

ICI RESEARCH REPORT

What Happens When Rates Rise?

*A Forecast of Bond Mutual Fund Flows Under a
2013 Taper Tantrum Interest Rate Scenario*

DECEMBER 2016

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What Happens When Rates Rise?

A Forecast of Bond Mutual Fund Flows Under a 2013 Taper Tantrum Interest Rate Scenario

Rochelle Antoniewicz, Senior Economist, prepared this report. Julieth Saenz, Research Assistant, provided research assistance.

Regulators and market commentators have speculated that a sharp, unexpected increase in long-term interest rates could cause strong, destabilizing outflows from bond mutual funds. This report applies the experience of the 2013 “Taper Tantrum” to examine potential outflows from such funds and the outflows’ impact on the broader bond markets in such an interest rate scenario.

Introduction

Long-term interest rates in the United States have been rising since summer 2016—slowly creeping up from July through October and then jumping after the presidential election. Thus far, the response from bond mutual fund investors has been subdued. Nevertheless, various commentators have expressed concerns that bond fund investors may rush to redeem shares to avoid portfolio losses stemming from unexpected increases in interest rates.¹

On July 8, 2016, the yield on the 10-year constant maturity Treasury bond hit a low point of 1.37 percent. From July 8 to October 31, the 10-year yield rose to 1.84 percent. In November, it jumped further, to 2.37 percent. All told, from July 8 through November 30, the yield on the 10-year Treasury rose 100 basis points, a sizable increase.

¹ Stanley Fischer, “Is There a Liquidity Problem Post-Crisis?” (speech), November 15, 2016; Itay Goldstein, Hao Jiang, and David T. Ng, “Investor Flows and Fragility in Corporate Bond Funds,” working paper, November 2016; Yao Zeng, “A Dynamic Theory of Mutual Fund Runs and Liquidity Management,” working paper, University of Washington, January 2016; Financial Stability Board, “Consultative Document,” *Proposed Policy Recommendations to Address Structural Vulnerabilities from Asset Management Activities*, June 2016.

When bond yields increase, prices on existing bonds—such as those that bond mutual funds hold in their portfolios—fall. Commentators who predict heavy outflows from bond mutual funds believe that these funds’ investors will react quickly to redeem, forcing the funds to dump bonds at “fire sale” prices and driving the market down further (and yields higher) in a destabilizing spiral.

Yet so far in this rate cycle, bond mutual fund investors have barely reacted. Over the period from July through October 2016, domestic taxable bond mutual funds² received net *inflows* of \$61 billion. In November 2016—despite the 10-year Treasury yield jumping an additional 53 basis points—investors redeemed, on net, only \$3 billion from domestic taxable bond mutual funds. This \$3 billion outflow represented a mere 0.12 percent of assets in these funds as of October 2016.

Skeptics might feel, however, that this real-world development fails to examine a primary concern: that investors might redeem heavily from bond funds if monetary policy were to tighten sharply and unexpectedly—a change in market perceptions like the one that occurred in 2013. They could argue that, unlike that episode, about half the increase in long-term interest rates since June is likely due to *expected* changes in monetary policy, while the other half likely reflects an unexpected change in the US political outlook.

As a thought experiment, we forecast how bond mutual fund investors might react to a sharp, unexpected change in monetary policy. Virtually all market participants expect that the Federal Reserve will increase the federal funds rate (the key overnight interest rate that banks charge to lend to each other) at the conclusion of its Federal Open Market Committee Meeting on December 14, 2016. Views are mixed, though, on how quickly and by how much the Fed may ramp up the federal funds rate going forward. Most observers expect the Fed to increase short-term interest rates slowly yet steadily over many months, to minimize the likelihood of harmful outcomes in financial markets and the real economy.

But what if the Fed instead tightened monetary policy sharply and unexpectedly? Would bond fund investors react more strongly than in the past several months? We estimate potential outflows from bond mutual funds under such a scenario by using the experience of the eight-month period covering the “Taper Tantrum” and its aftermath (May to December 2013). Based on our results, we would expect domestic taxable bond mutual fund outflows over the eight-month projection period to be moderate—totaling \$105 billion, or 4.0 percent of the assets in such funds as of October 2016. Furthermore, our analysis indicates that mutual funds’ sales of bonds in response to these projected outflows would have a minimal impact on the broader bond markets.

² Domestic taxable bond funds include those that invest primarily in Treasury, US agency, corporate (investment-grade or high-yield), asset-backed, or mortgage-backed bonds. Domestic taxable bond funds are offered with various durations (short-, intermediate-, and long-term).

Why the Taper Tantrum of 2013 Is Useful as a Predictor

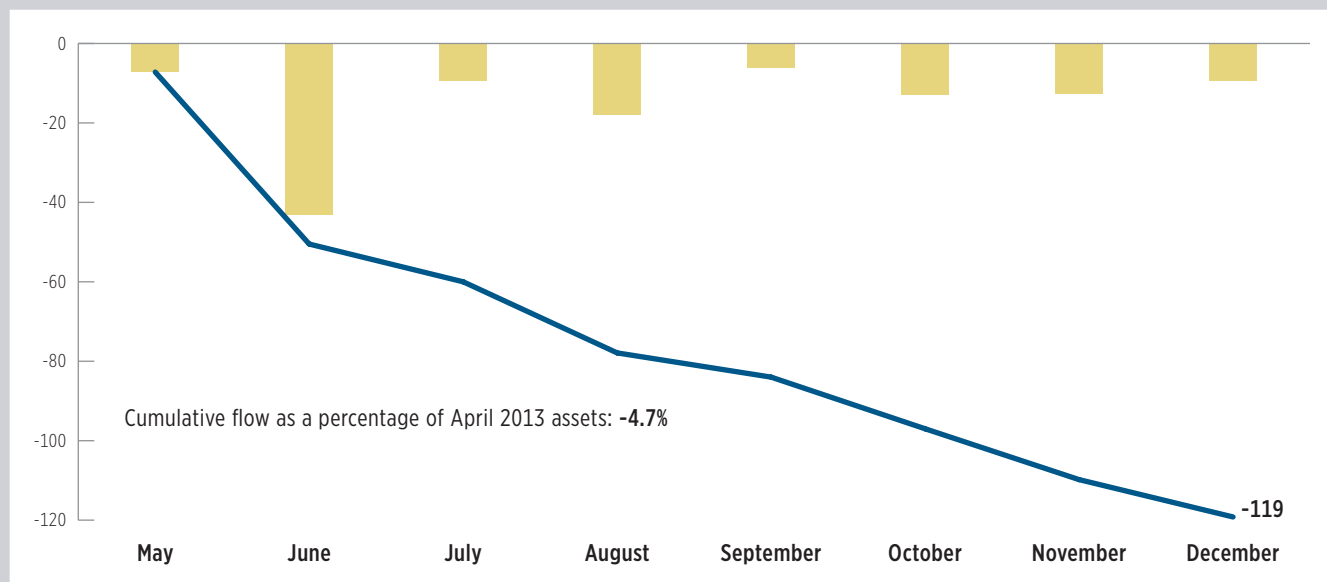
Beginning in May 2013, market perceptions of future monetary policy changed quickly as key Federal Reserve officials began to signal that the Federal Reserve would likely begin to taper its bond buying program later in the year. The bond market reacted swiftly: the nominal yield on the 10-year constant maturity Treasury bond rose more than 80 basis points from the end of April to the end of June 2013. The 10-year Treasury yield continued to drift higher through mid-September 2013, then retraced part of this increase over the next month before resuming its climb to finish the year at 3.04 percent—134 basis points higher than at the end of April 2013. This increase in interest rates was sizable and similar to the 149 basis point increase seen over the period from February through August 1994—a previous notable episode of unexpected monetary policy tightening.

