

**From:** Subcommittee on ETFs and Bond Funds  
**To:** FIMSAC  
**Date:** April 10, 2019  
**Re:** Report on the Design of Exchange-Traded Funds and Bond Funds – Implications for Fund Investors and Underlying Security Markets Under Stressful Conditions

The Subcommittee on ETFs and Bond Funds (“the subcommittee”) was tasked by FIMSAC to study the implications of the growth in fixed income exchange-traded funds (ETFs) and mutual funds on the liquidity and pricing in the corporate and municipal bond markets. In particular:

*“The subcommittee is charged with assessing the consequences of the increased presence of fixed income mutual funds and ETFs in these markets, including their current and possible future impacts on the liquidity and pricing of the underlying bonds under a variety of scenarios, as well as investor understanding of these products. Topics that may be considered include the interaction of fixed income prices and fund prices, including through the ETF arbitrage process, an assessment of the impact of redemptions from funds in stressed conditions, an assessment of the potential impact of the rebalancing process on underlying markets, whether funds help to diversify sources of fixed income liquidity, the role of index providers, and retail investor education.”<sup>1</sup>*

In the course of its fulfillment of this mandate, the Subcommittee on ETFs and Bond Funds has engaged in discussion with experts, including industry participants, academics, and (on some of these topics) regulators. The discussions have been both broad and technical, and a range of topics have been explored, some at length. The Subcommittee on ETFs and Bond Funds has previously written on related topics, including recommending establishment of a naming scheme for exchange-traded products (ETPs),<sup>2</sup> and recommendations to improve investor education surrounding ETPs as well as to explore the creation of a standardized centralized database to aggregate ETF information for the benefit numerous stakeholders.<sup>3</sup> This report – which represents the views of the subcommittee and not those of FIMSAC or the SEC, its staff, or its commissioners – on bond funds in stressed markets represents the synopsis of certain aspects our research and fact-finding and is meant to also serve as a compendium of relevant research on the topic.

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<sup>1</sup> Fixed Income Market Structure Advisory Committee—Subcommittees, available at: <https://www.sec.gov/spotlight/fixed-income-advisory-committee/fixed-income-market-structure-advisory-committee-subcommittees.htm>.

<sup>2</sup> Recommendation for an Exchange-Traded Product Classification Scheme (Oct. 2018), available at: <https://www.sec.gov/spotlight/fixed-income-advisory-committee/fimsac-etp-naming-convention-recommendation.pdf>.

<sup>3</sup> Recommendations for Investor Education and Data on ETFs (Oct. 2018), available at: <https://www.sec.gov/spotlight/fixed-income-advisory-committee/fimsac-etf-investor-education-and-data-recommendation.pdf>.

It should be noted at the outset that questions pertaining to stressed markets, including systemic risk, are highly complex involving not only funds, but the underlying markets and the behavior of investors. Indeed, these topics have been extensively analyzed and discussed for many years. A full discussion of the history, debates, economics and academic treatment of any one of these topics would likely require a very lengthy and detailed report that lies beyond the scope of the subcommittee's mandate. Rather, the subcommittee has chosen to focus on those topics that, in our view, have been the subject of the most discussion within the overall context of stressed markets and were similarly echoed in panel discussions.<sup>4</sup> We emphasize that this report is not meant as a compendium of all the issues regarding stressed market behavior.

This report starts with a foundational education of mutual funds and ETFs and describes the growth in assets under management of bond funds and ETFs in recent years. Given the large amount of attention to ETFs in the press, we focus the next section on ETF liquidity and pricing, including the arbitrage mechanism and the role of Authorized Participants (APs). We then discuss SEC requirements regarding liquidity risk management. We present evidence on the effect of stressed markets on fund liquidity, pricing, investor flows, and the liquidity of underlying bonds through a discussion of recent liquidity stress episodes. This report ends with a roadmap for future research, focused on further exploring gaps in current learning, including questions surrounding potential limitations that similarly impact this report's conclusions.

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<sup>4</sup> A complete record of the subcommittee's meetings and panel discussions is available at the SEC website at [www.sec.gov](http://www.sec.gov).

# Report on the Design of Exchange-Traded Funds and Bond Funds – Implications for Fund Investors and Underlying Security Markets Under Stressful Conditions

*Important Disclaimer: This report represents the views of the FIMSAC Subcommittee on ETFs and Bond Funds. It does not represent the views of the SEC, its staff, or any of its commissioners.*

## 1 Introduction

This report authored by the Subcommittee on ETFs and Bond Funds is to be submitted to FIMSAC as described in our attached cover letter. We begin our report with an overview of the structural characteristics of Exchange-Traded Funds (ETFs), mutual funds, and closed-end funds. These basic descriptions provide a foundation for further discussion relating the relationships between fixed income<sup>5</sup> ETF and mutual funds flows and the liquidity and pricing of the underlying securities under various market conditions. Given the large amount of attention to ETFs in the press, we focus the next section on ETF liquidity and pricing, including the arbitrage mechanism and the role of Authorized Participants (APs). We review liquidity risk management strategies of managed funds, and summarize the behavior of ETF and bond fund investors in prior stressed markets, with an emphasis on the empirical evidence to date. We end our report with suggestions for future research, including questions surrounding potential limitations of our conclusions.

### 1.1 Structural Comparisons of Mutual Funds, Closed-End Funds and ETFs

A mutual fund is an investment company that pools money from shareholders and invests in a portfolio of securities. A mutual fund will issue new shares to fulfill investors' purchase orders, and fulfill investors' sell orders by redeeming its shares. The Investment Company Act of 1940 requires that each business day a mutual fund calculate its NAV per share to reflect the current market value of the fund's portfolio securities, based either on readily available market quotations or fair value determined in good faith by the fund's board of directors. A fund's share price is its NAV per share plus any applicable sales charge. Rule 22c-1 of the Investment Company Act requires that shareholders purchasing or redeeming shares receive the next computed share price following the fund's receipt of the transaction order.<sup>6</sup>

The time at which a mutual fund prices its shares can be found in the fund's prospectus. Most funds price their shares at 4 p.m. EST. The SEC has stated that "Determining fair value requires taking into account market conditions existing at that time," and that when choosing pricing vendors, "a fund's board may want to assess, among other things, ... the extent to which the

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<sup>5</sup> Note that while some of our conclusions may extend to other asset classes such as equity, it should be understood that our focus in this report is on fixed income funds.

