead to a new yield of 3.9% and a capital loss of –4.6%. All else being equal, the expected total return during that

Notes on risk: Investments are subject to risk. Past performance is no guarantee of future returns. Investments in bonds are subject to interest rate, credit, and inflation risk.

While U.S. Treasury or government agency securities provide substantial protection against credit risk, they do not protect investors against price changes due to changing interest rates. Unlike stocks and bonds, U.S. Treasury bills are guaranteed as to the timely payment of principal and interest.

The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

There are additional risks when investing outside the United States, including the possibility that returns will be hurt by a decline in the value of foreign currencies or by unfavorable developments in a particular country or region.

Figure 1. Hypothetical example of the impact of an increase in interest rates

	Today	+1 year	+2 years	+3 years	+4 years	+5 years
Yield (%)	2.9	6.9	6.9	6.9	6.9	6.9
Price change (%)	0.0	–18.4	0.0	0.0	0.0	0.0
Total return (%)	2.9	–13.5	6.9	6.9	6.9	6.9
Cumulative total return (%)		–13.5	–7.5	–1.2	5.7	13.0
Annualized total return (%)		–13.5	–3.8	–0.4	1.4	2.5

Note: **This hypothetical example does not represent the return on any particular investment.** Yields are as of July 1, 2010, for the Barclays Capital U.S. Aggregate Bond Index. For simplicity, duration is assumed to remain at 4.6 years, although in practice, as yields change, duration will also change. Importantly, the dramatic change in yields that we assume in this example would likely constitute a very significant adjustment to the fund's weighted average duration. We assume no changes to yields in subsequent years purely for illustrative purposes.

Source: Vanguard.

period would be the average of the starting and ending yields—3.4% plus the capital loss associated with the rising yields (–4.6%) or –1.2%. And the good news is that, all else being equal, following the 1 percentage point rise in rates, the initial expected return for year 2 is 3.9%, instead of 2.9%.

But what happens if interest rates unexpectedly rise by a significant amount, say 4 percentage points across the yield curve? Such a move has happened only twice in the United States, once in 1980 and again in 1981, as the Federal Reserve drove interest rates higher in an effort to combat high inflation. But in relative terms, if interest rates jumped from 2.9% to 6.9%, that rise would constitute a 140% change in rates—a change that has never occurred in the United States, and one that would be truly significant. **Figure 1** demonstrates the hypothetical impact of a 400-basis-point increase in interest rates on an investment linked to the broad U.S. bond market. As expected, in year 1, the price decline is significant, leading to the potentially worst 12-month return ever for U.S. bond investors (historically, the actual worst 12-month return for the Barclay's Capital U.S. Aggregate Bond Index was –9.2% during the 12 months ended March 31, 1980).

For a total return investor, the new yield level starting in year 2 is of perhaps greater importance. Following the initial year of pain, that same investor would expect a 6.9% return going forward, all else being equal. And two years following the hypothetically worst bond market return ever, the diversified bond investor would be close to breaking even, simply by reinvesting interest distributions.

The need to put a "bond bear market" in context

When evaluating the potential risks in the bond market, it is critical to remember exactly why bonds are an integral part of a well-thought-out asset allocation plan—*to diversify the risk inherent in the equity markets*. Simply put, while the fear of rising interest rates may be legitimate, a potential bear market in bonds is dramatically different from a bear market in stocks (or other risky assets). In fact, unlike stocks, where the common definition of a bear market is a 20% decline in prices, to most investors a bear market in bonds is simply a period of negative returns. And to date, the broad U.S. bond market has never experienced a –20% return. Indeed, it's the magnitude of returns that is the key differentiator

between bad periods for bonds versus stocks. For example, the worst 12-month return for U.S. bonds since 1926 was –9.2%, while the worst 12-month return for U.S. stocks was –67.6% (12 months ended June 1932).[3] In another example, the worst calendar year for the broad bond market was 1994, when due to an unexpected upward shift in interest rates, the bond market returned –2.9% (in 1995, the bond market returned 18.5%). Contrast this to the experience of stock investors in 2008, when the Standard & Poor's 500 Index lost more than –2.9% in 27 individual trading *days*.