In both instances, bond mutual fund investors reacted by selling bond fund shares, on net. As shown in Figure 1, domestic taxable bond mutual funds had outflows in each month from May 2013 through December 2013, with the largest outflow observed in June 2013. Over the entire eight-month period, these outflows totaled \$119 billion, or 4.7 percent of taxable bond mutual fund assets as of April 2013. In 1994, bond mutual funds had outflows of \$34 billion over the period from February to August 1994, accounting for 5.1 percent of bond mutual fund assets as of February 1994.

FIGURE 1

Domestic Taxable Bond Mutual Funds Had Outflows from May Through December 2013

Billions of dollars; monthly, May–December 2013



Source: Investment Company Institute

To understand whether the 2013 Taper Tantrum experience can be used to project potential bond fund flows in the face of a similar interest rate shock generated from tightening monetary policy, it can be helpful to compare current levels of some key factors—interest rates, credit spreads, funds’ share of bonds outstanding, the composition of bond mutual fund holdings, and bond mutual fund investor demographics—with those seen in late spring or early summer 2013. The more closely aligned the factors are, the more reasonable it is to use the 2013 period as a predictor for bond mutual fund flows today.

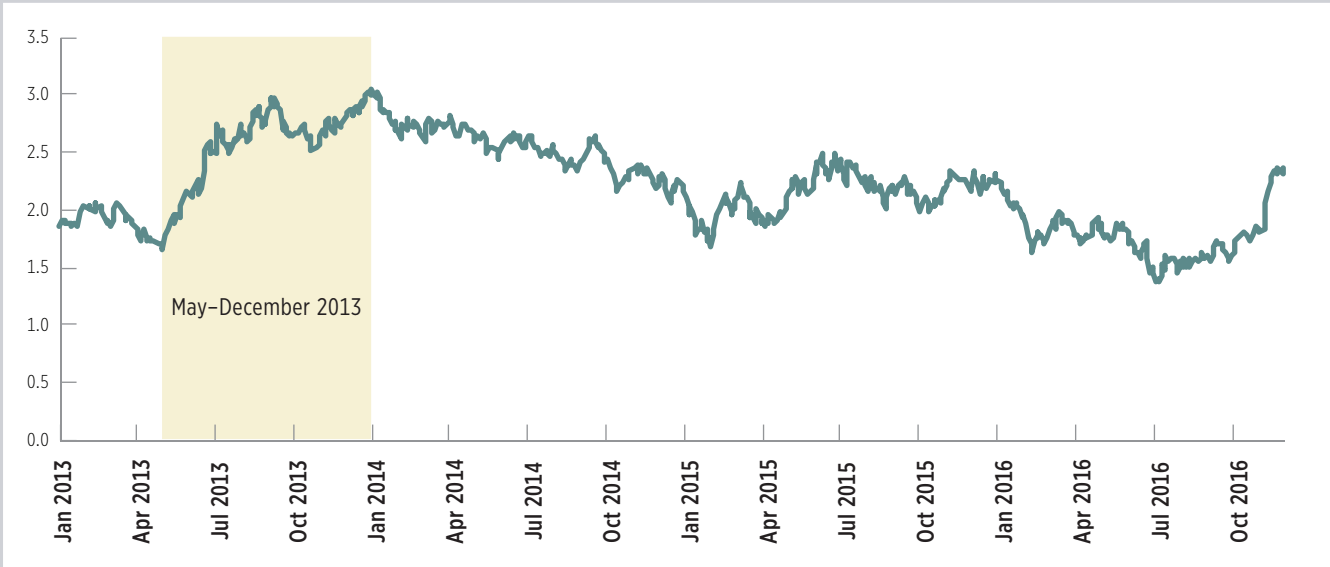
Long-Term Benchmark Interest Rate

As shown in Figure 2, the nominal yield on the constant maturity 10-year Treasury bond has been edging higher since July 2016 and recently jumped after the US presidential election. As of November 30, 2016, the yield stood at 2.37 percent, above the 1.70 percent recorded on April 30, 2013, but about the same level (2.33 percent) as on June 19, 2013.

FIGURE 2

10-Year Treasury Yield at About the Same Level as the End of May 2013

Percent; daily, January 2, 2013–November 30, 2016



Source: Federal Reserve Board

Credit Spreads

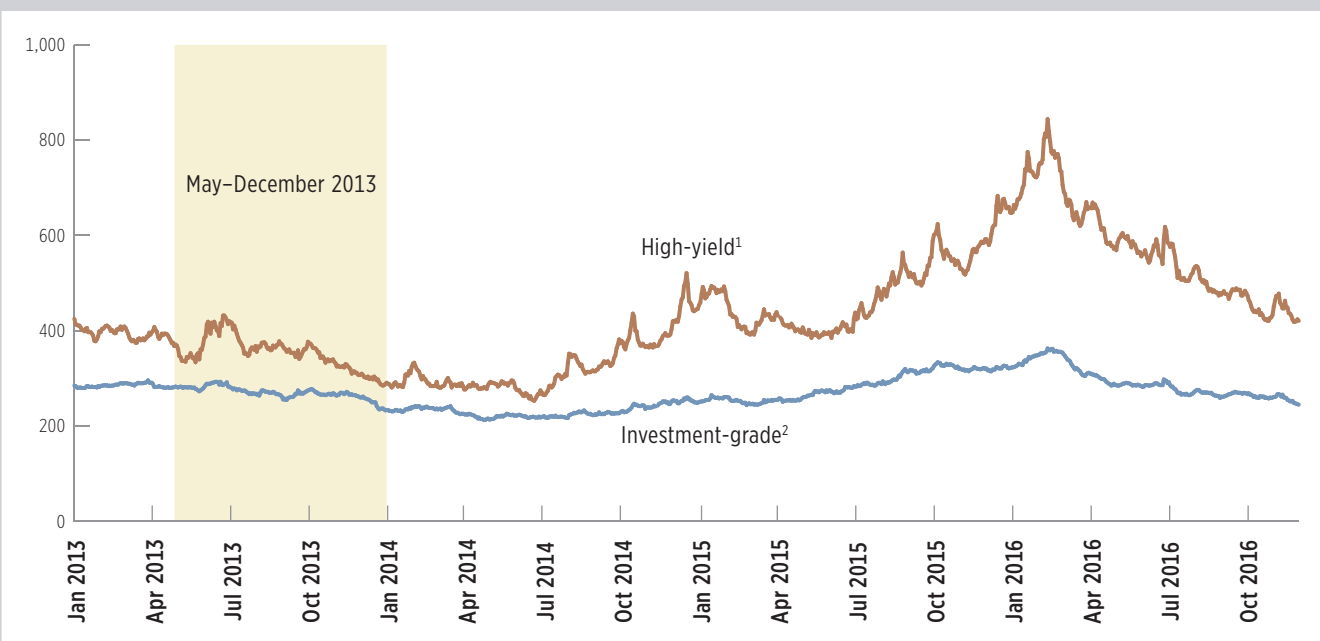
We see mixed results when comparing current levels of credit spreads to those observed in spring 2013:

