



A topic of current interest: Bonds or bond funds?

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- The current low-yield environment has led many bond investors to ask whether they should prepare for a rebound in yields by purchasing individual bonds. The potential benefits of this strategy are often exaggerated. More important is that, for most bond investors, bond mutual funds and exchange-traded funds (ETFs) provide a number of advantages over individual bond portfolios in terms of diversification, cash-flow treatment, portfolio characteristics, costs, and liquidity.¹
- Individual bonds can provide certain benefits over funds, and these advantages mostly have to do with a preference for control over security-specific decisions. The cost of these advantages can be thought of as a “control premium” that is reflected in generally higher (or additional) transaction costs, lower liquidity, more limited return opportunities, and higher bond portfolio risk. The control premium is higher for buyers of municipal and corporate bonds than for buyers of U.S. Treasuries.
- Vanguard believes that, given the generally higher risks and costs associated with portfolios of individual bonds, the vast majority of investors are better served by low-cost mutual funds. Particularly in the case of municipal and corporate bonds, it is likely that only investors with enough resources to build a portfolio of comparable scale to a mutual fund can afford to put these control advantages ahead of the benefits of investing in a fund.

Note: This paper is an updated version of a 2012 Vanguard paper of the same title by Donald G. Bennyhoff, Scott J. Donaldson, and Ravi G. Tolani.

¹ See the Vanguard research papers *Taxable Bond Investing: Bond Funds or Individual Bonds?* (Donaldson, 2009) and *Municipal Bond Funds and Individual Bonds* (Bennyhoff, 2009).

The 'principal at maturity' myth

Holding an individual bond to maturity primarily confers an emotional, rather than economic, benefit and tends to be most practical for funding of near-term liabilities with highly predictable values. When the principal paid at maturity is reinvested—as it often is in laddered individual bond strategies—the resulting portfolio is functionally similar to a mutual fund but is likely to incur greater costs and have less diversification.²

A bond's price is inversely related to changes in interest rates: When interest rates rise, the bond's price falls. This is because a bond's coupon payments are typically fixed at issuance, leaving the price as the only variable that can be adjusted to make the bond's yield competitive with that of newly issued bonds. When interest rates change, the price of each bond shifts so that comparable bonds with different coupon rates provide the investor with the same yield to maturity.

This price adjustment punctures the common myth that holding an individual bond to maturity will provide an economic benefit to the investor. Absent transaction costs, when interest rates are rising, the total return and present value of the cash flows will be equal from that point forward, regardless of whether the bond is held to maturity or sold at a loss prior to maturity with the proceeds reinvested in a bond with a comparable maturity date, but a higher coupon. Therefore, the fact that an investor is able to get principal back at a specific maturity date adds no economic value compared with a mutual fund that does not have a specific maturity date.

When evaluating bonds with the same characteristics but with different coupon payments, it is always best to compare their yields to maturity. This is illustrated in **Figure 1**. If 15-year bonds are currently yielding 4%, the price of the 2% bond—to be competitive—must decline to a level that results in a 4% yield to maturity. In this

Figure 1. How bond prices adjust to keep yields to maturity the same

A comparison of hypothetical bonds with 15 years to maturity

Coupon (annual interest payment)	6%	4%	2%	0%
Market price as a percentage of face value	122.24%	100%	77.76%	55.53%
Yield to maturity	4%	4%	4%	4%

Note: This hypothetical illustration does not represent the return on any particular investment.

Source: Vanguard.

Notes on risk

All investing is subject to risk, including possible loss of principal. Past performance does not guarantee future results. Bond funds are subject to interest rate risk, which is the chance bond prices overall will decline because of rising interest rates, and credit risk, which is the chance a bond issuer will fail to pay interest and principal in a timely manner or that negative perceptions of the issuer's ability to make such payments will cause the price of that bond to decline. Diversification does not ensure a profit or protect against a loss.

U.S. Treasury securities are guaranteed as to the timely payment of principal and interest. However, U.S. government backing of Treasury or agency securities held in a mutual fund applies only to the underlying securities and does not prevent share-price fluctuations. Some or all of the income from Treasury obligations held in a fund may be exempt from state or local taxes. Although the income from a municipal bond fund is exempt from federal tax, you may owe taxes on any capital gains realized through the fund's trading or through your own redemption of shares. For some investors, a portion of the fund's income may be subject to state and local taxes, as well as to the federal Alternative Minimum Tax. High-yield bonds generally have medium- and lower-range credit quality ratings and are therefore subject to a higher level of credit risk than bonds with higher credit quality ratings.

