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A Framework for Understanding Bond Portfolio Performance

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Investors are legitimately concerned that interest rates, after falling reliably for decades, on their way up and that bond portfolio values are on their way down. Investors now seek interest-rate protection. Some regard the bond bear market as having already started: The 10-year Treasury yield has risen from an all-time low of 1.4% on July 24, 2012, to a high of 2.98% on Sept. 5, 2013, before settling slightly to 2.88% as of last Friday.

In an earlier article, I recounted the long-term history of the bond market, focusing on the "bond mountain" of 1941-2012 wherein Treasury bond yields rose from 3% to over 15% and then fell back below 2%. Here, I provide a framework for analyzing and, hopefully, predicting the returns on actively managed portfolios of bonds — a task different from analyzing the bond market itself.

Alpha and Beta

One of the basic teachings of modern finance is that the return — on any portfolio in any asset class — consists of a market part (beta) and a non-market part (alpha). The "beta" component is the return that would have been achieved through passive exposure to the underlying asset class — say, the bond market. The non-market or "alpha" part is the rest of the return and is attributable to active management. This analytical framework works well for equity portfolios, which usually have betas quite close to 1 (the beta of the market). For example,

Equity portfolio return:	14%
Market (benchmark) return:	10%
Riskless rate:	0%
Beta of portfolio*:	0.9
Beta component of return:	0.9 x (10% − 0%) = 9%
Alpha of portfolio:	14% − 9% = 5%*

*Beta is calculated from a regression of a time series of market returns, in excess of the riskless rate, on portfolio returns, also in excess of the riskless rate.

In the bond market, however, there is an extra wrinkle. The amount of market exposure — the beta or, using bond-market terminology, the duration of a bond portfolio — can vary widely and depart greatly from the bond market's duration. The choice of duration is up to the portfolio manager. Bonds can have a duration as short as zero as and long as 18 years (based on the longest coupon-paying bond, which has 30 years to maturity). By including leverage or derivatives, the manager can engineer a negative duration, or one beyond 18 years. That's a lot of flexibility for the bond portfolio manager and a lot of choices from which the investor has to select.

Duration is a Type of Beta, But the Scale is Different

So far, I've used "duration" and "beta" interchangeably when referring to the bond market. Some readers may find this confusing. Beta is the general term for the sensitivity of a security or portfolio's value to the change in some variable. In its most common use, beta is the sensitivity of an equity portfolio's value to changes in the value of the overall equity market — and that is the sense in which I used "beta" in the example above. In that context, beta is scaled so that the market has a beta of one, and betas greater than one reflect risk or sensitivity greater than that of the market, while betas less than one are associated with less risk than the market. In the bond market, however, the sensitivity of the bond's price to a change in interest rates is scaled in years and is called *duration.*[1]

While duration and beta measure exactly the same thing — the sensitivity of a security's price to a change in some other variable — the scales are different. A bond portfolio with a duration of 5 years, when the market benchmark (usually the Barclays Aggregate index, or AGG) has a duration of 5.6 years, is very much like an equity portfolio with a beta of 0.9: it is nine-tenths as risky as the market. Readers who train themselves to think of duration and beta as functional equivalents — measures of relative risk — will find bond math and bond portfolio performance evaluation much easier to understand.

Alpha and beta cannot be separated for a bond portfolio as simply as I did for an equity portfolio. We must first consider the question of what we mean by alpha and beta in a bond context.

Should Duration Be Considered Alpha or Beta?

The choice of duration may reflect the manager's desire to appeal to a certain clientele (long-term bonds for pension funds, short-term bonds for conservative savers, etc.). Or, it may reflect the manager's desire to beat the market benchmark by adopting a duration that is shorter or longer than that of the benchmark, given a view that the bond market is going to rise or fall.

Should the manager's duration decision be classified as beta, or as alpha?

The answer is "yes" — but which one depends on the reason that a given duration is chosen by the manager.

[1] The duration of a bond is the present-value-weighted average number of years it takes the bondholder to get his or her money back. Thus, a 30-year bond, bought at par, with a 5% coupon paid semiannually, has a duration of 15.8 years. This is the approximate number of dollars by which a bond with $100 par value will decline in price if the interest rate moves from 5% to 6%. A more accurate estimate is given by the modified duration, *D/[1+YTM/n],* in which D is the unmodified or Macaulay duration defined above, YTM is the yield to maturity and n is the number of coupon payments per year.