- » Investment-grade bonds: The difference between the yield on the Moody's Baa Corporate Bond Index and the yield on the 10-year constant maturity Treasury, shown as the blue line in Figure 3, was 245 basis points at the end of November 2016. At the end of April 2013, the investment-grade credit spread was 283 basis points.
- » High-yield bonds: The difference between the yield on the Bank of America Merrill Lynch US High-Yield Index and the yield on the 10-year constant maturity Treasury (the brown line in Figure 3)—was 421 basis points at the end of November 2016, 50 basis points higher than at the end of April 2013.

FIGURE 3

Spreads to Investment-Grade and High-Yield Bonds Remained Fairly Stable in 2013

Basis points; daily, January 2, 2013–November 30, 2016



¹ Measured as the difference between the effective yield of BofA Merrill Lynch High-Yield Index and the yield on the 10-year Treasury constant maturity.

² Measured as the difference between the mid-yield of Moody's Baa Corporate Bond Index and the yield on the 10-year Treasury constant maturity.

Source: ICI calculations from Bloomberg and Federal Reserve Board data

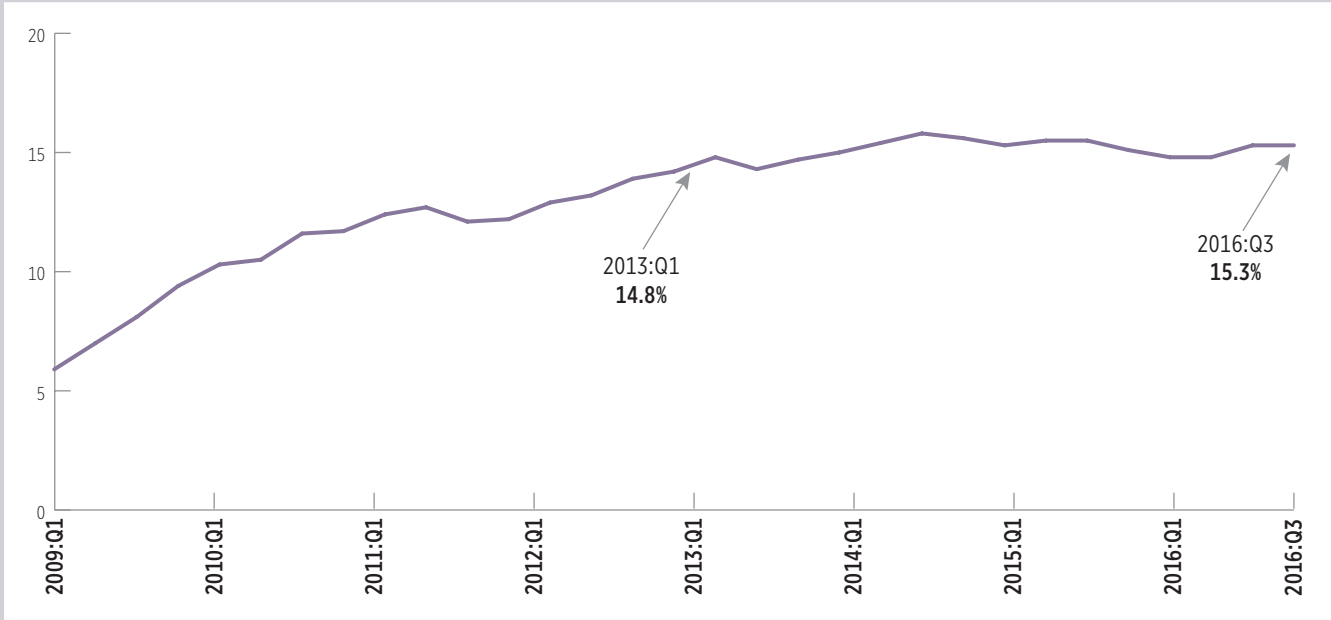
Mutual Funds' Share of Outstanding Corporate Bonds

Mutual funds' current share of the corporate bond market is about the same as in spring 2013. According to quarterly data published by the Federal Reserve, mutual funds held 14.8 percent of outstanding corporate bonds in March 2013 compared with its latest reading of 15.3 percent as of September 2016 (Figure 4).

FIGURE 4

US Mutual Funds' Share of the Corporate Bond Market*

Percent; quarter-end, 2009:Q1–2016:Q3



*This includes bonds issued by domestic corporations and foreign bonds held by US residents.

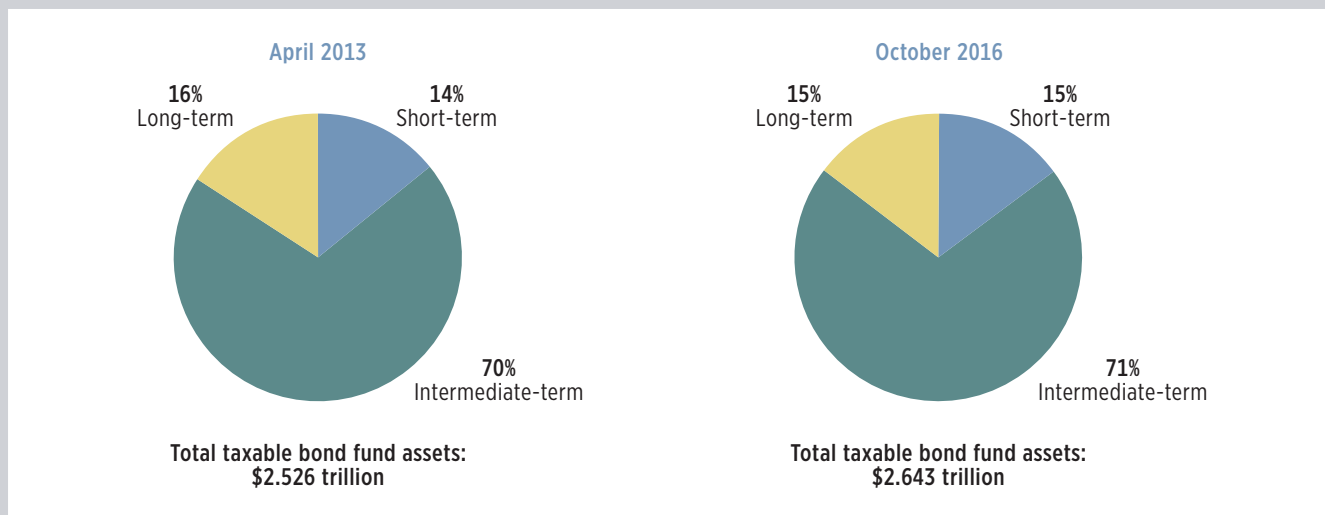
Source: ICI calculations of Federal Reserve Board data