² Laddering refers to building a portfolio of bonds with a range of maturities. The strategy seeks to manage interest rate risk by diversifying cash flows.

example, that price is 77.76% of face value (or \$777.60 per \$1,000 face value). The 2% bond would provide the same return as the 4% bond at par, but some of the return would come from the bond's appreciation from \$777.60 to its \$1,000 value at maturity, as opposed to the coupon payments.

The hold-to-maturity myth typically surfaces only when interest rates are expected to rise. Reversing the expectation may underscore the flaw in the myth. When interest rates fall, an existing individual bond can be sold at a premium, which would lock in the gain in principal. On the other hand, holding the bond to maturity would bring the investor only the par value, with no gain in principal. But selling the bond specifically to get the premium has no economic benefit, because the investor will be reinvesting the proceeds in lower-coupon bonds—which leaves him or her with the same yield to maturity in either case.

To put this still another way: If rising rates mean there is an economic benefit to holding bonds to maturity, then falling rates should mean there is an economic benefit to selling them and buying new ones. Thus, an active trading strategy would be preferred over a buy-and-hold, laddered bond portfolio in a declining interest rate environment. Ironically, this environment has been the norm for the past 15 to 20 years, yet the trading concept has not been endorsed by the investment community. One doesn't hear that if a falling interest rate environment is anticipated, an open-end mutual fund with no set maturity date is the preferred structure.

Diversification

In fixed income investing, diversification among issuers, credit qualities, and term structures is a primary consideration for municipal and corporate bonds, but less critical for mortgage-backed securities and U.S. Treasury securities.

Municipal bonds

For investors in municipal securities, bond funds typically provide substantially more diversification among issuers, credit qualities, and maturities, as well as in the range of individual bond characteristics (for example, call provisions), than a buyer of single bonds can obtain. This is possible largely because a bond fund has a larger pool of investable assets, along with the professional staff needed to conduct credit analysis.

Greater diversification then allows the portfolio manager to seek return opportunities farther out on the credit quality spectrum than is possible for an individual investor. That is because a mutual fund is unlikely to be seriously affected if one issuer among hundreds encounters financial problems.

The transaction costs for buying individual municipal bonds can be fairly onerous (as we will discuss in more detail later), and it is generally more cost-efficient to buy and sell them in larger lots. That can put self-directed individuals at a disadvantage, because creating a well-diversified bond portfolio typically requires a significant capital investment. As a result, many self-directed bond portfolios exhibit a higher-quality bias to help compensate for their lack of diversification. While the quality bias can help lower the credit risk in the portfolio, the trade-off is generally lower returns.

Corporate bonds

In the corporate bond market, the dynamic nature of credit risk makes it essential to diversify issuer-specific risk. The price volatility that results from a change in an issue's credit rating is typically asymmetrical: When a credit downgrade occurs, a bond usually will drop much further in price than it would rise on news of an upgrade. This means that for investors in corporate bonds, the penalty for choosing a bond that is downgraded is usually greater than the reward for choosing one that gets upgraded. As a result, credit analysis is an essential part of corporate bond investment strategy.

Credit diversification and effective credit analysis can help minimize a portfolio's exposure to issues that could hamper overall returns. As bonds of lower credit quality are included in the portfolio, the importance of both broad credit diversification and credit analysis increases. The number of issues required to construct a well-diversified corporate bond portfolio is debatable, but is likely to be significant.

Mortgage-backed securities

In the mortgage-backed market, the need for diversification occurs not so much at the credit-quality level as at the mortgage pool level. The credit quality of most mortgage-backed securities is generally considered second only to that of U.S. Treasuries, so that little credit analysis is required. However, diversifying the mortgage pools in a portfolio can be beneficial.

Here is why: The underlying mortgages in a pool are grouped by similar maturity dates and coupon rates. As a result, the pools have varying characteristics that can cause them to react very differently to various market environments, potentially leading to high price volatility. Diversifying among pools can mitigate that volatility risk. In addition, within a specific mortgage coupon and maturity group, investors can benefit by owning pools that contain numerous underlying loans, thus minimizing the negative impact of any single refinancing.