In addition to the magnitude differences, another challenge for stock investors is that, unlike bonds, where a decline in prices leads to higher (nominal) yields, as we saw in Figure 1, there is not as direct a relationship for stocks. This is because the yields and valuations in the stock market are driven by earnings as well as prices. In other words, there are two metrics at work instead of one. In short, price declines do not automatically imply that earnings cannot decline as well, leading to valuations during or after a bear market that may not improve, as witnessed during the previous two bear markets.[4] Of course, as we will show in **Figure 2**, when accounting for inflation, real returns going forward may not be as attractive if inflation increases more than interest rates, as happened in the United States during the late 1970s and early 1980s.

A historical perspective: the global experience

While Figure 1 shows a simplified example of the impact of rising rates, perhaps it is more useful to examine the actual history of U.S. interest rates and the returns of bond, stock, and balanced investments during and after a period of significantly rising rates. To do this, we first evaluate both near-term rates (defined by year-over-year changes in the yield on the 3-month Treasury bill), and longer-term rates (defined

Mitigating bond risk by moving into cash

We recognize that bond investors, facing the prospect of rising rates, are naturally inclined to either shorten duration or move into cash. There are several potential concerns with such a strategy. Davis et al. (2010) note the risks inherent in such a strategy if the yield curve experiences a "bear flattening," meaning short-term rates rise, while longer-term rates remain anchored. In addition, investors who shift from bonds to cash will realize an opportunity cost in the form of lower yield while they wait for the anticipated rise in rates. The longer the wait, the greater the yield give-up.

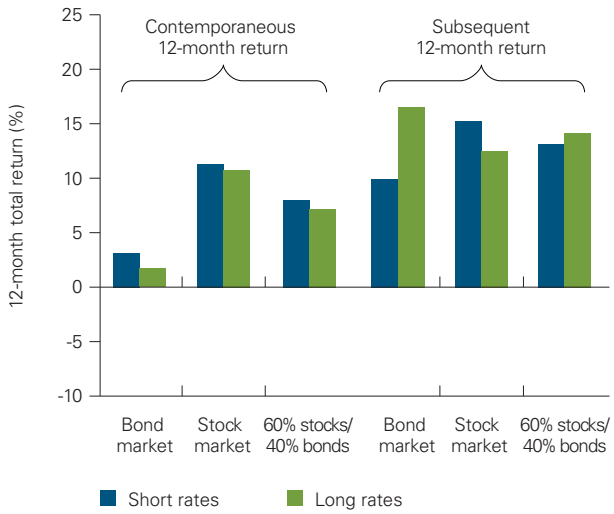
Finally, because cash has historically offered a meager real return, investors using such a strategy would then need to correctly time their exit. This is because, historically, cash investments have tended to underperform both stocks and bonds following a given rise in interest rates in both nominal and real returns. For example, replicating Figure 2 using the returns for the Citigroup 3-Month Treasury Bill Index, we found that cash investments registered an average nominal return of 12.1% (5.3% average real return) compared with Treasury bonds' average nominal return of 16.6% (9.9% average real return) and equities' average nominal return of 12.5% (5.8% average real return) during the 12 months following a 200-basis-point increase in long-term interest rates. For changes in short-term rates, there was only a marginal difference between the returns of cash and bond investments, while stocks outperformed significantly.

3 For U.S. stock market returns, we use the Standard & Poor's 90 Index from 1926 to March 3, 1957; the Standard & Poor's 500 Index from March 4, 1957, to 1974; the Wilshire 5000 Index from 1975 to April 22, 2005; and the MSCI US Broad Market Index thereafter. For U.S. bond market returns, we use the Standard & Poor's High Grade Corporate Index from 1926 to 1968; the Citigroup High Grade Index from 1969 to 1972; the Lehman Brothers U.S. Long Credit Aa Index from 1973 to 1975; and the Barclays Capital U.S. Aggregate Bond Index thereafter.

