



Forecasting Bond Returns and Evaluating Bond Funds

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Can we predict the performance of bond funds? This question needs to be separated into two questions: Can we predict the bond market? Can we predict the alpha, or return above (or below) the bond market's return, of bond managers?¹

The bond market is a poor bet going forward. Some managers, however, will earn returns above and below the market return, and it's valuable to know whether one can select winning managers in the fixed-income asset class.

While past performance is not a guarantee of future alpha, it sure is a hint – the skills needed to generate alpha in a given market are likely to be as valuable in one period as in another. This principle is the basis of selecting active managers. How can we adapt it to bond funds, given the larger market forces at work?

My use of the terms “alpha” and “beta,” which were originally applied to equities, deserves some explanation in the context of the bond market. The returns on any portfolio, in any asset class, can be separated into a beta component – the part due to exposure to market movements – and alpha, the part due to individual manager decisions. In the bond market, the beta component is the return due to the general trend of interest rate. The alpha part is the remainder (positive or negative) of the fund's return — that is, the part not explained by overall interest-rate movements. Alpha-beta separation is the key to analyzing past performance and predicting future performance in bond funds, just as it is in equities and other asset categories.

Forecasting the bond market is a mystery within a riddle within an enigma, as Winston Churchill described Russia. Stocks are real assets and pay off in proportion to the production and profitability of companies, which can be studied with fundamental analysis. Government bonds, however, pay off in currency, which, in a fiat-money system, is worth what the sovereign issuer wants it to be worth.

This recursive function is difficult to analyze. A government is constrained in its behavior by the need to maintain good enough credit (in real terms) that it can continue to issue bonds into the far future at a reasonable interest cost. Yet if that were a serious restraint, the bond market would not have experienced the massive fluctuations that we are about to

¹ The alpha in the capital asset pricing model or market model is not just the difference between the portfolio's return and the market's return; it is also adjusted for the beta (market-related risk) of the portfolio.



review. Bond investors have to be good judges of the tension between the issuer's need to maintain good credit and its desire to pay bondholders in cheapened currency.

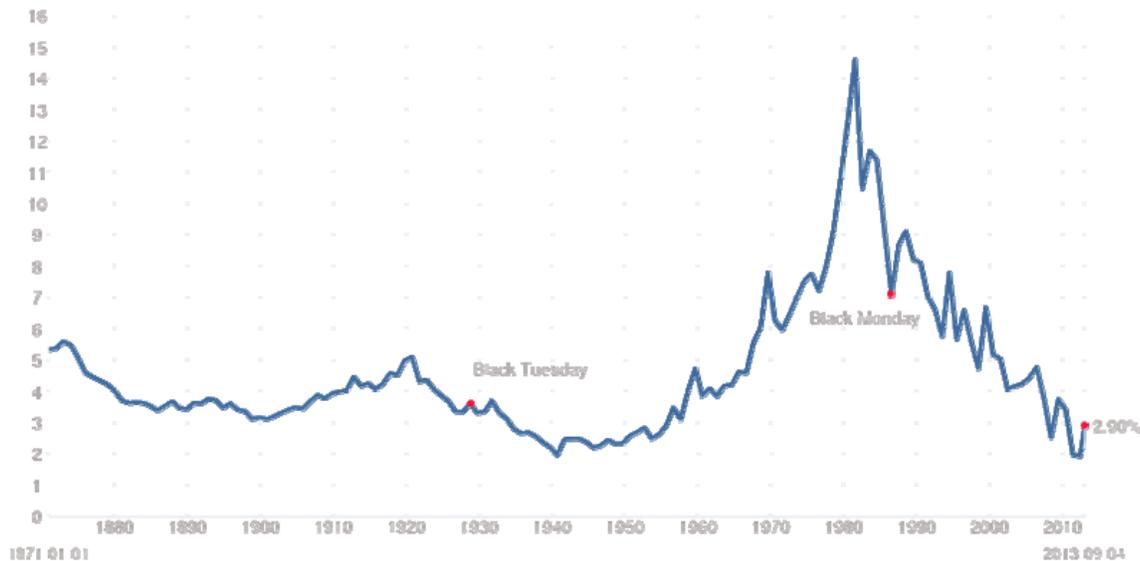
Forecasting manager alpha is another matter. I believe that manager skill exists, yet alphas tend to be low while active risk (the variability of alpha) is very high. This fact makes manager alphas hard to forecast. In this essay, I identify the general types of manager decisions that determine fund performance relative to the market benchmark. The companion to this essay, forthcoming later in 2013, discusses alpha forecasting in greater detail. But first, let's look at the long-term forces that have driven the overall direction of interest rates and the bond market in the past – and those that are likely to govern rate movements in the future.