Mutual Fund Assets and Allocation by Duration

Assets of domestic taxable bond mutual funds currently also are about the same as in spring 2013. Bond mutual fund assets totaled \$2.643 trillion in October 2016 compared with \$2.526 trillion in April 2013—a difference of only 4.6 percent (Figure 5). When we dig deeper to look at the distribution of bond fund assets by broad duration categories (short-term, intermediate-term, and long-term), we find almost no difference between April 2013 and October 2016. Funds that tend to invest in intermediate-term bonds (generally in the two-year to five-year remaining maturity range) accounted for 70 percent of domestic taxable bond fund assets in April 2013 and 71 percent in October 2016. Also, the asset-weighted duration of intermediate-term bond funds, reported quarterly in Morningstar Direct, was 4.7 years in September 2016, little changed from 4.5 years prior to the run-up in long-term interest rates in 2013.

FIGURE 5

Taxable Bond Mutual Fund Assets Are Little Changed Since 2013



Note: Components may not add to 100 percent because of rounding.

Source: Investment Company Institute

Bond Mutual Fund Investors

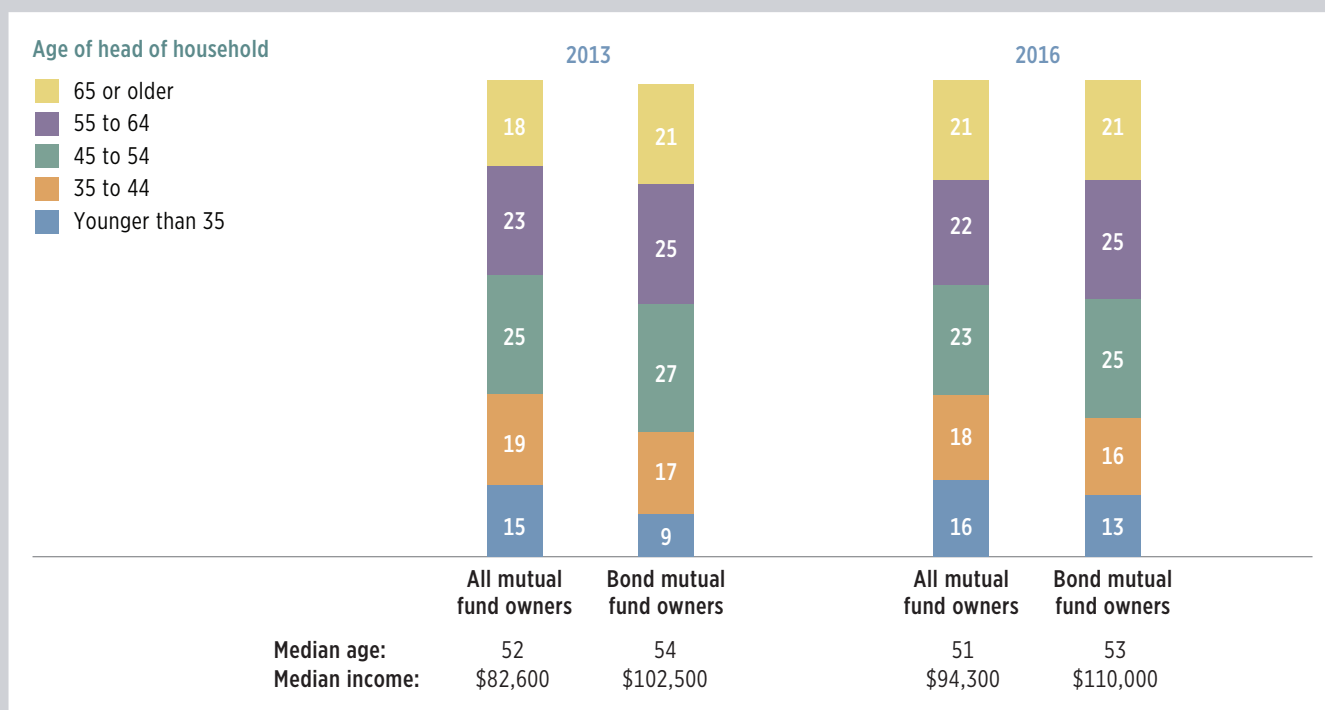
As investors age, they tend to increase exposure to bonds in their portfolios because of the steady stream of income offered by bonds and the lower historical price volatility of bonds relative to equities. As a result, bond mutual fund investors tend to be a little older compared to mutual fund investors generally. Also, they are more likely to be “seasoned” investors who have lived through various market declines.

This demographic characteristic has not changed much in the past few years. In 2016, the median age of bond mutual fund investors was 53 years old and 71 percent of investors were at least 45 years old. In 2013, the median age of a bond mutual fund investor was 54 years old and 73 percent of bond fund investors were 45 years or older (Figure 6).

FIGURE 6

Age Distribution of Households Owning Bond Mutual Funds

Percent distribution of households owning mutual funds by age, selected years



Note: Age is based on the age of the sole or co-decisionmaker for household saving and investing.

Source: Investment Company Institute Annual Mutual Fund Shareholder Tracking Survey