Let's clarify. If the manager holds a duration around 4 years because the fund is designed to appeal to conservative investors who prefer intermediate-term rather than long-term bonds, then the fund will beat the AGG, which currently has a duration of 5.6 years, in a bear market (assuming they have the same credit exposure). It will underperform the benchmark in a bull market. In this case, the return from the shorter-than-benchmark duration is a type of beta because the duration bet is an attempt to match the client's preferences, not to beat the benchmark.

Now, let's say the manager holds the same 4-year duration because she is trying to beat the AGG and is currently bearish, but she intends to shift to a longer-than-benchmark duration when she turns bullish, and the fund is designed to appeal to investors who desire a benchmark-like duration on average over time. Then the return from the shorter-than-benchmark duration is alpha. The manager wants to beat the benchmark all the time, not just in a bear market, and her duration bet is an explicit attempt to do that.

Since we don't like ambiguity, and we can't always figure out why a manager chooses a given duration, let's adopt a clearer terminology with three components of return instead of just two:

1. *Pure beta return*: the return from being exposed to the market, given a duration equal to that of the benchmark

2. *Timing return*: the return from having a duration different from that of the market

3. *Selection return*: the actual portfolio return after taking into account (1) and (2), usually attributable to selection of specific securities.

Note that (1) and (2) may be grouped together as beta, making (3) the only "pure" alpha. We could also consider only (1) to be beta and group (2) and (3) together as alpha.

A Manager-Return Forecasting Framework

Let's use this three-part dissection of return to analyze a bond manager's forecast performance.[2] Let's say you think the 10-year Treasury rate will rise by 2.5% in two and a half years, from 2.5% to 5% (an assumption I made in my earlier article, although the starting rate is a little out of date). From that expectation and the duration of the market, which is 5.6 years, one can easily derive the pure beta return:

Price return = yield change × duration × −1 = 2.5% × 5.6 × −1 =	−14.0% or −0.14
Price return stated as an annual rate: (1−0.14)^(1/2.5)–1 =	– 5.86%
+ Income return (annual)	2.50%
Total return stated as an annual rate	–3.36%

[2] The analysis of a hypothetical bond manager's past performance, along the lines of the equity example, is skipped to save space.

Let's say that the manager, who is bearish, plans to have a duration of 4 years instead of the market duration of 5.6. (If she were sufficiently bearish, she could shorten the duration all the way to zero, but that would involve sacrificing the entire yield or income return on the portfolio, since the interest rate on zero-duration assets is currently zero. A duration of 4 reflects the expectation of slowly rising rates but also the importance of earning a significant yield.) The return effect of the manager's duration bet, which we earlier decided to call the timing return, is:

Timing return = yield change × size of duration bet *vs.* benchmark × −1
= 2.5% × −1.6 × −1 = 4.0% = 0.04
Timing return stated as an annual rate: (1+0.04)^(1/2.5)–1 = 1.58%

Finally, from an analysis of the manager's past selection return (and reducing her historical selection-based return component toward zero because successful manager track records deteriorate over time), we expect her to add 1% per year through bond selection over the next two and a half years.

Our expectation for her fund's total return, conditional on interest rates rising 2.5% in two and a half years, is thus: −3.36% + 1.58% + 1% = −0.78%.

Using the Forecasting Framework for Manager Selection

Should we hire this manager? No, assuming we expect a 2.5% rise in yields. We would do better to hold cash and earn nothing.

But, a manager who can earn these very substantial (1%) timing and selection returns is not worthless. We might hire her and hedge the duration of the portfolio, which, while shorter than that of the market, is still substantial (representing a price decline of 4% per 1% rise in interest rates).

Or we could be wrong about the rise in interest rates. If interest rates increase only a little, this particular manager will perform well. If interest rates stay the same or decline, we'd do better with a manager with a longer duration, if that manager also added 1% per year through security selection.