Up and down the bond mountain

Many of today's market participants don't know much about the history of bonds and interest rates. They know that interest rates were higher in the recent past. They may vaguely remember that interest rates were once very high, and a few older investors may even know that before interest rates were very high, they were low. To remedy this sketchy knowledge, let's take a detailed look at the history of bonds and interest rates.

Figure 1 shows the "bond mountain," the tremendous increase in yields between the mid-1960s and the 1981 peak, followed by the equally large decrease from 1981 to 2012. Since 2012, yields have been rising.

Figure 1
Long-term U.S. Treasury bond yields from 1871 to 2013



Source: U.S. Treasury and Robert J. Shiller. Accessed at <http://www.multpl.com> on September 4, 2013.

Since bond prices (and, consequently, returns) move the opposite direction from interest rates, the climb up the bond mountain represented a massive bear market. Much of U.S. bondholders' and savers' wealth was destroyed, at least in real (inflation-adjusted) terms. The bond bull market that began in 1981 provided very robust returns to a new generation of investors.

I believe, as do many bond market participants, that the bull market is over. Yields will continue to rise, and bond funds will do poorly. Funds that have long durations will underperform those with shorter durations.

Figure 2 shows how changes in bond yields affected the performance of bond portfolios. Annual total returns and price returns, in both nominal and real terms, are shown over two time periods for a hypothetical long-term U.S. Treasury bond portfolio.² The first sub-period covers 1976-1985, surrounding the peak of the bond mountain, and the second period covers 2008-2013, surrounding the more recent valley. (The 2013 data are through August.)

² The price return, sometimes called return in excess of yield, is calculated as the total return for a year minus the bond's yield to maturity at the beginning of the year. It represents the "surprise" or unexpected component of return, which comes from changes in interest rates. This is roughly equivalent to the price return or capital gain in a stock index.



Note how sharp the annual moves are – in the 1977-1986 period, they were often larger than moves in the stock market. Also, note the big differences, in times of high inflation and high yields, between the total nominal returns and the real price returns. Finally, observe the size of the cumulative losses in real terms over 1977-1981. Now that's wealth destruction.

Figure 2
Year-by-year long-term U.S. Treasury total and price returns, in nominal and real terms, 1976-1985 and 2004-2013³

Bond yield "peak" (return "valley")

Year	Nominal		Real		End-of-year yield
	Total return	Price return	Total return	Price return	
1977	-0.69	-7.86	-7.46	-14.63	8.03
1978	-1.18	-9.05	-10.20	-18.08	8.98
1979	-1.23	-9.84	-14.54	-23.15	10.12
1980	-3.95	-14.00	-16.34	-26.40	11.99
1981	1.86	-10.33	-7.08	-19.27	13.34
1982	40.36	23.95	36.49	20.08	10.95
1983	0.65	-9.82	-3.14	-13.62	11.97
1984	15.48	2.32	11.52	-1.63	11.70
1985	30.97	17.84	27.20	14.07	9.56
1986	24.53	14.99	23.40	13.86	7.89

Bond yield "valley" (return "peak")

Year	Nominal		Real		End-of-year yield
	Total return	Price return	Total return	Price return	
2008	25.87	20.50	25.76	20.39	3.03
2009	-14.90	-18.25	-17.16	-20.51	4.58
2010	10.14	5.89	8.52	4.27	4.14
2011	28.23	23.74	24.54	20.05	2.48
2012	3.31	0.88	1.54	-0.89	2.41
2013*	-10.22	na	-10.78	na	3.56

Monetary and fiscal background

³ Source: Ibbotson Associates 2013 Classic Yearbook, used by permission. Bond returns for 2013 are for the Barclays US Aggregate Government – Treasury Long, inflation for 2013 is from the Bureau of Labor Statistics, and the August 2013 yield is from Figure 3 of this article (20-year bond).



Why did bonds climb and then descend a mountain? Bond yields were stable from the end of the Civil War to 1965, with the exception of the two World War periods. During the wars, yields rose sharply to reflect massive bond issuance and wartime inflation, then quickly fell back to prewar levels. The monetary stability of this long period was associated first with the gold standard and then with a series of hard-money Federal Reserve chairmen. The gold standard was abandoned in gradual steps between 1913 (the founding of the Fed) and 1971 (the closing of the gold window), but most Fed chairmen before the mid-1960s followed a policy of maintaining the same degree of price stability as prevailed when the gold standard was in force.⁴

The bear went over the mountain

Bond yields began to rise at an accelerating rate in the mid-1960s because inflation was increasing. Bonds are priced by investors to provide a positive real yield plus compensation for whatever inflation is expected over the life of the bond. If inflation expectations rise, so do interest rates – causing the prices of existing bonds to fall. (The current real yield is negative, but that will change.)