<sup>6</sup> Investment Company Institute, "Frequently Asked Questions About Mutual Fund Share Pricing", [https://www.ici.org/faqs/faq/mfs/faqs\\_navs](https://www.ici.org/faqs/faq/mfs/faqs_navs)

service determines its evaluated prices as close as possible to the time as of which the fund calculates its net asset value.”<sup>7</sup>

Retail investors rely on mutual funds to meet personal financial objectives, such as investing for retirement, saving for education, etc. Similar to fixed income ETFs, fixed income mutual funds provide individual investors a vehicle for diversification, such as tracking a broad index that contains hundreds of constituent bonds, through a single purchase.

ETFs combine characteristics of both closed-end and mutual funds (Agapova 2011). Like a closed-end fund or a stock, ETF shares can be bought and sold intraday at market determined prices in the so-called secondary market. Unlike a mutual fund, this requires an investor to possess a brokerage account. Like a mutual fund, ETFs continuously offer their shares for sale. However, unlike mutual funds, ETFs do not sell or redeem individual shares; ETF shares are bought and sold directly from the ETF asset manager by specialized entities in blocks called “creation units.”

Exhibit 1 summarizes the differences among ETFs, open-end mutual funds, and closed-end funds across different dimensions. There are two key differences between how this process works in an ETF versus a mutual fund that are relevant for this report. First, in an ETF, end of day primary market trades (i.e., those resulting in a change in shares outstanding through the so-called creation/redemption mechanism) are facilitated only by APs, a pre-approved group of institutional firms who have entered into an agreement with the ETF’s distributor. The ETF creation and redemption mechanism allows the shares of the ETF to adjust to demand and supply. In open-end mutual funds, shareholders generally transact with the fund itself at the end of day and at net asset value (NAV), while in listed closed-end funds, investors sell on an exchange and receive cash based on market liquidity at that moment in time but the supply of shares is fixed.

Second, in many ETFs, primary trades happen “in-kind” and do not require securities purchases or sales by the ETF.<sup>8</sup> To execute an in-kind trade, an AP presents a basket of securities to (or receives a basket of securities from) the ETF in exchange for ETF shares.

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<sup>7</sup> SEC Release No. 33-9616, “Money Market Fund Reform; Amendments to Form PF”

<sup>8</sup> Rule 22e-4(a)(9) under the Investment Company Act of 1940 defines “In-Kind ETF” as “an ETF that meets redemptions through in-kind transfers of securities, positions, and assets other than a *de minimis* amount of cash and that publishes its portfolio holdings daily.” The SEC staff has stated that it would be reasonable for an In-Kind ETF to determine that if the percentage of its overall redemption proceeds paid in cash does not exceed 5%, such use would be *de minimis*. The SEC staff has also stated that if an ETF’s percentage of overall redemption proceeds paid in cash exceeds 10%, it would be unreasonable to consider it a *de minimis* amount of cash for purposes of qualifying as an In-Kind ETF. See Staff of the Division of Investment Management, “Investment Company Liquidity Risk Management Programs, Frequently Asked Questions (as of Feb. 2018), at Q11, available at: <https://www.sec.gov/investment/investment-company-liquidity-risk-management-programs-faq>.

**Exhibit 1:  
Comparison of Fund Structures**

Attribute	Mutual Funds	Closed-End Funds	ETFs
Trading	End-of-day at NAV	Intraday	Intraday (for investors other than APs, who can also trade end-of-day at NAV)
Visibility into Holdings (Transparency)	Typically monthly or quarterly	Typically monthly or quarterly	Daily <sup>9</sup>
Shares outstanding	Number of shares can change at end of day based on purchases and redemptions	Supply of shares is fixed	Number of shares can change at end of day based on creations and redemptions
Pricing	All transactions are at the fund's end-of-day NAV	Initial public offering price and after IPO - market determined	Primary market- end-of-day NAV Secondary market- market determined
Liquidity (investor perspective)	End of day only (Primary Processes)	Intraday – subject to market liquidity (Secondary Market )	Intraday (Secondary Market) and End of day (Primary processes)
Redemption Issues	Cash – fund managers trade to meet net redemptions; there may be redemption fees	No redemption as shares are fixed; only secondary market trading	Primary market trading via APs adjusts shares
Settlement	Cash	Cash	In-kind or cash

**Source:** Based on descriptions in Agapova (2011), ICI (2018), Madhavan (2016) and other sources.

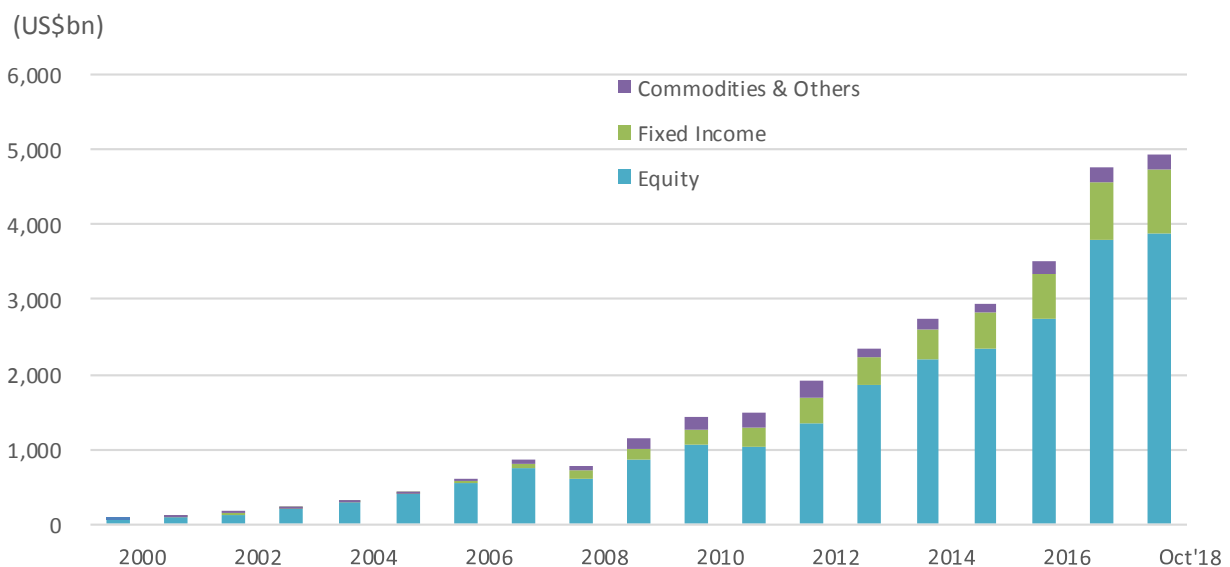
<sup>9</sup> SEC exemptive orders for actively managed ETFs and recent orders for index-based ETFs with an affiliated index provider have required full portfolio transparency. Exemptive orders for index-based ETFs with an unaffiliated index provider have required publication of the ETF's baskets. See Securities and Exchange Commission, "Exchange Traded Funds" (2018) at n. 207, available at: <https://www.sec.gov/rules/proposed/2018/33-10515.pdf>.