In addition, there are other managers, with other mixes of timing skill and selection skill. The timing and selection returns from each must be counterbalanced against the others. The analysis needed to build an optimal portfolio of bond managers (or to select the single best manager), given an interest rate forecast, is obviously complex — but I have provided the basic tools for such an analysis. Specific recommendations about how to build a fixed-income portfolio out of the various available bond managers would depend on client preferences and circumstances.

Normalization of Interest Rates or Another Bond Mountain?

There is a broad consensus that interest rates are rising but it is not clear when, how far or for how long. One scenario is that we are headed for 1970s-style inflation, with bond yields commensurate with high inflation rates. (On one occasion in the 1970s and early 1980s, long-term Treasury yields exceeded 15% and inflation surpassed 13%.) This view presumes that deeply indebted governments will try to pay their debts in cheaper, deflated dollars. While the U.S. government is not deeply indebted by world standards, it is relative to its own history. Moreover, the prospect is for more debt as the baby boomers retire and make large claims on the government's health-care and social-insurance programs. There is also a concern that quantitative easing has involved, or will involve, a kind of money printing or debt monetization despite the fact that traditional monetization (increasing the reserves of the banking system to fund purchases of Treasury debt) has not taken place.

Even if inflation runs at a fraction of 1970s rates — say 6% — and bond yields rise to 7% or 8%, the carnage in the bond market would be spectacular. Only investors who are very well hedged against it (by holding short-term bonds or, in some scenarios, Treasury inflation-protected securities, or TIPS) would come out anywhere near whole.

But there is another view that is receiving serious attention, which I call normalization. Stephen Sexauer, of Allianz Global Investors, articulated it as follows:

> At some point, 10-year U.S. Treasury yields will converge on trend nominal GDP growth. This latter rate looks like it will be 4% to 5% if productivity growth returns to its long-term trend rate of 2% and the working population grows around 0.50% (thus summing to 2.5% real GDP growth) and we add to that the Fed's stated goal of at least 2% inflation. (The Fed normally gets its way, eventually.)
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> Once rates normalize to this level, expected returns for a constant-duration portfolio over a holding period of six or more years should be 4% to 5%. Marty Leibowitz recently published a report reminding us how this is so, stressing the importance of coupon reinvestment to the realized return.[3] A return of 4% to 5% with little risk, in a nominal GDP and profits growth world of 4% to 5%, is pretty good.
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> There is no need for a sustained bond market disaster that is the mirror image of the bull market from 1980 to 2013. The reason: in 1980, the market was very far from equilibrium, and good policy also moved the equilibrium lower. At the current 10-year yield of 2.75%, given the long duration because of the low coupon, there is still risk of principal loss. However, once that happens and rates normalize, bonds could rapidly become a competitive investment, provided that current Fed policies work, we get back to trend growth, and inflation stays contained.[4]

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[3] Leibowitz, Martin L., and Anthony Bova. 2012. "Duration Targeting: A New Look at Bond Portfolios." Morgan Stanley *Portfolio Strategy*, New York (December 18).

[4] Interview for the *Ounavarra Review,* 4th quarter 2013 (as yet unpublished), November 25, 2013.

How High Do Rates Need To Go Before We Can Invest Comfortably in Bonds Again?

If the bond market crashes as it did in the 1970s, then investors should avoid duration for a very long time. If, however, normalization is the most likely scenario and the future will be a mix of bull and bear markets, we can figure out how high Treasury yields need to go before they are a fair deal. Since an allocation to fixed income is an important stabilizer for almost all portfolios, and since the zero-duration, zero-return version of this allocation is a surefire capital destroyer ("financial repression"), it is helpful to analyze the historical risk-reward relationship for bonds as a guide to the future.

We begin with a calculation by the popular analyst David Rosenberg of Gluskin Sheff Research in Toronto.[5] Noting that the starting price/earnings ratio is a good predictor of subsequent returns in the stock market, he applied a similar method to predicting bond returns. Table 1 shows the subsequent three-year nominal return (in annualized form) on the 10-year U.S. Treasury bond, for each range of starting yields (2% to 3%, 3% to 4% and so forth).