Projected Flows of Domestic Taxable Bond Mutual Funds

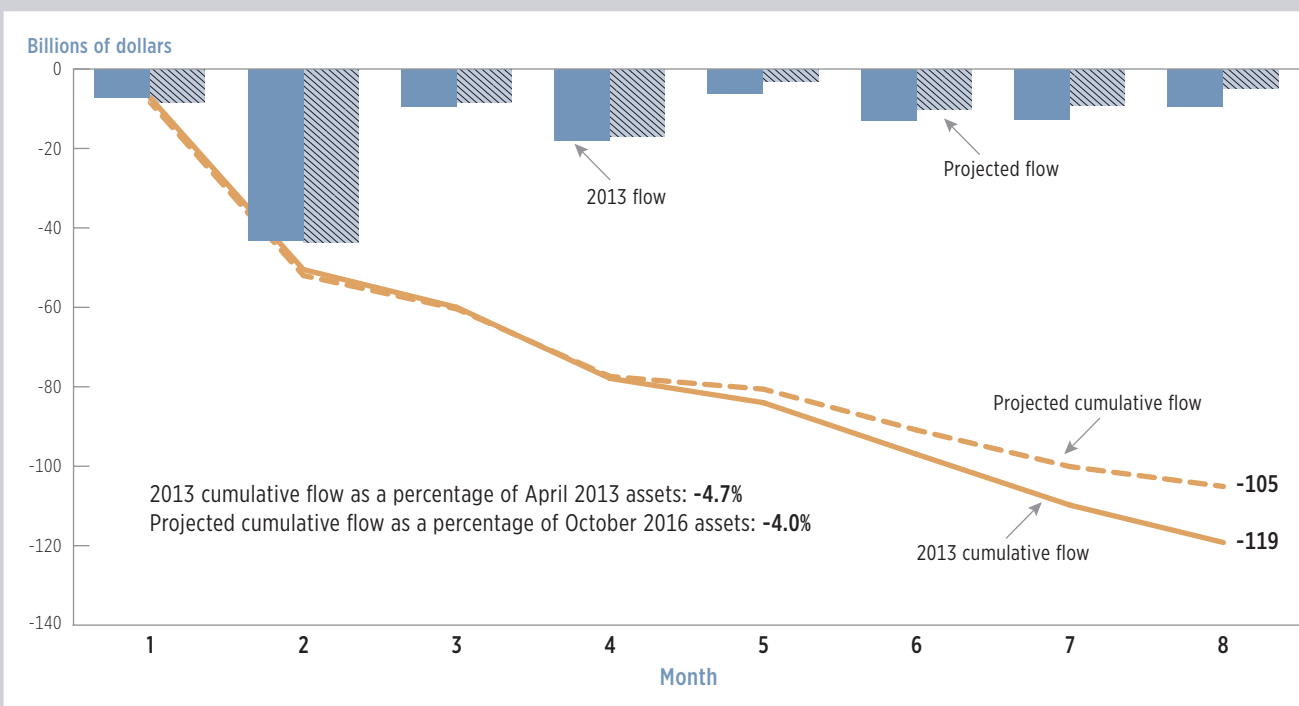
In this section, we estimate potential outflows from bond mutual funds using the experience of the period from May to December 2013, covering the Taper Tantrum and its aftermath.

As shown in Figure 7, we estimate that domestic taxable bond mutual funds would have \$105 billion in cumulative outflows over an eight-month period following the initial rise in long-term interest rates. This projected \$105 billion outflow would represent 4.0 percent of assets in domestic taxable bond funds as of October 2016. In comparison, over the eight-month period from May through December 2013, domestic taxable bond funds had outflows of \$119 billion, accounting for 4.7 percent of their assets as of April 2013. (A detailed description of the forecast methodology is provided in the appendix.)

FIGURE 7

Taper Tantrum Take II: Expect Only Moderate Outflows

Taxable bond mutual funds; projected flows based on October 2016 assets and flows, May–December 2013



Note: Flows were projected using the ratio of flows to assets for the period of May–December 2013 and applying it to the October 2016 asset level.

Source: Investment Company Institute

Why is our projected eight-month cumulative outflow of \$105 billion so close to the \$119 billion outflow that actually occurred in the May–December 2013 period? The outflows are not much different because, as demonstrated earlier in Figure 5, domestic taxable bond mutual fund assets and the allocation of those assets by duration in October 2016 are about the same as in April 2013.

Duration matters because when interest rates rise, bonds with higher durations generally will have larger declines in their values. Similarly, bond mutual funds with higher durations tend to have larger declines in their net asset values than bond mutual funds with lower durations. If investors are sensitive to declines in net asset values and redeem their fund shares, one would expect bond funds with higher durations to have larger outflows as a percentage of their assets than bond funds with lower durations. In addition, we might expect short-term bond funds to have inflows as some investors take defensive positions in a rising interest rate environment.

As shown in Figure 8, this was the pattern we saw in domestic bond fund flows from May through December 2013. Intermediate-term bond funds and long-term bond funds each had cumulative outflows of \$67 billion from May through December 2013, while short-term bond funds had a cumulative inflow of \$15 billion in the same period.

If bond fund investors today react in a similar manner to a comparable rise in interest rates, we would expect intermediate-term and long-term bond funds to have cumulative outflows of \$63 billion and \$60 billion, respectively, over an eight-month period. In contrast, we would expect inflows to short-term bond funds to amount to \$18 billion over the same period.

FIGURE 8

Bond Mutual Funds with Longer Durations Are Expected to Have Higher Outflows

May–December 2013

Duration category	Flow <i>Billions of dollars</i>		Flow <i>Percentage of total net assets</i>	
	2013	Projected	2013	Projected
Short-term ¹	\$15	\$18	4.3%	4.6%
Intermediate-term ²	-67	-63	-3.8	-3.4
Long-term ³	-67	-60	-16.5	-15.7
Total	-119	-105	-4.7	-4.0

¹ This category includes funds with the following investment objectives: investment-grade ultra short-term, investment-grade short-term, multisector short-term, and government short-term.

² This category includes funds with the following investment objectives: investment-grade intermediate-term, investment-grade multi-term, multisector intermediate/long-term, multisector alternative strategies, multisector multi-term, government intermediate-term, government multi-term, and high-yield.

³ This category includes funds with the following investment objectives: investment-grade long-term, government long-term, inflation protected, and mortgage backed.

Note: Flows were projected using the ratio of flows to assets for the period of May–December 2013 and applying it to the October 2016 asset level for each investment objective. Components may not add to the total because of rounding.

Source: Investment Company Institute

Projected Purchases and Sales of Bonds by Domestic Taxable Bond Funds

Commentators who are concerned about the broader impact of outflows from bond mutual funds often assume that outflows from these funds directly drive sales of bonds from funds' portfolios, on a one-to-one basis. This connection between bond fund flows and funds' bond trading activity, however, is not as tight as they might believe.

Bond mutual fund managers have many other means of meeting redemption requests than selling bonds. Each day, bond mutual funds receive cash in the form of interest income from bonds held in the portfolio and proceeds from matured bonds. Also, mutual funds in general have cash coming in from new sales of fund shares on any given day. During a period of net redemptions, bond fund managers can often fulfill the vast majority of redemption requests using these cash sources. In addition, bond fund managers employ a wide range of successful strategies to prepare to meet shareholder redemptions, including holding short-term assets or using highly liquid derivatives.

Contrary to popular belief, mutual funds are active on both the purchase and the sell sides of the bond market. Bond mutual fund managers are constantly monitoring the bonds held in their portfolios and frequently decide to buy and sell bonds based on any number of factors, such as credit quality, spreads, sector exposure, and duration.

When meeting redemptions, managers use a nuanced approach in their bond trading, with their actions guided by market conditions, expected investor flows, and other factors. For example, during a market downturn, a manager might determine that the fund can add shareholder value by buying some illiquid bonds. With liquidity at a premium, the manager might judge that the prices of such bonds are depressed relative to their fundamental values and thus represent a buying opportunity. On the other hand, the fund might seek to add shareholder value by selling some of its more liquid bonds (which, being in high demand, are trading at a premium to fundamental value). Other fund managers may conclude that it is necessary and appropriate to meet outflows by selling a "slice" of the fund's portfolio.