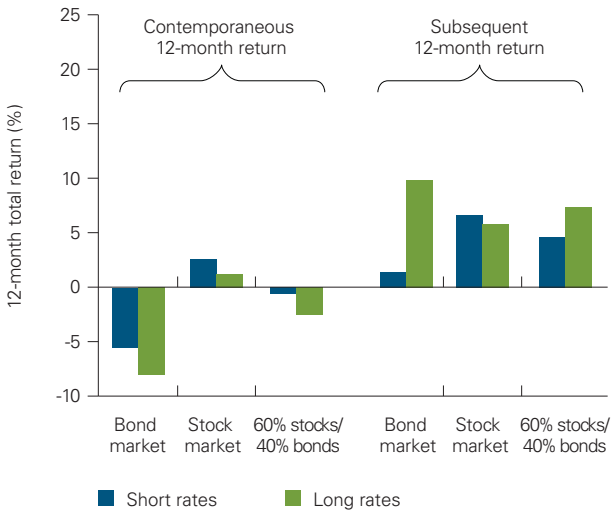
4 For example, the bear market from March 2000 through September 2002 saw the P/E ratio of the S&P 500 Index actually increase at the end of 2001 before finally falling to levels below the market peak. And more recently, over the course of the October 2007 through February 2009 bear market, earnings and prices each declined a similar amount, resulting in valuations that remained stable throughout much of the bear market.

Figure 2. Average returns to bond, stock, and balanced investors in the United States during and after periods when yields increase at least 200 basis points

2a: Nominal returns



2b: Real returns



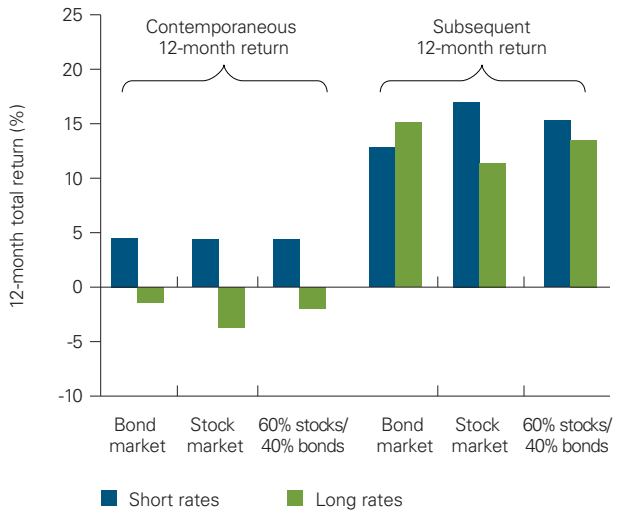
Source: Vanguard, using data provided by Thompson Reuters Datastream. To represent short rates, we use the middle rate of the 3-month Treasury-bill traded on the secondary market from 1970 through 1981. For the period since 1981, we use the 90-day constant maturity Treasury bill. To represent long rates, we use the 20-year constant maturity Treasury bill. Inflation is represented by the Consumer Price Index. Bond market returns are represented by the Barclays Capital U.S. Treasury Index starting in 1973. Stock market returns are represented by the MSCI USA Index starting in 1970. The balanced portfolio covers only the periods where returns for both stocks and bonds are available—1973–April 2010. The returns here represent the average return across all periods that saw a 200-basis-point rise in yields. As with any average, some periods saw higher returns and some saw lower returns. For example, returns for the balanced portfolio during periods where short-term rates increased ranged from –0.46% (10th percentile) to 15.72% (90th percentile).

by year-over-year changes in the yield on the 20-year constant maturity Treasury bond). We then sort all 12-month periods by the magnitude of the change and calculate the return to bond, stock, and balanced fund investors (60% stocks and 40% bonds) for the same 12-month period as the rate change, as well as the 12-month period following the rate change.