As with corporate bond investing, mutual funds provide readily available, diversified portfolios of mortgage-based securities. The benefit is especially notable for investing in Government National Mortgage Association pools, because GNMA securities require a higher minimum investment. A mutual fund of mortgage-backed securities provides investors with the ability to be well diversified starting with the first dollar invested. Individual mortgage-backed portfolios, however, typically take time to build and usually do not have a large number of securities.

U.S. Treasury bonds

As direct obligations of the U.S. government, Treasuries enjoy a degree of creditworthiness unequalled in the taxable bond world. As a result, they are generally considered immune from credit risk, and the cost of credit analysis is not rewarded. Also, Treasuries issued after 1985 are not callable, a fact that simplifies the bond selection process and allows for more certain principal reinvestment schedules. Mutual funds have little or no advantage over a Treasury bond ladder in terms of diversification so long as the portfolio's value is sufficient to permit complete diversification across maturities in the ladder's term.

Cash-flow treatment and portfolio characteristics

The timing of initial and periodic investments, the ability to maintain the portfolio's risk characteristics, and the ease of partial liquidations are primary considerations for municipal and corporate bonds and for mortgage-backed securities, but are less critical factors for U.S. Treasury portfolios.

Municipal, corporate, and Treasury bonds

Bond funds typically can implement both the initial investment and periodic investments of cash flows more readily than someone managing a portfolio of individual

bonds. In other words, the funds can put money to work faster. Often this translates into higher returns through reduced cash drag.

Bond funds can also maintain more consistent risk characteristics, the most important of which is duration. They are able to do so because of their more regular, ongoing cash flows, which enable fund managers to make incremental purchases in a way that preserves the desired portfolio characteristics. In an individual laddered bond portfolio, the duration drifts down over time and jumps back up as cash flows are reinvested. A portfolio with fewer bonds, or with concentrated positions, is especially prone to this effect.

Bond funds also make liquidations, especially partial liquidations, notably easier. An investor's sale of fund shares does not change the characteristics of the fund's bond exposure. By contrast, liquidations from an individual bond portfolio may require selling the entire holding in a bond, which alters the characteristics of the portfolio. To properly maintain the portfolio's strategy and makeup, the investor would need to sell a small percentage of each bond held; obviously, this is not a viable solution. In addition, liquidating only a portion of a particular bond can be expensive in the case of municipal bonds and, to a lesser degree, of corporate bonds, because of bid-ask spreads and transaction costs.

Mortgage-backed securities

The ability to implement investments quickly (or liquidate them quickly) is an especially important benefit of mutual funds in the mortgage-backed market. Individual mortgage-backed securities pay income and return a portion of principal on a monthly basis. With a mutual fund, the investor can have the income and principal reinvested automatically, something that is not possible when the investor receives these sums directly.

Holdings of individual mortgage-backed securities have another concern: uncertainty as to the duration and amount of their securities' monthly payouts. The interest income paid by mortgage-backed bonds drops as they age, because the underlying loans are being paid down and the security's constant coupon rate is being applied to a shrinking amount of principal in the mortgage pool. Moreover, as interest rates rise and fall, the amount of principal repayment falls and rises, respectively, introducing

another level of uncertainty. Mutual funds are less subject to these gyrations in income streams because they are continually reinvesting the fluctuating payouts in new securities with different coupon rates.

A final complication caused by repayments of principal in an individual mortgage-backed security is that, as the original principal amount shrinks, the security may become difficult to sell, given the minimal demand for so-called odd-lot bonds of small principal amounts. An individual bond holder could face illiquidity, but a mortgage-backed bond fund does not have that problem, as the fund could simply allow the bonds to liquidate themselves over time through monthly principal payouts. Any shareholder redemptions could be easily financed from the fund's ongoing cash flows.

Investment costs

For fixed income investments, as opposed to equity investments, costs tend to be a more significant drag on performance, and therefore to exert an important influence on returns. Investment costs are a primary consideration for investing in individual municipal bonds and to some extent for corporate bonds, but are a less critical factor for U.S. Treasuries.