## 1.2 Growth of Fixed Income Mutual Funds and ETFs

Assets in fixed income open-end mutual funds and ETFs have seen rapid growth in recent years. Overall, fixed income mutual funds and ETFs account for 11% of the U.S. bond market (US government bonds, corporate bonds, and tax-exempt bonds) as of December 2018, up from 7% a decade earlier. Fixed income index mutual funds (i.e., those that seek to track an index) held approximately 1.5% and actively managed mutual funds 7.8% of the \$40.3 trillion US fixed income market, as of year-end 2018. The corresponding figures for ETFs (primarily index, but includes some active funds) is 1.6%.<sup>10</sup>

The share of global assets under management in fixed income ETFs is rising, and at a faster rate than fixed income mutual funds.<sup>11</sup> Exhibit 2 below shows global fixed income, equity, commodity and other types of ETF assets under management to illustrate the increase in fixed income ETF assets from when the first such fund was introduced in July 2002.<sup>12</sup>

### Exhibit 2: Global ETP Assets



**Source:** BlackRock ETP Landscape October 2018

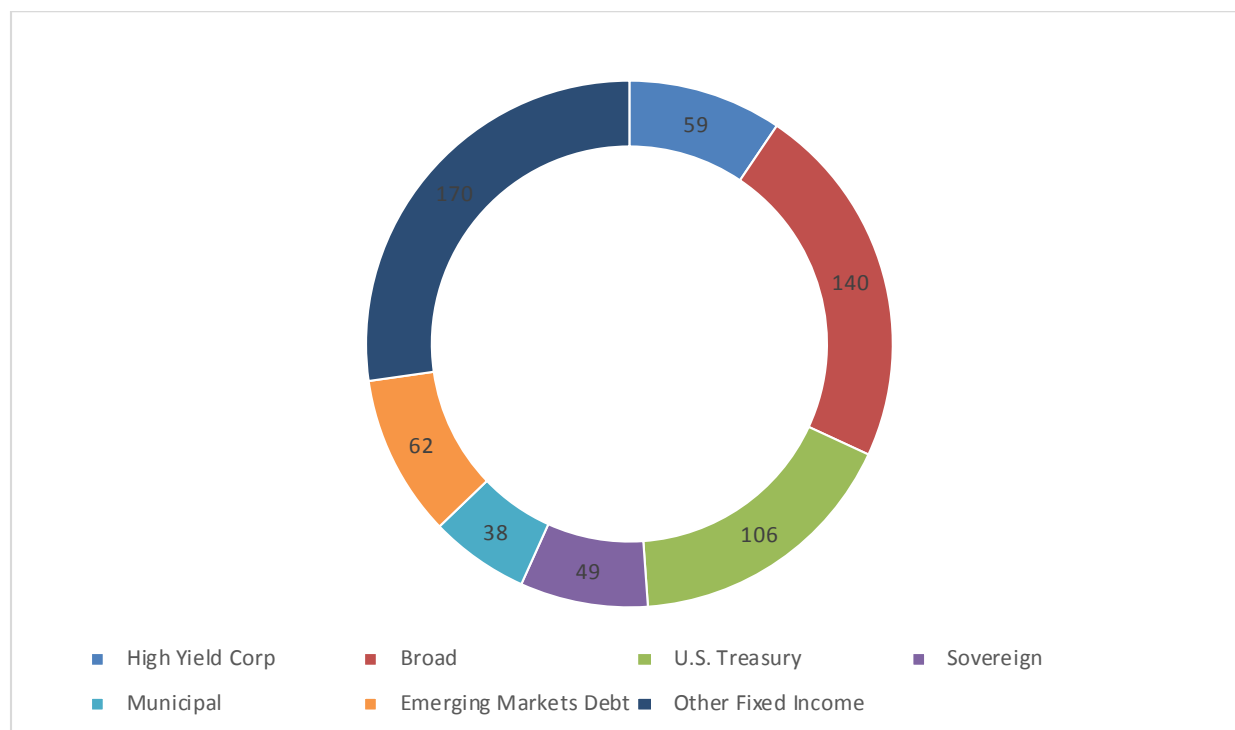
<sup>10</sup> Retail investors (i.e., households) held 95% of US long-term mutual fund (equity funds plus fixed income funds) total net assets at year-end 2017. Investment Company Institute, Investment Company Fact Book (2018 and 2014 annual editions) and “Trends in Mutual Fund Investing, December 2018” monthly release.

<sup>11</sup> Investment Company Institute 2018; Hill, Hougan, and Nadig 2016.

<sup>12</sup> Source: ETF.com October 2017 ETF Report, available at: <https://www.etf.com/publications/etfr/issue/fixed-income>

Fixed income ETFs have experienced growth in a variety of sub-asset classes of the bond market in recent years. Initially, these were typically portfolios of investment grade and government bonds, but have been extended to other categories including high-yield bonds, emerging market bonds, and even bank loans. Exhibit 3 shows a snapshot of assets globally across a wide variety of sub-asset classes of fixed income ETFs as of October 2018. The graph is shown in dollar amounts but the relative sizes are immediately obvious.