In this paper, we estimate the amount of trading by domestic taxable bond mutual funds in US government, domestic investment-grade corporate, and domestic high-yield bonds that likely would result from our projected outflows discussed above. The methodology for these estimates is based on funds' trading patterns from May to December 2013 and is discussed in detail in the appendix.

To get a sense of potential impact on the current bond markets, we also estimated domestic taxable bond mutual funds' share of marketwide purchases and sales, taking into consideration recent market trading activity. Figures 9 through 11 show bond mutual funds' actual purchases and sales of US government bonds, investment-grade bonds, and high-yield bonds relative to the actual purchases and sales by all market participants for each month from January through October 2016 (solid lines). The projected bond mutual fund shares are shown by the dashed lines.

US Government Bonds

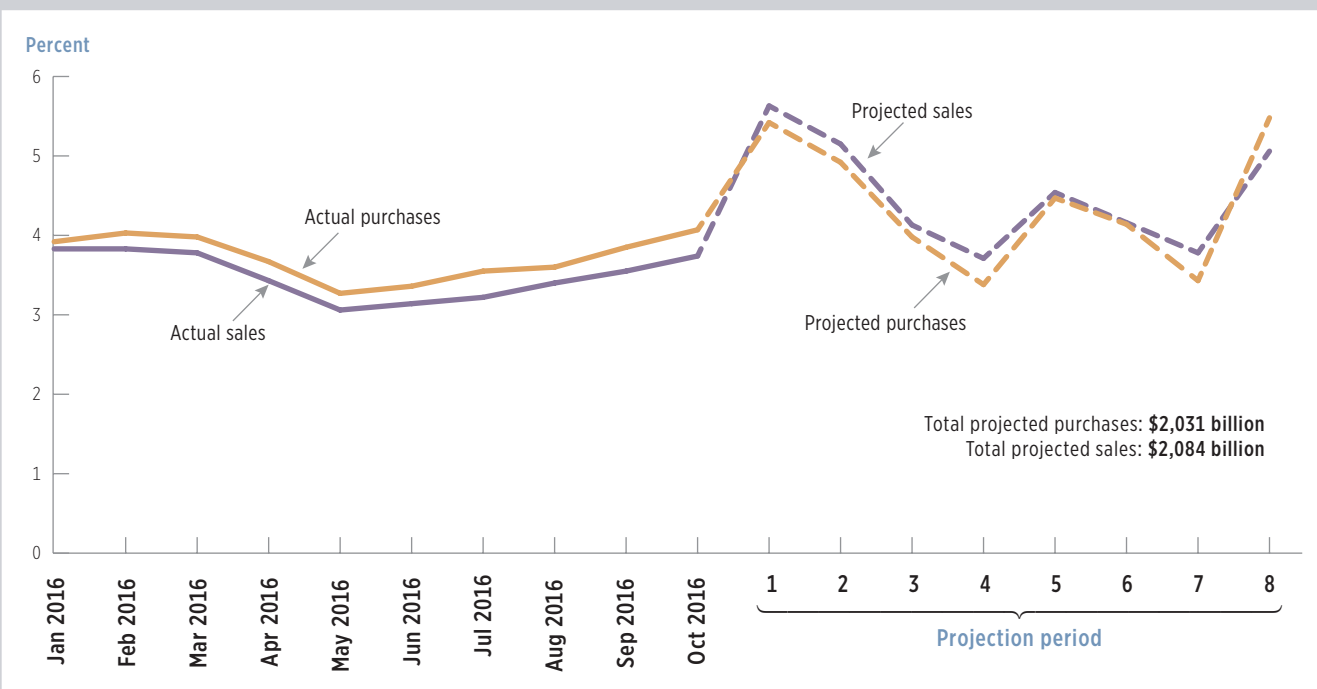
As shown in Figure 9, we would expect domestic taxable bond mutual funds to be modest net sellers of US government bonds (Treasury bonds, US agency bonds, and mortgage-backed securities issued by US agencies). Although both their purchases and sales of US government bonds are expected to increase as a share of the projected total trading volume in US government bonds, the level of their market participation rates are anticipated to remain low—around 5 percent or less of total trading.

Beginning in May 2013 and through December 2013, investment-grade multi-term bond funds, inflation-protected corporate bond funds, and mortgage-backed bond funds, in aggregate, had steady outflows that totaled \$135 billion. During that time, these funds sold, on net, a total of \$84 billion in US government bonds. Over the same period, other types of bond mutual funds (some with inflows and some with outflows) were net purchasers of US government bonds. Our projection maintains these observed relationships between fund flows and purchases and sales of US government bonds.

FIGURE 9

Mutual Fund Sales of Government Bonds Are Projected to Modestly Exceed Their Purchases

Bond mutual funds' share of all government bond transactions,* monthly



* For projected months, all government bond transactions are estimated as the average of the monthly observations for the period from January through October 2016.

Note: Government bonds are US Treasury bonds, US agency bonds, and mortgage-backed securities issued by the US government.

Sources: Investment Company Institute, New York Federal Reserve Bank, and FINRA TRACE

Domestic Investment-Grade Bonds

As shown in Figure 10, bond mutual funds' purchases of domestic investment-grade bonds would be expected to exceed their sales in all but one month (month 2) of the projection period. This result may be surprising, but it follows the same pattern of bond mutual funds' purchases and sales of domestic investment-grade bonds from the May to December 2013 period. Intermediate-term, multi-term, and long-term investment-grade bond funds had fairly consistent outflows that totaled \$98 billion over the eight-month period. Yet collectively these funds sold less than \$100 million, on net, in investment-grade corporate bonds in the same period.