Why was inflation increasing? Monetary economists generally blame the desire of the Federal Reserve to accommodate Presidents Johnson and Nixon's desire for easy money during their reelection campaigns. At the same time, there was fiscal pressure from simultaneous spending on the Vietnam War and the so-called war on poverty. The government also received a more subtle benefit from inflation: It could pay back its debt, including remaining World War II debt, with much cheaper dollars. I will return to this theme when I outline the future prospects for bonds.

Bonds continued their climb up the mountain until September 1981, when the yield on the 10-year U.S. Treasury issue reached the stunning level of 15.32%. The wealth destruction suffered by savers was spectacular. A dollar invested in Ibbotson Associates' hypothetical long-term bond portfolio in 1941 (when interest rates reached their lowest point until the current decade) shrank to \$0.33 in real terms, with coupon income included, by September 1981. So much for long-term investing always being fruitful.

⁴ A gold standard produces price stability because, if the money supply is defined as the gold supply, it cannot be expanded very quickly. It takes time and effort to find more gold and dig it out of the ground (only to rebury it somewhere else). A gold standard suffers from the flaw that it is very inflexible, so monetary authorities cannot easily respond to emergencies such as a war or depression. No country in the world uses a gold standard today.



The great bond bull market

By 1979, the American saver-investor had had enough. The broader economy was suffering terribly from high interest rates, which were driving many long-established small businesses into bankruptcy and putting people out of work. The sense of dejection was so intense that Jimmy Carter's July 15, 1979, speech became known as the [Malaise Speech](#), although he did not use the word.

Shortly thereafter, Carter appointed Paul Volcker, a strong monetarist, to the chairmanship of the Federal Reserve. Volcker raised short-term interest rates to unprecedented levels, above 20%, and pursued other hard-money policies. The election of Ronald Reagan further energized Volcker, who strongly supported his monetarist approach. While Volcker's actions precipitated two sharp recessions in three years, inflation fell from more than 13% to a historically comfortable level of 4%, and confidence returned to the U.S. economy. By 1984, the inflation and interest rate crisis was over.

Would investors, fearful of another inflation episode, price bonds to include a large yield premium in the ensuing decades to cover that risk? At first they did. Inflation fell very fast, and nominal interest rates fell more slowly, leaving real interest rates (that is, nominal interest rates minus inflation) at historic highs. As the late 1980s, 1990s and new millennium unfolded, however, interest rates continued to fall, reaching an all-time low of 1.53% on the 10-year note in July 2012.

This fall in yields produced tremendous gains for bondholders — the longer the duration of the bond portfolio, the bigger the gain. A dollar invested in the hypothetical Ibbotson Associates long-term bond portfolio at the yield peak in September 1981 grew, in real terms, to \$11.54 by July 2012 – an astonishing compound annual real return of 8.16%. In riskless bonds, no less. This exceeded even the real return on the S&P 500, which was 8% compounded annually over the same period.

Most savers do not roll over a portfolio of long bonds in this way. They hold a portfolio that is diversified across maturities, so their returns are moderated: they're higher in a bear market and lower in a bull market. However, some investors, particularly pension funds, do invest principally in long-term bonds. Some observers argue that savers should structure their portfolios more like pension fund managers do, matching liabilities with assets based on the duration of each.⁵

⁵ See, for example, Sexauer, Stephen C., and Laurence B. Siegel, "A Pension Promise to Oneself," *Financial Analysts Journal*, November/December 2013. Most of the "LDI for individuals" crowd would agree that real interest rates are currently too low for individual investors to lock in, even if liability-driven investing is a good general principle.



The future for bonds: The bull market is over

No one can predict the future – I would have guessed that interest rates would bottom at a much higher level. But mean reversion is a powerful force, and it is foolish to ignore history. We can see from Figure 1 that a “normal” level of interest rates, taking a very long historical view, is approximately 4%. Even if interest rates on 10-year bonds rose only to 4% from their current level around 2.9%, that move would represent a 9% capital loss (beyond the loss already experienced since July 2012). But interest rates are likely to move well beyond the 4% level.