**Exhibit 3:**  
**Fixed Income ETP Assets by Category in Billions of Dollars**



Source: BlackRock ETP Landscape October 2018

### 1.3 Factors that explain the growth in fixed income ETFs and Bond Funds

What factors drive the growth in open-end mutual fund assets and ETFs in particular?

Investors in individual bonds face a number of challenges. First, many individual corporate bonds trade primarily in the opaque, dealer (“over-the-counter” or OTC) market characterized by a lack of accessible pre- and post-trade transparency, lack of liquidity, and infrequent trading. Bid-ask spreads in fixed income markets can be significantly higher than spreads in equity markets, particularly for retail size transactions, and dealers may build their commissions (“mark ups”) into prices. By contrast, fixed income ETFs trade intraday on electronic exchanges

("lit" markets) that offer a high degree of transparency, meaning that actionable bid and offer quotes are readily available.

Second, many fixed income ETFs have low bid-ask spreads compared to the underlying bonds (Madhavan 2016), and commissions are explicitly stated, as with equities.<sup>13</sup> For individual investors, it may be easier and cheaper to invest broadly in fixed income through an ETF (and a mutual fund) as opposed to purchasing individual bonds through their broker.

Third, from the viewpoint of portfolio construction, keeping constant the maturity of a fixed income portfolio comprised of individual bonds may require ongoing attention and frequent trading, but a fixed income ETF (and a mutual fund) can be designed to do this without the need for trading. For individual investors, fixed income ETFs and broad, open-end mutual funds provide a way to obtain instant diversification (many tracking indexes such as the iBoxx Investment Grade Index or the ICE BofAML 0-5 Year US High Yield Constrained Index with hundreds of constituent bonds) in a single trade.

In the context of these challenges, fixed income ETFs, like mutual funds, are attractive to individual (retail) bond buyers because of low cost, diversification, and transparency. Other investor types, such as hedge funds or large institutions, increasingly use fixed income ETFs for a variety of purposes including gaining broad market exposure, as tools to mitigate risk in portfolio transitions (where institutions move assets from legacy to target portfolios), and for portfolio completion (e.g., filling in an exposure gap, say, with emerging market bonds to complement an exposure to broad global fixed income), etc.<sup>14</sup>

In the context of the growth in fixed income index mutual funds and ETFs that track indexes, it is worth noting that the concept of index investing in fixed income is not as well established as in equities. Exhibit 4 shows the approximately \$40 trillion US fixed income market broken down by investment category. We distinguish index and active mutual funds, and also estimate the assets tracking indexes that are managed by institutions. Note that the ETF figures include both index and active funds, but the great majority of ETF assets are in index products. We note that most US fixed income assets (74%) are not managed by asset managers including those held by individuals, insurance companies, official institutions, etc. The remainder are "managed" in the sense that active managers, index managers, hedge funds, and others manage these assets with the objective of either tracking or outperforming an index. The share of ETFs is about 1% of the assets in investment grade and 3% of high yield (Madhavan 2016).<sup>15</sup>

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<sup>13</sup> For example, in 2018, municipal bonds, high-yield bonds, and investment grade bonds typically traded at bid-ask spreads of 25, 50, and 35 basis points, respectively.<sup>13</sup> By contrast, large fixed income funds (with assets of over \$10 billion) typically traded at spreads around 1 basis point. (BlackRock, Bloomberg, Barclays, NYSE Arca, as of 6/30/18.)

<sup>14</sup> See, e.g., Greenwich Associates, "ETFs: U.S. Institutions' New Tool of Choice for Portfolio Construction," (2019) or Tabb Group (2019) surveys.

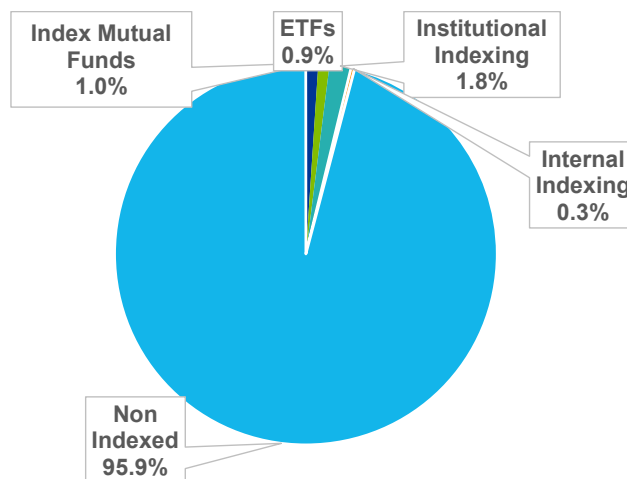
<sup>15</sup> Dannhauser (2017) compares the corporate bond ETF trading volume with total TRACE volume in ETF bonds. In the last quarter of 2013, ETFs trade \$2 for every \$5 of the underlying bonds. Since then, secondary market ETF volume has increased in ratio.



These statistics are worth keeping in mind as we turn to the possible risk factors associated with fixed income mutual funds and ETFs in stressed markets.

**Exhibit 4:**

**Distribution of US Fixed Income Assets – By Investment Style**



**Source:** “Index Investing Supports Vibrant Capital Markets”, BlackRock ViewPoint (2017), available at <https://corpgov.law.harvard.edu/2017/10/23/index-investing-supports-vibrant-capital-markets/> Data from World Federation of Exchange Database (WFED), BIS (data as of Q3 2016), HFR, Cerulli, Simfund (data as of Dec 2016), iShares GBI (data as of Dec 2016), Global Heat Map, McKinsey Cube.