All bond portfolios incur costs. Mutual funds and professionally managed separate accounts bear transaction and management costs. A self-directed bond portfolio incurs only transaction costs, but is subject to many other limitations that can be considered "opportunity" costs. These opportunity costs can also be a factor in separate accounts.

Whether for tax-exempt or taxable bond investors, the basic decision comes down to this: Does the mutual fund expense ratio detract less from the portfolio's total return than (1) the return surrendered by a higher-credit-quality bias, if one exists, (2) the default risk, if there is no quality bias, or (3) the additional transaction costs? It would be rare for the mutual fund expense ratio (particularly in the case of a lower-cost bond fund) to be larger than one of the other costs.

Transaction costs

The bid-ask spread tends to vary by trade size and bond sector, and the size of the spread is typically larger for small transactions. Mutual funds buy and sell large quantities of bonds, with trades routinely exceeding \$1 million. The larger transactions can command higher prices for sales and lower prices for buys. So long as bid-ask spreads are inversely related to purchase lot size, mutual funds are likely to have an advantage over individuals or other small-scale buyers. The benefits of scale are most significant in sectors of the bond market other than Treasuries, although they are important there, too.

Figure 2 illustrates this point. It shows that in the municipal bond market, the bid-ask spread for a "retail" trade (less than \$100,000 per bond) is typically higher than that for an institutional trade—sometimes substantially so.³ In the end, higher spread costs translate into lower yields.

Even when investors take steps to reduce the impact of transaction costs, they may still surrender return. An investor who seeks to minimize the bid-ask spread by concentrating purchases in a few bonds will sacrifice diversification. Without diversification, the investor will

Figure 2. How trade size reduces the bid-ask spread

Trade size	Number of trades	Spreads in basis points			
		Price bid-ask spread	Spread relative to trades of more than \$1 million	Yield bid-ask spread	Spread relative to trades of more than \$1 million
More than \$1 million	1,270	20	—	4	—
\$100,000 to \$1 million	8,008	67	47	22	17
\$50,000 to \$99,999	5,424	100	80	34	30
\$0 to \$49,999	29,999	134	113	55	51

Notes: Based on the average spread for municipal bonds from August 29 through September 2, 2016. A basis point is 1/100 of a percentage point. Figures may not sum because of rounding.

Sources: Vanguard Fixed Income Group and Municipal Securities Rulemaking Board.

³ The impact of trade size on transaction costs is noted in several other studies, including those by Edwards, Harris, and Piwowar (2004) and Chakravarty and Sarkar (2003).

likely feel compelled to hedge default risk by focusing on bonds of the highest quality or on insured bonds and thus will pass up the returns normally available from lower-quality or uninsured issues.

Management costs

Bond funds and separately managed accounts (SMAs) charge ongoing fees for management and administrative expenses. These fees, expressed in the expense ratio, include the costs not only of portfolio management but also of legal, accounting, custody, and recordkeeping services. While the cost of investment management is a widely recognized component of a fund's expense ratio, these additional operational expenses are also important, though less well understood. Fund expenses can vary widely, but many lower-cost choices exist.

Proponents of individual bond holdings frequently cite the expense ratio as a drawback for funds. In reality, however, it is generally more cost-effective to pay the expense ratio for years rather than to risk paying a large spread when buying a bond. Assume, for example, that an investor has the option to invest in either an individual 5-year municipal bond or an intermediate-term tax-exempt mutual fund with a 5-year average maturity and an expense ratio of 15 basis points annually. For the individual bond to be more cost-effective than the fund, the investor would have to pay a spread of less than 75 basis points (15 basis points per year over 5 years) when purchasing the bond. However, as shown in Figure 2, to get a spread that low the investor might need to invest more than \$100,000 in each bond.

Control of the portfolio

One advantage of self-directed individual bond portfolios and, to some extent, of SMAs over mutual funds is the owner's ability to influence portfolio decisions.

A tax concern: Bond funds cannot pass realized losses through to individuals

Because investors directly own the bonds in an SMA or a laddered individual bond portfolio, they can use any net losses from individual bond positions for tax purposes against either earned income or realized capital gain liabilities from other investments.