Why? There are only two ways for a government to repay domestic creditors less in real terms than it borrowed from them: default and inflation.⁶ The U.S. Treasury is not going to default. So it will pursue policies that make it possible to pay back the debt in full in nominal terms — but not real terms. We will have renewed inflation. This higher level of inflation will be reflected in higher bond yields and capital losses on existing bond positions. The losses will be larger for longer bond durations. Prudent investors should shorten their durations, and very risk-averse investors should move to durations near zero.

Bond investing near the zero-interest-rate lower bound is a one-sided proposition. If you protect against rising rates by going to a zero duration, you’ve lost 3% or 4% in annual yield, but you haven’t sacrificed any meaningful possibility of a gain beyond that – interest rates can’t go much lower. However, if you don’t protect against rising rates, you’re exposed to the fluctuations of a long-term bond portfolio, which historically has suffered a one-year real price return as poor as -26.4% (in 1980). While this last data point is a worst-case scenario, and I don’t expect it to repeat, it provides a guidepost as to how bad long-term bond returns can get.

The choice inherent in a bond duration decision at current low interest rates can be expressed in a different, more vivid way. Matthew Kenigsberg of Fidelity Investments studied inflation and tax hedging strategies over the last 70 or so years. He [concluded](#) that investors who hedged against inflation by buying real assets but who were wrong (because inflation did not occur), experienced disappointing returns – they received returns on real assets that were lower than the returns on nominal assets. But investors who did not hedge against inflation and who were wrong (because inflation did occur) experienced catastrophic returns. At any reasonable spending rate, even as little as 3% of their nest egg per year, they were wiped out over a 30-year time horizon.

⁶ I added “domestic creditors” because, if all creditors are foreign, the debt can be repaid more cheaply through currency devaluation. Devaluation is usually inflationary, but not always.



So, if you don't know the direction of inflation, it's better to hedge.⁷

From bond market to bond portfolio

Now that we have an operative forecast of the bond market – rising yields as well as rising inflation – let's think about how a manager might incorporate the forecast into bond portfolio construction.

A portfolio manager, in any asset class, assesses alternatives and contemplates tradeoffs. He or she could shorten the portfolio's duration to protect against rising rates, but that action has a cost (specifically an "opportunity cost"): You don't get the higher current yield on the longer bond. Thus, if the asset class is (for now) government bonds and we can ignore credit risk, the tradeoff is between higher current yield but more price risk on longer-duration bonds, versus lower current yield but less price risk on shorter-duration bonds. The slope of the yield curve reveals the rate at which the tradeoff proceeds:

Figure 3
Current yield curve (September 2013) vs. typical yield curve

Current (9/4/13):

Maturity	1 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
Yield	0.02	0.02	0.05	0.14	0.46	0.89	1.74	2.36	2.90	3.56	3.80

Typical (average over 1985-2013)⁸

Maturity	1 Mo	3 Mo	6 Mo	1 Yr	2 Yr	3 Yr	5 Yr	7 Yr	10 Yr	20 Yr	30 Yr
Yield	3.71	na	na	4.21	4.48	4.71	5.09	5.40	5.73	6.13	6.13

At present, the 30-year Treasury bond has a yield of 3.8%, compared with a yield of 0.02% on a 30-day Treasury bill. This is a steep yield curve, mostly likely reflecting expectations of rising interest rates.⁹ Historically, the yield curve has been about half as steep, with long

⁷ Investors who either hedged or did not hedge and who were right had very good returns. (These are investors who hedged against an inflation that later did occur, and investors who did not hedge against inflation but the inflation that was feared did not occur.) Kenigsberg's analysis also includes taxes, which we do not consider here. His work was presented at the Chicago Quantitative Alliance Sept. 11, 2013.

⁸ Source: 1-30 years, U.S. Federal Reserve, <http://www.federalreserve.gov/pubs/feds/2006/>, average of daily yields from Nov. 25, 1985, to Sept. 17, 2013; 1 month: Ibbotson Associates, average of monthly returns from December 1985 to December 2012, with 2013 monthly updates through August from Barclays US Treasury Bills index.

⁹ A yield curve can be mathematically decomposed into forward rates, which give an estimate of the interest rates that investors today expect to occur in the future. The expected 10-year interest rate ten years from now, $f_{10,20}$ — that is, the interest rate for a bond to be purchased in 10 years that matures in 20



bonds out-yielding short-term bills by a little more than two percentage points, as Figure 3 shows.