**1.4 Potential Impact of Mutual Funds and ETF Flows**

**1.4.1 Fixed Income Mutual Funds**

Policy makers and observers have focused on flows into and out of fixed income mutual funds – especially during periods of market stress – as a potential contributor to higher volatility and risk.<sup>16</sup> In this section, we review some of the major considerations around flows out of fixed income mutual funds and, in the following section, ETFs. The impact of flows, particularly in

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<sup>16</sup> See for example:

Financial Stability Oversight Council, “Update on Review of Asset Management Products and Activities”, <https://www.treasury.gov/initiatives/fsoc/news/Documents/FSOC%20Update%20on%20Review%20of%20Asset%20Management%20Products%20and%20Activities.pdf>

International Monetary Fund, “Plain Vanilla Investment Funds Can Pose Risks”, <https://www.imf.org/en/News/Articles/2015/09/28/04/53/sopol040815b>

International Monetary Fund, “The Asset Management Industry And Financial Stability”, <http://www.imf.org/external/pubs/ft/gfsr/2015/01/pdf/c3.pdf>

times of market stress, is part of the subcommittee’s mandate to form an “assessment of the impact of redemptions from funds in stressed conditions, an assessment of the potential impact of the rebalancing process on underlying markets.” As noted previously, the subject of risk is complex and has been the subject of considerable previous academic and regulatory efforts. A detailed analysis requires context of other participants in the fixed income markets, the investor base in these funds and how banks, broker-dealers and others would respond in similarly stressed market conditions, subjects that are beyond the scope of the present report. We do not address whether any of the predicted outcomes are better or worse, from a policy perspective, than counterfactual market compositions. Rather, we focus more on the evidence to date on flows from funds, and how fund structures, as discussed earlier, may be relevant.

We had noted that a defining feature of mutual funds is their daily redeemability. Mutual fund shareholders may redeem their shares at the end of any business day. A fund must stand ready to meet any redemptions while also fulfilling ongoing obligations to its remaining shareholders, including the fund’s duty to pursue its stated investment objective, strategies, and policies. Reducing the risk that funds will be unable to meet redemption obligations and mitigating possible dilution of the interests of fund shareholders formed part of the SEC’s stated rationale for regulations addressing Open-End Fund Liquidity Risk Management Programs and related disclosure rules that were finalized between 2016 and 2018. These regulations are discussed below in Section 2.5 of this report.

Historical data on the behavior of both fixed-income fund investors and the funds themselves do not clearly support the idea that a prolonged decline in bond prices would drive fund shareholders to sell *en masse*. For example, fixed income mutual funds’ \$144 billion cumulative net outflows between October 1, 2018 and January 9, 2019, a recent period of high volatility, represented 3.4% of the \$4.2 trillion in fixed income mutual funds as of September 2018 (before the start of the outflows). Despite \$32 billion of net outflows from fixed income mutual funds in October 2018, all major categories of fixed income funds were net buyers of bonds that month.<sup>17</sup>

Exhibit 5 below summarizes some of the relevant data on outflows as a fraction of assets under management. Prior periods of sustained outflows from fixed income funds in 2008, 2013, 2015, and 2016 likewise amounted to a small share of fixed income fund assets. The longest and largest such period, encompassing 31 weeks from June 5, 2013 to December 31, 2013, coincided with \$168 billion in outflows, or 4.8 percent of fixed income fund assets at the time.<sup>18</sup>

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<sup>17</sup> Investment Company Institute, “Debunking Assumptions About Bond Mutual Funds’ Flows and Bond Sales”, [https://www.ici.org/viewpoints/view\\_18\\_bond\\_flows\\_purchases](https://www.ici.org/viewpoints/view_18_bond_flows_purchases), and “Summary: Estimated Long-Term Mutual Fund Flows Data (xls)”, [https://www.ici.org/info/flows\\_data\\_2019.xls](https://www.ici.org/info/flows_data_2019.xls)

<sup>18</sup> Investment Company Institute, “Debunking Assumptions About Bond Mutual Funds’ Flows and Bond Sales”, [https://www.ici.org/viewpoints/view\\_18\\_bond\\_flows\\_purchases](https://www.ici.org/viewpoints/view_18_bond_flows_purchases)

## Exhibit 5: Redemptions from Fixed Income Mutual Funds as a Share of Fixed Income Fund Assets

<i>Period of Net Redemptions</i>	<i>Cumulative Outflow (\$ billions)</i>	<i>Percentage of Total Net Assets<sup>a</sup></i>
6/5/2013–12/31/2013 <sup>b</sup>	-\$168	-4.8%
9/18/2008–12/17/2008	-\$73	-4.2%
10/1/2018–1/9/2019	-\$144	-3.4%
7/29/2015–10/7/2015	-\$56	-1.6%
11/11/2015–2/13/2016	-\$43	-1.2%

<sup>a</sup> Cumulative outflow over the period as a percentage of fixed income mutual fund assets at the month-end prior to the start of the period of net redemptions.

<sup>b</sup> Data contain two one-week periods with small inflows.

Source: Investment Company Institute and ICE Data Services

In summary, the evidence to date does not provide support for the notion of a negative feedback loop, where volatility drives net outflows that in turn cause portfolio managers to sell assets to meet redemptions, further accentuating a decline in the overall fixed income markets.

Having discussed the possible impacts of redemptions from fixed income mutual funds in times of stress, we turn now to the corresponding questions for fixed income ETFs.

## 2 Liquidity of Fixed Income ETFs and Underlying Securities

The rapid growth of ETF assets, particularly in less liquid parts of the bond market such as high yield, has generated considerable discussion and several commentators have raised liquidity concerns.<sup>19</sup> We consider ETFs separately from mutual funds, and discuss certain characteristics particular to this vehicle including fixed income ETF liquidity and pricing, possible risks presented by the role of APs— including “step away” risk (where APs possibly simultaneously cease their primary market activities) and “liquidity mismatch” risk (where the fund’s underlying constituents are relatively illiquid). We also discuss effects of stressed market conditions on liquidity and pricing for ETFs and mutual funds.