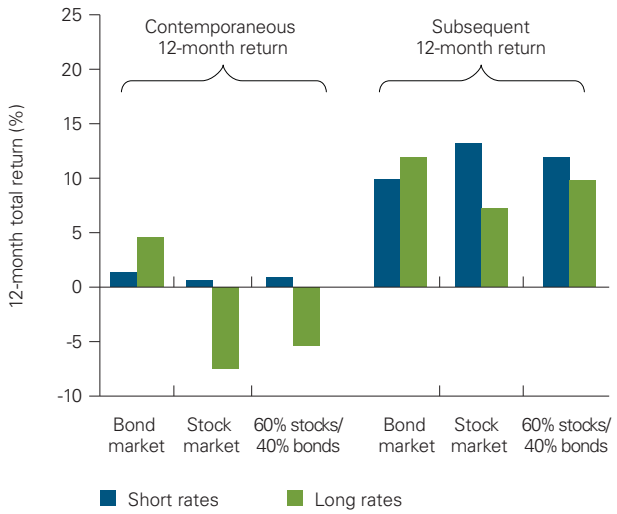
The results are presented in Figure 2. Immediately noticeable is that, in nominal terms, during periods where either short or long rates were rising significantly (greater than 200 basis points during 12 months), bond investors still realized positive returns. Interestingly, stock investors, on average, realized returns not significantly different from the long-term average return generally associated with stocks (9%–10%). As expected, balanced investors benefited from the diversification of asset class risks. Of course, it is notable that the majority of periods in the United States that have seen rapidly rising rates have also witnessed high or increasing inflation. As expected, after adjustment for inflation, the results are markedly different. However, even after accounting for inflation, returns for the 12 months following the rate increase were positive, particularly when long-term rates rise. And by diversifying asset class exposure, balanced investors not only weathered the rising rate environment, in both nominal and real terms, but also enjoyed significantly positive returns following the event. If history offers any lesson, it's that a reasonable

Figure 3. Average returns to bond, stock, and balanced investors in non-U.S. markets during and after periods when respective yields increase at least 200 basis points

3a: Nominal returns



3b: Real returns



Source: Vanguard, using data provided by Thompson Reuters Datastream. The following data series were used: Australia short rates: Dealer Bill 180-Day middle rate; France short rates: Interbank 3-month offer rate (October 1987–December 1988) and 3-month Treasury bill since January 1989; Germany short rates: Overnight bank rate (January 1970–December 1985) and Interbank 3-month offer rate since January 1986; Italy short rates: Euro-Lira 3-Month Bank Rate (June 1978–December 1987) and 3-Month T-Bill Auction Rate since January 1988; Japan short rates: Basic discount and loan rate (January 1970–April 1991) and Average 3-month time deposit since May 1991; Norway short rates: Interbank 3-month offer rate (January 1986–December 2002) and 3-month Treasury bill since January 2003; Spain short rates: Interbank 3-month offer rate (December 1991–July 2007) and 1–3-month Treasury bill since August 2007; Sweden short rates: 3-month Treasury bill since April 1989; U.K. short rates: Interbank 3-month offer rate (January 1975–December 1984) and 3-month Treasury bill since January 1985. Australia long rates: AU Commonwealth 10-year government bond yield since January 1970; France long rates: government guaranteed bond yield since January 1970; Germany long rates: Long-term government bond yield (9 year–10 year) since January 1970; Italy long rates: government bond gross yield since January 1970; Japan long rates: Interest bearing 10-year government bond yield since January 1970; Norway long rates: Benchmark 10-year government bond since January 1985; Spain long rates: central government 10-year bond since August 1987; Sweden long rates: 10-year government bond yield since January 1970; U.K. long rates: gross redemption yields on 20-year Gilts since January 1970. Inflation rates are represented by respective consumer price indexes. Bond market returns provided by Citigroup World Government Bond Indexes. Local indexes start on January 1985 for Australia, France, Germany, Italy, Japan, and the United Kingdom. Norway starts on January 1995; Spain and Sweden start on January 1991. Indexes represent total returns denominated in local currency. Equity market returns provided by MSCI All Country World Indexes. Local indexes start on January 1970 for all countries represented. Indexes represent total returns denominated in local currency. Returns shown represent only common periods for both equity and bond indexes.