Let's examine the tradeoffs among various points on the curve. Is it worth giving up nearly four percentage points of yield per year – the difference between the shortest and the longest yield from the first part of Figure 3 – in order to protect fully (by having a zero duration) against rising rates? Let's calculate the amount by which the long bond yield would have to rise, in one year, to wipe out the nearly 4% advantage:

Opportunity cost: 3.8% - 0.02%	3.78%
Starting yield on 30-year bond:	3.80%
Starting price of 30-year bond:	\$100
Price of 30-year bond that would just offset the opportunity cost: \$100 - \$3.78 =	\$96.22
Yield on 30-year bond that would produce a price of \$96.22:	4.02%
Change in yield:	+0.22%

That's not a very big rise in rates. There is a lot of risk in the long bond.

My rising-rate forecast, translated to a rate rise of 0.5% per year for five years, makes it attractive to shorten the duration from a starting point of holding only the longest bond.¹⁰ But shorten it how much? As with any tradeoff, you only want to go so far and no farther. Most of the steepness in the yield curve is between the 3-year and 10-year bond, and since 10-year bonds are much less risky than 30-year bonds, there is an optimal duration (longer than 30 days) where the sacrifice of current yield "pays for" the right amount of protection from rising rates. For a given forecast of interest rate increases, it would be foolish to pay more by shortening still further.

Such a portfolio position, taken with an explicit interest rate forecast in mind and resulting in a different duration than the benchmark, is an alpha bet. It is a deviation from the benchmark that is intended to produce alpha if the forecast turns out to be correct, and it will produce a negative alpha if the forecast is wrong. (Interest rates don't have to fall for

years — is given by $[1+f_{10,20}]^{10} = 1.0356^{20}/1.0290^{10}$, which resolves to $f = 4.22\%$. This is considerably higher than the current 10-year rate of 2.90%.

¹⁰ While this is a bearish forecast, it's not way out on a limb. The Congressional Budget Office, which is supposed to use consensus views, "assumes long-term interest rates will rise only gradually to 5.2% in 2018," according to a University of Chicago [working paper](#) whose authors include former Fed governor Frederic Mishkin. Thus, my forecast, which has rates rising by 2.5 percentage points in five years, is essentially identical to that of the CBO, which has rates them rising by 2.3 percentage points over the same period. A really bearish forecast would have rates rising much farther or much faster.



the forecast to be wrong. If interest rates stayed the same, the portfolio would earn a negative alpha relative to its benchmark because of lower coupon income.)

In practice, the benchmark is the Barclays Aggregate, which has a duration of approximately 5.6 years, much shorter than the long-term bond we've been discussing. If that is the case, shortening relative to the benchmark, not relative to the long bond, would be the way to place an alpha bet on rising interest rates.

When the year (or other measurement period) is over, we can look back and separate the achieved return into alpha and beta components as follows:

Figure 4
Analysis of hypothetical bond portfolio's one-year past performance

Actual (total) return	9.00%
Actual starting duration	4 years
Duration of the benchmark	5.6 years
Return of the benchmark, or beta return	10.00%
Return of the benchmark adjusted for duration (beta return): $(4/5.6) \times 10.00\% =$	7.14%
Alpha of portfolio (line 1 minus line 5)	1.86%

In this example, the entire alpha (the difference between the portfolio and benchmark returns) is due to the bet on rising rates (the shorter-than-benchmark duration). In actual bond portfolios, the creation of alpha is much more complicated and may involve a bet on credit — by increasing the weight of corporate bonds in the portfolio relative to the benchmark, for example — as well as duration. There are few more levers to push: bets on yield curve twists (non-parallel shifts in the yield curve, where so far we've assumed only parallel shifts can take place), bets on convexity, bets on illiquidity and bets on specific issuers.

What matters going forward

I conclude with what, for some readers, may be a puzzling comment. At this juncture in history, past performance is probably a negative indicator of future performance for bond funds. Funds outperformed during the bull market by persistently adopting a duration longer than the benchmark, but these funds will underperform as rates rise if they continue to have a longer-than-benchmark duration. If a fund was long in duration because its forecast of falling rates was correct in the past, and the fund is now implementing a current forecast of rising rates by shortening its duration, then it will win in both bull and bear markets.



One cannot know whether a manager has that kind of forecasting skill. One can only make an educated guess, based on what the manager has said and done in the past and on what he or she is saying and doing now.

Companion piece

This article is the first in a series of two. The companion article will flesh out the concepts of alpha and beta for bond portfolios and use them to develop bond-specific tools for portfolio evaluation and manager selection. I will look at popular risk-adjusted return measures and other performance measures and assess their usefulness for selecting winning managers. Most importantly, I will apply the scientific principles of portfolio construction, which acknowledge the limitations of our ability to make forecasts and rely instead on diversification to manage risk, to the task of selecting bond managers.

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