<sup>19</sup> As a recent example, see “Why Most Index Funds and ETFs Are Not Good Investments,” by Robert C. Lawton, Forbes, April 7, 2019, who notes: “There is concern from many investors about the liquidity of ETFs especially during significant market volatility. The more thinly traded the ETF, the more likely it will have pricing issues during periods of market stress. Also, those ETFs that tend to be unique in their composition are thought to be subject to mis-pricing during periods of market volatility. With over 2,000 ETFs in existence, many feel at least half are subject to liquidity problems.” Available at: <https://www.forbes.com/sites/robertlawton/2019/04/07/why-most-index-funds-and-etfs-are-not-good-investments/#373182f17555>

## **2.1 Impact of Fixed Income ETFs on the Liquidity of the Underlying Markets**

We begin with an examination of the possible impacts of the growth of fixed income ETFs on the liquidity of underlying bonds. Liquidity is a term commonly used to refer to the ability to buy or sell without significantly impacting the market price of the security. Some academic theories (see Bessembinder, Spatt and Venkataraman, 2018) suggest that the presence of an ETF could improve the liquidity of the underlying bonds in many ways. ETFs may provide a low-cost mechanism for fixed income dealers to hedge their inventory risk, and thus may reduce bid-ask spreads in the underlying bonds. The competition among participants performing ETF arbitrage could increase dealer participation and further attract new traders, thus leading to a liquidity spillover from ETF to the underlying bonds by arbitrage trading (Nam 2018). Evidence from equity markets suggests that increases in ETF ownership decrease the trading costs for institutional investors in the underlying stocks, and that the main mechanism is via a reduction in price impact costs due to an improvement in stock resiliency (Saglam, Tuzun and Wermers (2018)).

Further, the trading advantage of informed participants over less sophisticated traders is lower in a basket portfolio than in individual securities (Subrahmanyam 1991). This is because information asymmetries that arise due to security-specific private information are less severe in basket portfolios than individual securities. The growth in AUM of fixed income ETFs suggests that these products offer a convenient way for fixed income investors to build diversified positions.

However, other studies point out that the migration of less-informed traders to basket securities, such as ETFs, could hurt the liquidity of individual securities that make up the basket (an early study is Gorton and Pennecchi 1993). Evidence from equity markets suggests that the introduction of a basket security, such as equity index futures or ETFs, is associated with a deterioration in liquidity of the underlying stocks (Jagadeesh and Subrahmanyam, 1993) and more recently Israeli, Lee and Sridharan (2017). In the context of corporate fixed income ETFs, Dannhauser (2017) finds that ETFs reduce the proportion of retail trading and increase institutional ownership in the underlying bonds, and insignificantly or negatively impact the liquidity of individual corporate bonds. By comparing liquidity of corporate bonds before and after introduction of ETFs, Nam (2018) finds that liquidity improvements are larger for highly arbitrated, low volume, high-yield, long-duration bonds, and for 144A bonds, indicating that bonds that are less accessible to investors before ETF introduction benefit from the liquidity spillover from ETFs.

In summary, the theoretical and empirical evidence regarding the impact of fixed income ETF growth on the liquidity of the underlying bond markets is not conclusive, and is an area for future research.

## **2.2 Understanding Fixed Income ETF Premiums and Discounts**

One of the main sources of confusion with respect to fixed income ETFs is the observed premium (or discount) to NAV and the volatility of these premiums. Many commentators assume that deviations of price from NAV for fixed income ETFs represent pricing errors, particularly in times of market stress. Further, the size and volatility of premiums and discounts for fixed income ETFs appear to be much larger than corresponding equity ETFs (Tucker and Laipply 2013), leading to perceptions of relative inefficiency. Premiums and discounts in fixed income ETFs tend to widen in absolute value in more volatile times (Madhavan and Sobczyk 2016; Antoniewicz and Heinrichs 2015).

ETFs can be active or may track indexes. Common indexes – by design – typically contain more liquid bonds than the entire universe. Secondary market liquidity and low bid-ask spreads (for large funds) mean that fixed income ETFs are often the choice of exposure vehicle in times of stress. ETF prices equilibrate supply and demand, even in stressed times when the underlying bonds may be more illiquid. Indeed, while fixed income ETFs trade throughout the day on an exchange, many individual OTC bonds may not trade at all on a given day. So, larger absolute premiums and discounts to NAV in times of market stress are not evidence of mispricing; they are to be expected given the points above.

Of course, some premiums/discounts do reflect transitory price shocks, but these should be arbitrated away quickly if they exceed transaction cost bounds, as explained below. Madhavan and Sobczyk (2016) examine statistically all US-domiciled ETFs in the period 2005-2014, including equity and fixed income ETFs. They conclude that premium/discount volatility is mainly a reflection of infrequent trading of the underlying bonds as constituents in the OTC market, rather than anomalous behavior of the ETFs themselves. The difference in return behavior can lead to premiums/discounts to NAV that are independent of true dislocations in value. Staleness in prices and illiquidity means that NAV adjusts more slowly, causing premiums or discounts to widen, particularly in stressed times.

We also note that premiums and discounts in fixed income ETFs may reflect the over-the-counter nature of the bond market. Individual OTC fixed income securities typically trade at much wider bid-ask spreads than listed domestic equity securities (Hendershott and Madhavan 2015).<sup>20</sup> The wide bid-ask spreads and relative lack of trading lead to larger arbitrage boundaries than typical equities; these spreads are reflected in market price deviations from NAV (note that fixed income ETF NAVs are typically marked to the bid side of the underlying market), relative to domestic equity ETFs.

In summary, premiums and discounts for fixed income ETFs are not necessarily evidence of mispricing or of challenges to liquidity. Clearly, there is scope for more academic research on this subject including the link between primary market activity and actionable arbitrage opportunities.

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<sup>20</sup> Bessembinder, Spatt and Venkataraman (2018) present the academic evidence on trading activity and transaction costs in Treasury, corporate, municipal and structured credit markets.

Another set of concerns voiced by commentators regarding ETFs in general (not solely fixed income funds) relates to the unique way that ETFs adjust their shares outstanding, a subject we now turn our attention towards.

## **2.3 Authorized Participants and “Step Away” Risks**

### **2.3.1 Understanding the Arbitrage Mechanism**

The key role of APs in adjusting the ETFs shares outstanding to reflect supply and demand has often given rise to questions about the possibility of market disruption should one fail or if they were to “step away” in unison during a time of heightened volatility.

Before we consider this potential, it is helpful to define the various participants in the ecosystem from a liquidity provision perspective. It is important to note that APs and market makers (i.e., broker-dealers who regularly provide two-sided (both buy and sell) quotations) are distinct. An AP does not have to be a market maker in a given ETF, nor does a market maker need to be an AP. That said, some institutions are both an AP and a market maker in a given ETF. As noted earlier, only APs have the ability to utilize the creation/redemption process explained earlier.