investment strategy should not be abandoned in the face of a potential bond bear market even if that market is driven by significant inflationary pressures.[5]

Of course, while inflation is one potential driver of future rate increases, we know from the experiences of other countries that there are other possible drivers as well. These could include government budget problems, exogenous market influences, or any number of systemic shocks to a country's bond market. Since the United States has not explicitly experienced a significant fiscal or economic crisis since 1973 that has led to higher interest rates (outside of the inflationary regime of the late 1970s and early 1980s), we expanded our view to encompass nine foreign countries. We looked at

5 It's important to note here that these results assume perfect investor behavior (i.e., not selling as rates moved upward) and, in the case of the 12 months following the rise, perfect timing to capture the returns immediately following a 200-basis-point rise in rates. Because correct market timing is notoriously difficult to achieve, these examples are meant to illustrate the benefits of remaining true to one's long-term strategic allocation between stocks and bonds and not to demonstrate the potential value of selling bonds to avoid the rate increase or buying bonds to benefit from the higher subsequent yields simply because we do not in any way demonstrate the risks inherent to timing interest rate movements. For more on the successes and failures of actively managed bond funds, see Philips (2010).

Australia, France, Germany, Italy, Japan, Norway, Spain, Sweden, and the United Kingdom, using the same methodology as in the United States.

The results for these countries are in **Figure 3**. By expanding the analysis to multiple countries, we have also expanded the range of interest rate scenarios, from primarily inflation driven in the United States to include the Japanese deflationary environment, the fiscal crises of Norway and Sweden in the 1990s, as well as the respective fiscal and economic environments across the Eurozone. It's also important to point out that we are not evaluating a portfolio spanning all nine countries. Instead, we evaluate the experience in each separate country and then take the average return across each country. In this way, we obtain a result comparable with that of the U.S. investor.

In Figure 3, we again looked at both nominal and real returns because inflation remains an important component of investment returns in any country or asset class. While the aggregate results are similar to that of the United States, there are some interesting differences. First, real returns for bond investors are positive during and after the rising rate cycle, indicating that, in all likelihood, the core driver of higher rates was not inflation. Second, equity investors across countries were more likely to experience negative returns during the rising rate environment than U.S. investors. This disparity between bond and equity returns potentially indicates other systemic drivers, such as a banking crisis or some other jolt outside of inflationary shocks, that would hinder equity investors. Of course, despite these differences during the period of rising rates, the performance for non-U.S. bond, stock, and balanced investors was quite positive in both nominal and real terms in the periods following the increase in rates. The message is clear: A reasonable investment strategy should not be abandoned in the face of a potential bond bear market, whether driven by inflation or some other market force.

Conclusion

The implications of this case study are clear: 1) A majority of diversified, long-term investors should not view a bond bear market with the same level of apprehension as an equity bear market. Indeed, even the worst bond market historically saw less than one-sixth of the losses of the worst equity market; 2) Should a bond bear market occur, investors can somewhat offset price declines with higher nominal yields and potentially higher subsequent nominal returns; and 3) the historical experience of global markets supports a policy of reasonable asset allocation within a solid investment plan. Indeed, in most historical global scenarios, a balanced, diversified investor not only withstood the 12-month period of rapidly rising rates, but also realized significantly positive returns in the subsequent months. Overall, investors should consider the experiences of the past, and the fact that, more often than not, balanced, diversified portfolios have generally performed as they would be expected to, in diverse market scenarios.

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P.O. Box 2600
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