Table 1
Subsequent 3-year nominal 10-year Treasury bond yields, in annualized form, for each range of starting yields

Starting yield (%)	Average of subsequent 3-year annualized returns (%)	Starting yield (%)	Average of subsequent 3-year annualized returns (%)
Less than 2	na	7-8	6.4
2-3	3.6	8-9	8.3
3-4	4.5	9-10	8.6
4-5	4.0	10-12	15.5
5-6	5.6	12-14	17.4
6-7	6.7	More than 14	18.0

Source: Rosenberg (2013).

This analysis says that, in rough terms, you get at least the starting yield back as a three-year rate of return, almost no matter what the starting yield is. Thus, if these numbers are representative of the future, bonds will be a rewarding investment even now (yields are in the 2% to 3% range, and the subsequent three-year return is 3.6%). Returns in excess of the starting yield are slightly negative in the 4% to 5% range and in the 7% to 8% range. At the highest starting yields, there are big gains in excess of the yield.

[5] Rosenberg, David. 2013. "Valuations Matter" (pp. 9-11) in "Breakfast with Dave." Gluskin Sheff Research, Toronto (November 13).

But this picture is a little too reassuring. Rosenberg did not reveal the dates over which data were collected, so his analysis might reflect mostly the bull-market experience of the last 30 years. With two colleagues (Tim Aurthur and Don Galligan at the Ford Foundation), I repeated the analysis using data from the full market cycle, 1952 to 2012, capturing the whole "bond mountain" — that is, about 30 years of bear markets and 30 years of bull markets. Here are the results:

Table 2
Subsequent 3-year nominal 10-year Treasury bond yields, in annualized form, for each range of starting yields (based on data from 1952 to 2012)

Starting yield (%)	Average of subsequent 3-year annualized returns (%)	Starting yield (%)	Average of subsequent 3-year annualized returns (%)
Less than 2	na	7-8	7.26
2-3	1.50	8-9	7.91
3-4	3.86	9-10	10.25
4-5	3.24	10-12	16.16
5-6	5.63	12-14	18.23
6-7	7.93	More than 14	18.46

Source: Calculated using data from Ibbotson Associates and Bloomberg.

The results were worse but not a complete disaster. The worst changes from Table 1 to Table 2 are at low starting yields (below 5%). If the future will be a mix of bull and bear markets, then bonds are not a fair or better-than-fair deal until yields reach 5% or more. That is the level at which we'd start to move our duration back toward that of the market.

But I repeat my warning from the earlier article: There's an asymmetry to this decision. Inflationary episodes can be self-reinforcing (hence the notion of "runaway" inflation) and are politically and operationally difficult to reverse. They also cost investors in nominal assets, such as conventional bonds, a massive portion of their wealth — a cost multiplied by the effects of taxation. Even if normalization were the more likely scenario, investors would do well to hedge against the pernicious risk of high inflation to some degree.

Hedging against inflation is like buying fire insurance – the likelihood of a fire is low, but the consequences if one does occur are dire. Such a hedge, which consists of shortening the bond portfolio duration and buying TIPS as yields rise, has a cost, but so does fire insurance. The question is how much insurance to buy and whether the insurance is a fair deal at the current market price.

Fixed-Income Investment Recommendations

What would my fixed-income portfolio look like, given the prospects I've outlined? Part of the portfolio should be aimed at taking advantage of the modest returns that will come from normalization, if that effort proceeds smoothly, and part should be a hedge against frighteningly high rates of inflation. The portfolio should contain:

- Cash
- Intermediate Treasury bonds
- Intermediate TIPS
- Global sovereign bonds, including emerging-market debt
- Global credit
- High-yield, preferred stock, other specialized income products

The specific allocations would depend on the investor's market views, the other assets is in the portfolio (for example, a large equity weight makes the portfolio risky and should cause the fixed-income part to be more conservative) and the investor's risk capacity. Cash provides the direct hedge against rising rates. Intermediate Treasuries represent a compromise between the desire for yield and the avoidance of duration. Intermediate TIPS do the same thing but with the TIPS inflation adjustment or protection. Non-U.S. assets hedge against a decline in the dollar, which would occur if the U.S. experiences more inflation than other countries. Credit, high-yield and preferred-stock strategies capture a credit-risk premium that should be uncorrelated with inflation and should soften the blow from rising Treasury yields.

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