Most active APs also act as agents to facilitate creations or redemptions (known as primary market trading) on behalf of their clients.<sup>21</sup> These activities could be on behalf of market makers, as well as institutions trading in large blocks who find it cheaper to (say) buy an ETF via the channel of primary market liquidity than trading in the secondary market. In this respect, the AP can be viewed a provider of technology that facilitates the creation and redemption process. Market participants (APs and market makers) use this technology (or capability) to balance the supply and demand of the ETF shares.

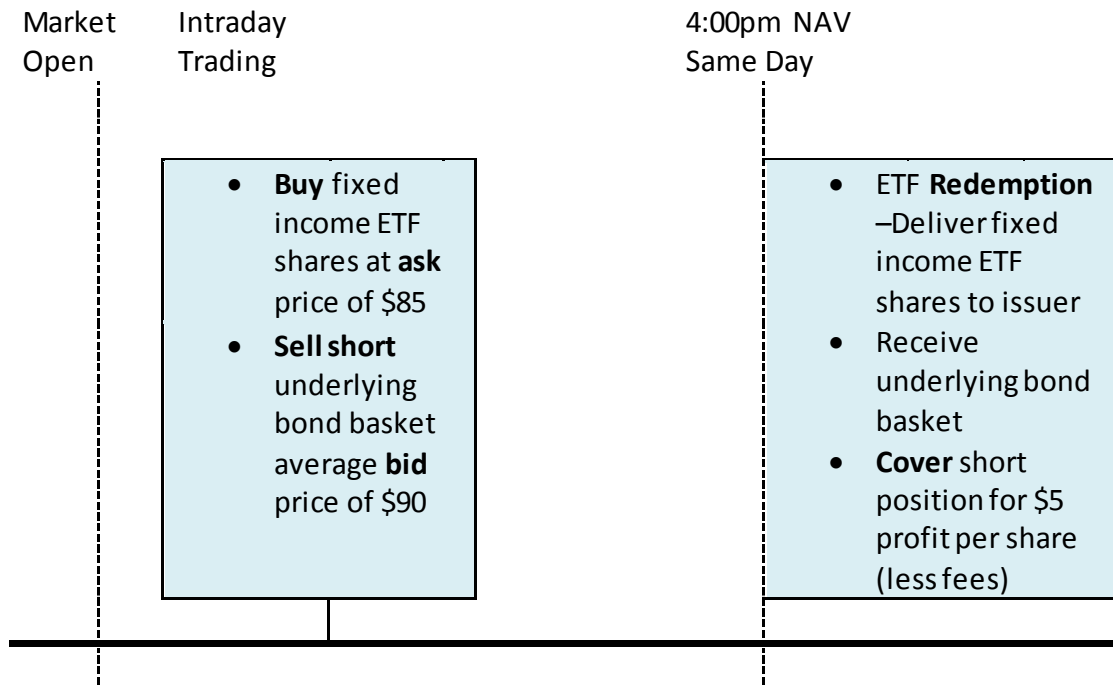
APs play a critically important role (see Antoniewicz and Heinrichs (2015) and Pan and Wang (2018)) through the creation/redemption arbitrage mechanism. Exhibit 6 below shows the normal arbitrage process where the AP reacts to a discrepancy between the price of a fixed income ETF and intrinsic value (i.e., the current value of the underlying basket) of the funds, resulting in a creation or redemption. In the top panel, the ask price of the ETF in the secondary market has fallen to \$85 (the bid price will be lower) while the average price of the underlying basket of bonds inclusive of transaction costs (i.e., the average bid price) is assumed to be \$90. (Note that in this illustrative example, the price of the bond basket is not necessarily NAV because this value may be stale and may not reflective of where the basket presently trades.) The AP (or a market maker utilizing them) sells short the bond basket while simultaneously buying the ETF, locking in a \$5 gain per share (less creation/redemption fees) at the time of the trade. The position is closed out from an accounting perspective at the end of

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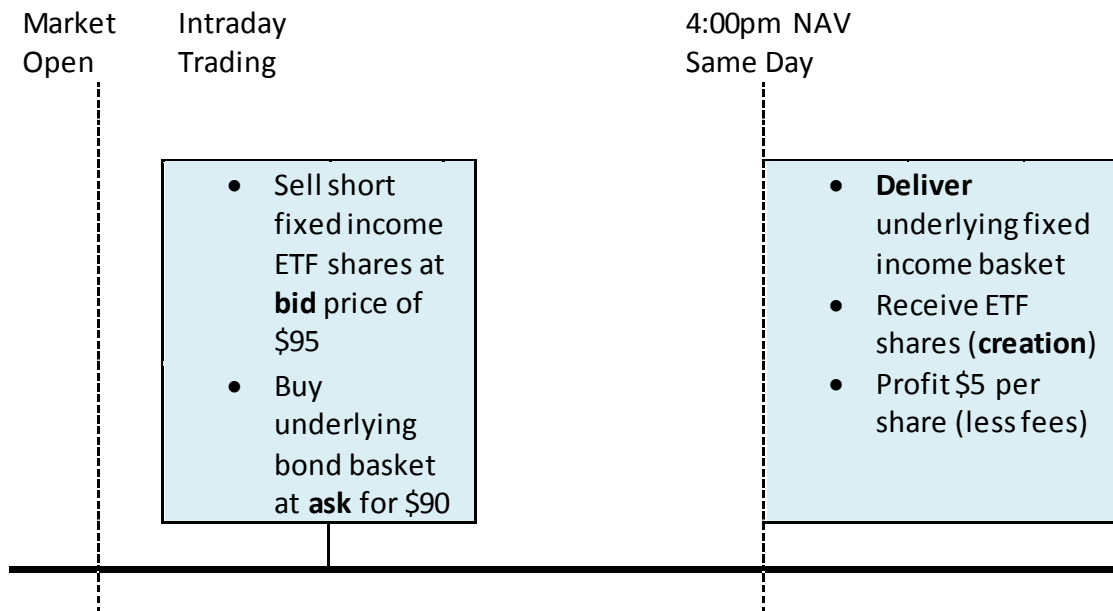
<sup>21</sup> APs do not receive compensation from the ETF sponsor and have no legal obligation to create or redeem the ETF's shares. Rather, APs are compensated either through their market making activities in the secondary market, or through service fees they collect from clients (such as independent market makers) who may engage them to facilitate primary market trades on their behalf.

the day when the AP redeems the ETF to obtain the bonds needed to cover the short position. The bottom panel shows the reverse.