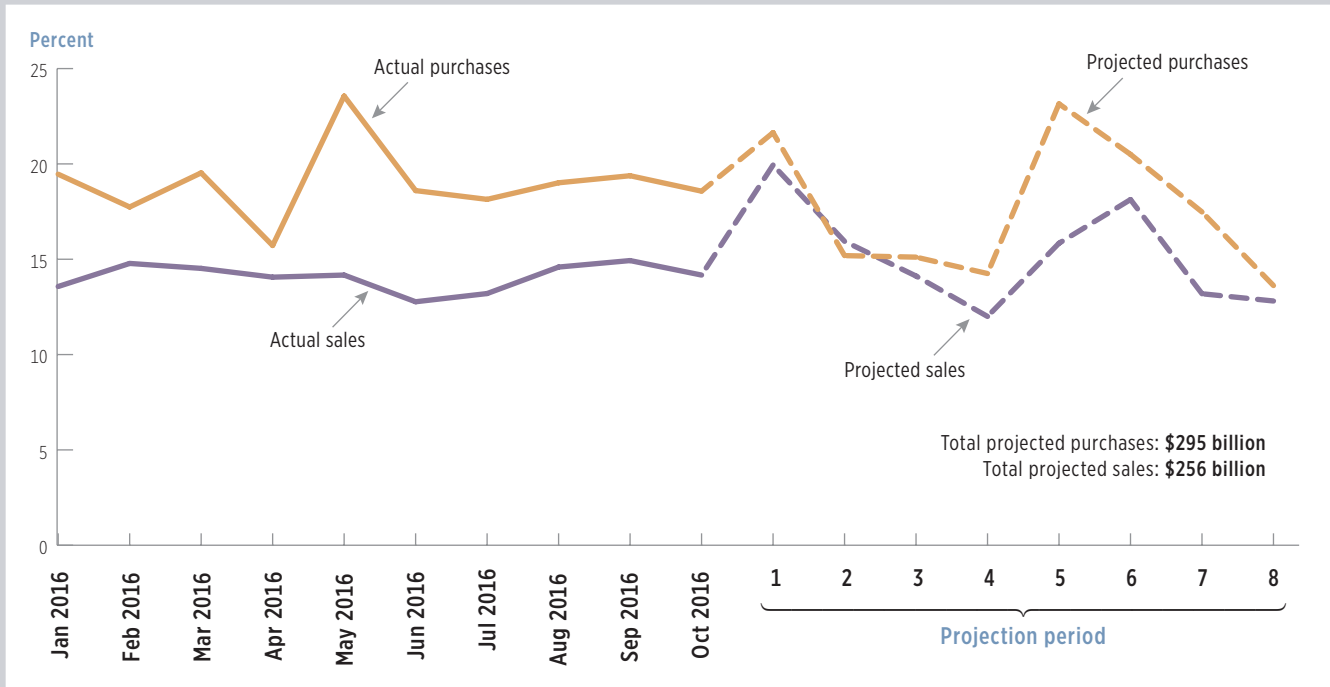
Looking more closely at the data, we see that funds had different strategies for meeting redemptions in 2013. Investment-grade intermediate-term and long-term bond funds reduced their purchases of corporate bonds, probably using cash that came into the fund to fulfill redemptions. As noted above, investment-grade multi-term bond funds appear to have sold US government bonds, rather than corporate bonds, to partially meet redemptions. One possible explanation for this may be that these funds were using US government bonds as collateral for their derivatives positions. Bond mutual funds often use derivatives to help manage their portfolios, and the cash collateral that funds segregate to support their derivatives positions provides a ready source of liquidity to meet redemptions.

Short-term investment-grade bond funds, in contrast, had inflows totaling \$14 billion and purchased, on net, \$24 billion in investment-grade bonds over the period from May to December 2013. Our projection maintains these observed relationships between fund flows and purchases and sales of investment-grade bonds.

FIGURE 10

Mutual Fund Purchases of Investment-Grade Bonds Are Expected to Exceed Their Sales

Bond mutual funds' share of all investment-grade corporate bond transactions,* monthly



* For projected months, all government bond transactions are estimated as the average of the monthly observations for the period from January through October 2016.

Sources: Investment Company Institute, New York Federal Reserve Bank, and FINRA TRACE

Domestic High-Yield Corporate Bonds

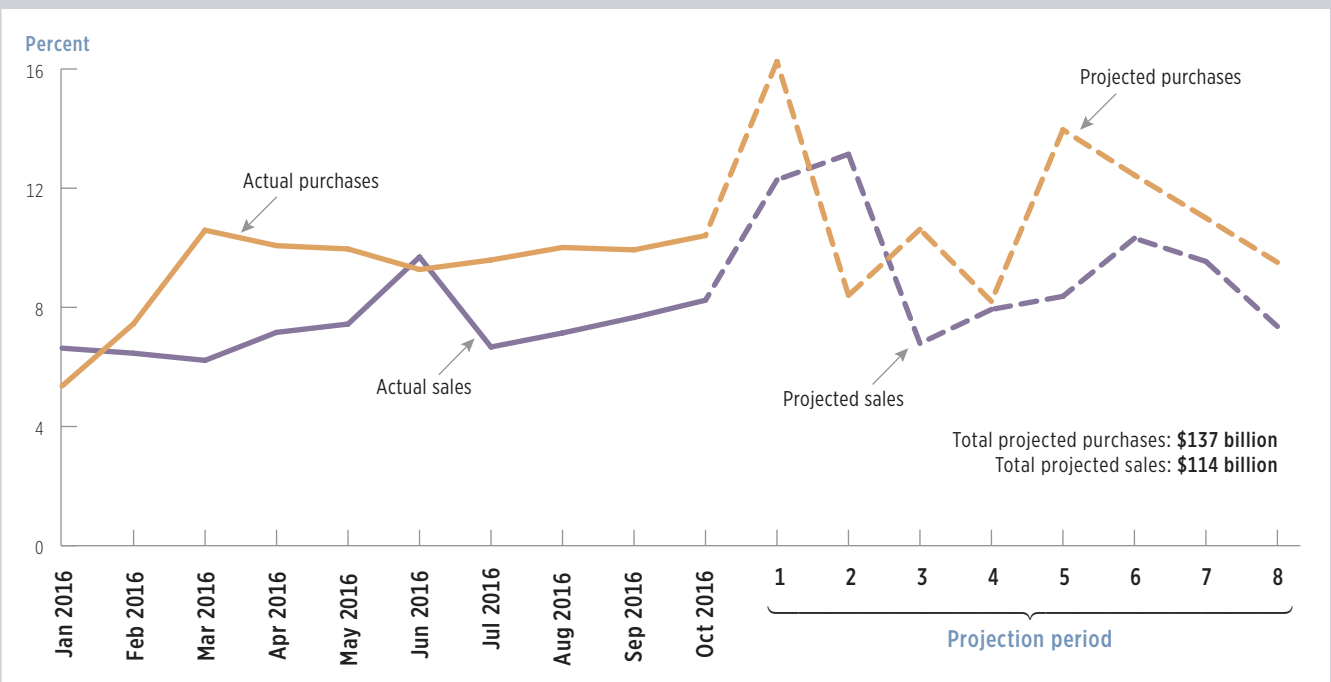
In our forecast, high-yield corporate bond mutual funds also would be expected to purchase more corporate bonds than they sell in all but one month (month 2) of the projection period (Figure 11). Based on the forecast for month 2, funds' sales of high-yield bonds would account for a relatively small share (13 percent) of projected total sales in high-yield bonds.

Unlike domestic investment-grade bond funds, which altogether experienced fairly consistent outflows in each month in the May–December 2013 period, high-yield bond funds only had outflows of \$6 billion in June 2013. In this month, high-yield bond funds sold, on net, \$8 billion in high-yield bonds. All the other months had inflows and, hence, high-yield bond mutual funds were net buyers of high-yield bonds in these months. These monthly relationships between fund flows and purchases and sales of high-yield bonds are preserved in our forecast and month 2 of the projection reflects the behavior observed in June 2013.