A mutual fund, on the other hand, cannot pass through realized losses to its shareholders. Instead, the fund uses realized losses against realized gains, and carries forward any excess losses to be used against future gains. Although this may defer the pass-through of losses, it provides long-term tax efficiency to the fund structure. In addition, investors have a further option: They can sell mutual fund shares to realize a loss where applicable.

Regarding SMAs, another factor to consider is that to take advantage of losses in these accounts, an investor will incur transaction costs on both the sale of the current bond and the purchase of the new bond. The round-trip transaction costs may well exceed the taxes saved by realizing the loss.

Mutual fund managers and separate-account managers have the ability to run their portfolios in an identical manner. Both types of managers can harvest losses where appropriate. From a tax perspective, the only difference is that the separate-account structure allows for the pass-through of excess losses to the individual investor, whereas the mutual fund structure does not.

Municipal bonds

An individual bond portfolio can be tailored to meet certain objectives, such as providing income free of the alternative minimum tax (AMT), meeting credit-quality targets (for example, an all-AAA/insured portfolio), or obtaining exposure to a particular state. Proponents of separately managed accounts often justify their higher costs by citing the tax savings achieved by holding individual bonds exempt from the AMT or from the investor's state income tax.

Sometimes forgotten is the key point that investors should be primarily concerned with maximizing after-tax returns, rather than with minimizing taxes. Bonds issued outside an investor's home state and bonds subject to the AMT often carry higher yields to maturity. As a result, the investor may well get higher after-tax returns from a portfolio including such bonds. In addition, the investor gains diversification—an important benefit.

Corporate, mortgage-backed, and Treasury securities

A portfolio of individual taxable bonds can be tailored for very specific objectives in which an investor has complete control over the selection of specific bonds or types of bonds. Possibilities include, for instance, a specific credit-quality target (such as an all-AAA portfolio), specific characteristics (no derivatives), or specific call-protection targets.

The benefit of control is most apparent in situations where an investor wishes to match the maturity and face value of a bond with a known future liability. Bond mutual funds do not have a maturity date, so the value of the fund at any point in the future is uncertain. When an investor has a predetermined future spending need—particularly if it is a near-term need—an individual bond that matures when the money is required may be preferable to a mutual fund. Because this control becomes much more limited in the case of bonds with call options, such as corporate and mortgage-backed securities, the strategy is more often implemented using Treasuries.

This cash-flow matching strategy (a strict form of asset-liability matching) involves purchasing individual bonds that carry coupon payments and par values at maturity precisely matching the value of liabilities coming due. Once cash flows are matched, the asset portfolio need only be adjusted for changing liabilities. Cash-flow matching can be a very inflexible process, however, and is often costly to implement, because it requires that expected liability streams exactly match the cash flows of fixed income investments. One method of cash-flow matching is to build an asset portfolio of zero-coupon bonds that match liability maturities. Treasury STRIPS, because of their lack of default risk, may offer the most straightforward way to match liability cash flows.⁴

Although a cash-flow-matching strategy can be beneficial in limited (often institutional) situations, it's important to state again that there is no economic value to receiving principal back at maturity if the principal is simply reinvested in another bond. As securities in a laddered portfolio mature, they are reinvested, just as in a mutual fund—producing the same return in each portfolio, if

all else is equal. Naturally, it would be very difficult for a separately managed account to achieve cost parity, cash-flow parity, and diversification similar to that of a mutual fund.

In essence, when the principal paid at maturity or redemption is reinvested, rather than spent, a laddered portfolio functions similarly to a mutual fund, but with greater costs and less diversification.

Conclusion

For the reasons described in this paper, the vast majority of investors in municipal or taxable bonds are best served by low-cost mutual funds. Only those investors with the resources to achieve scale comparable to that of a mutual fund should consider putting certain control features ahead of a mutual fund's benefits. Mutual funds generally provide better diversification, more efficient management of cash flows and portfolio characteristics, better liquidity, and lower costs.

Although bonds that are held directly can provide certain advantages over bond mutual funds—primarily related to control over security-specific decisions—such control comes at a cost. To construct an individual bond portfolio, an investor must assign a very high value to the control benefits to justify the higher costs and additional risks involved.

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⁴ STRIPS, for Separate Trading of Registered Interest and Principal of Securities, are bonds—usually issued by the U.S. Treasury—whose two components, interest and principal, are separated and sold individually as zero-coupon bonds.

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