FIGURE 11

High-Yield Bond Mutual Funds Are Expected to Purchase More Corporate Bonds Than They Sell

Bond mutual funds' share of all high-yield corporate bond transactions,* monthly



* For projected months, all government bond transactions are estimated as the average of the monthly observations for the period from January through October 2016.

Sources: Investment Company Institute, New York Federal Reserve Bank, and FINRA TRACE

Summary of Bond Purchase and Sales Projections

Figure 12 shows domestic taxable bond mutual funds' cumulative purchases and sales of US government bonds, domestic investment-grade bonds, and domestic high-yield bonds as a share of marketwide cumulative purchases and sales for January through October 2016 (reported data) and for the eight-month forecast period (projected data). We compare the most recent reported data with the projected data to get a sense of any potential impact on current bond markets.

FIGURE 12

Expect Minimal Impact on Bond Markets

Purchases/sales of bonds by domestic taxable bond funds relative to marketwide purchases/sales¹ over period specified

Bond category	2016 ³			Projected ⁴		
	Purchases	Sales	Memo:	Purchases	Sales	Memo:
US government ²	3.7%	3.5%	Net buyers	4.4%	4.5%	Net sellers
Domestic investment-grade corporate	18.9	14.1	Net buyers	17.6	15.3	Net buyers
Domestic high-yield	9.3	7.3	Net buyers	11.3	9.5	Net buyers

¹ Marketwide purchases and sales are each estimated as one-half of marketwide bond trading.

² US government bonds are US Treasury bonds, US agency bonds, and mortgage-backed securities issued by the US government.

³ Calculated using cumulative totals of actual data for the period January through October 2016.

⁴ Calculated using bond mutual funds' projected purchases/sales of bonds over the eight-month projection period relative to projected marketwide bond purchases/sales that were based on average purchases/sales for the period from January through October 2016.

Sources: Investment Company Institute, New York Federal Reserve Bank, and FINRA TRACE

Conclusion

Bond mutual fund investors did not overreact to rate changes during the 2013 Taper Tantrum, and bond fund managers were not forced to sell bonds into a declining market. In a similar scenario of sharp, unexpected interest rate increases, potential outflows from domestic taxable bond mutual funds are expected to be modest and even a bit smaller than those experienced during the 2013 episode. In addition, we would not expect bond sales by mutual funds to have a sizable impact on the broader bond markets. Bond fund managers have other means of meeting redemption requests than selling bonds, and often use a nuanced approach in their bond trading.

Appendix: Forecast Methodologies

Projected Flows of Domestic Taxable Bond Mutual Funds

Our main assumption in this analysis is that current bond mutual fund investors react in the same manner as they did during the Taper Tantrum of 2013.

The forecast methodology uses the actual flow experience over the Taper Tantrum period. It applies that experience to the current level of bond mutual fund assets and projects that experience eight months into the future. In the first step, we calculate the actual flows for each month over the period from May to December 2013 as a percentage of April 2013 assets for each one of the 16 types of domestic taxable bond mutual funds classified by ICI. In the second step, we project flows for each type of domestic bond mutual fund for eight months in the future by multiplying the October 2016 level of total net assets in each type of bond fund by their actual monthly flow rates from the Taper Tantrum period.

For example, in the initial month of the Taper Tantrum (May 2013), bond mutual funds that primarily invest in intermediate-term debt issued by domestic investment-grade companies experienced outflows equivalent to 3.0 percent of their April 2013 assets. As of October 2016, these bond mutual funds had \$542.8 billion in assets under management. If interest rates were to rise by the same amount as in May 2013, we project that bond funds of this type, collectively, would have \$16.3 billion in outflows in month 1 (i.e., our projection for month 1 is $\$542.8 \text{ billion} \times -0.03 = -\16.3 billion).

To obtain the aggregate projected outflow of \$8.4 billion for month 1 shown in Figure 1, we performed this calculation for each of the 16 types of domestic taxable bond mutual funds and totaled their respective projected flows. For example, in our forecast for month 1, outflows from investment-grade intermediate bond funds were partly offset by projected inflows to investment-grade short-term bond funds. We used this method to calculate aggregate flow forecasts for each month forward using the appropriate monthly flow rate from the Taper Tantrum (i.e., month 2 used the June 2013 flow rate, month 3 used the July 2013 flow rate, etc.).

Projected Domestic Taxable Bond Mutual Fund Shares of Bond Trading

Our main assumption in estimating expected purchases and sales by domestic taxable bond funds was that fund managers would react to the projected flows in the same manner as in the May–December 2013 period. That is, they would buy and sell bonds with the same intensity or in the same proportion to flows. For each of the 16 types of domestic taxable bond mutual funds, we calculate the monthly purchase and sales intensity ratios for both US government bonds and corporate bonds over period from May to December 2013 as purchases divided by the absolute value of the flows and sales divided by the absolute value of the flow. Then, for each bond fund type, we project purchases and sales of US government bonds and domestic corporate bonds by multiplying the absolute value of the projected flow by the intensity ratios for each of the eight months in the projection period. High-yield bond mutual funds' purchases and sales of domestic corporate bonds were categorized as high-yield. All other funds' purchases of domestic corporate bonds were categorized as investment-grade.

For example, in May 2013, bond funds that primarily invest in intermediate-term bonds issued by domestic corporations had outflows of \$10.3 billion. In this particular month, these bond funds purchased \$7.6 billion in corporate bonds and sold \$7.5 billion in corporate bonds. We calculated the purchase-to-flow intensity ratio for month 1 as \$7.6 billion divided by \$10.3 billion, or 73.8 percent. The sales-to-flow intensity ratio for month 1 was similarly calculated as \$7.5 billion divided by \$10.3 billion, or 72.8 percent.

As noted earlier, we projected that domestic investment-grade intermediate-term bond mutual funds would have outflows of \$16.3 billion in month 1. Using the purchase and sales intensity ratios from May 2013, we project that fund managers would buy \$12.0 billion ($\$16.3 \text{ billion} \times 0.738$) in investment-grade corporate bonds and sell \$11.9 billion ($\$16.3 \text{ billion} \times 0.728$) in investment-grade corporate bonds in month 1. For each month forward, we employed the methodology described using the appropriate projected monthly flow rate and intensity ratios (i.e., month 2 used the June 2013 intensity ratios, month 3 used the July 2013 intensity ratios, etc.).

Projected totals for purchases and sales of US government bonds by bond mutual funds were obtained by adding across the different types of bond mutual funds in each month. Projected totals for purchases and sales of investment-grade corporate bonds by bond mutual funds were obtained by adding across 15 types of bond funds in each month. Projected purchases and sales of corporate bonds by high-yield bond mutual funds were excluded from the investment-grade bond category and instead were classified as high-yield bonds.

The monthly projected shares for bond mutual funds were estimated by dividing the projected monthly totals for bond mutual funds' purchases and sales by the average monthly trading activity from January through October 2016.



1401 H Street, NW
Washington, DC 20005
202-326-5800
www.ici.org