**Exhibit 6:  
Fixed Income ETF Arbitrage Illustrative Example (ETF Price below Intrinsic Value)**



**ETF Arbitrage Illustrative Example (ETF Price above Intrinsic Value)**



**Note:** Hypothetical example for illustrative purposes only. Although market makers will generally take advantage of differences between the NAV and the trading price of ETFs shares through arbitrage opportunities, there is no guarantee that they will do so.



Observe that primary market flows are in the same direction of the difference between price and the intrinsic value of the basket, net of transaction costs. The process depicted in Exhibit 6 represents what is typically referred to as the arbitrage process in the primary market. In the secondary market, any trader (including hedge funds, market makers, and others) may choose to buy or sell ETFs if they believe they can profit from the trade. Such actions also will tend to align the ETF price with the perceived intrinsic value of the fund.

### **2.3.2 “Step Away” Risks**

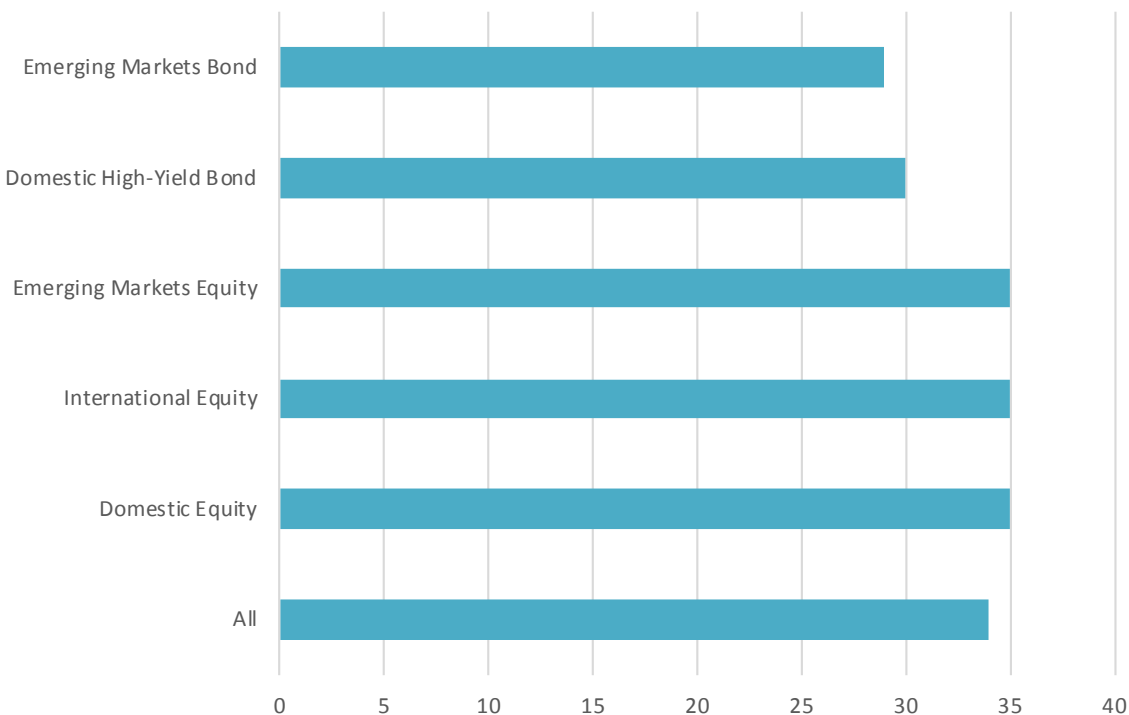
One of the concerns often voiced around APs has to do with the possibility that they cease their arbitrage activities in times of stress, possibly at the same time, causing a price dislocation. Before we review so-called “step away” risk, it is useful to provide some context on the number of ETF APs. An analysis of 931 US ETFs by Antoniewicz and Heinrichs (2015) covering \$1.8 trillion of assets under management shows that the largest ETFs – presumably those funds of most concern from a systemic risk perspective – have an average of 38 APs.<sup>22</sup>

Exhibit 7 shows the mean number of APs across equity and fixed income ETF categories. In the event an AP steps away from the market, other active or inactive APs may act upon the opportunity to interact with the ETF, although there is no obligation to do so. Liquidity providers such as market makers or hedge funds may also buy an ETF share that is trading at a price that is below its intrinsic value on the secondary market if their profit exceeds transaction costs.

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<sup>22</sup> The new Form N-CEN contains information that will shed more light on APs.

**Exhibit 7:  
Mean Number of APs by ETF Category**



**Source:** Antoniewicz and Heinrichs (2015,) based on ICI survey data.

Still, the fact that there are multiple APs for fixed income ETFs does not necessarily imply that “step away” risk is not a concern. Even though corporate bond ETFs typically have an average of 25 to 35 APs, only a handful of APs create or redeem shares actively on a typical trading day (Pan and Zeng 2018). Evidence from equity markets indicates that market makers without affirmative obligations tend to withdraw participation in unison when market conditions are stressful (Anand and Venkataraman 2016). APs are not required to create or redeem ETF shares. What could happen if all APs were to simultaneously withdraw in a major market event? In this scenario, with no link to adjust the ETF’s shares outstanding, the ETF would likely trade like a closed-end fund (that is, a fund with a fixed number of shares) with possibly wider premiums or discounts until at least one AP were to resume their operations.

We note that even in the Great Financial Crisis of 2007/8 and in other bond market stress events subsequently, there was not a case when APs all ceased their operations. A final nuance worth noting is the earlier highlighted distinction between APs and market makers. Presumably if actionable discounts were sufficiently large, market makers would buy ETF shares that were trading well below intrinsic value, stabilizing prices. As we have discussed, the AP’s “technology” or capability to create/redeem shares can be utilized at a modest creation cost by other participants such as market makers or liquidity providers (e.g., hedge funds), meaning that even if they choose not to deploy their capital there is still a mechanism to adjust shares outstanding.

## 2.4 Liquidity Mismatch

In the case of ETFs, liquidity concerns have been raised in the context of intraday trading of ETFs whose underlying constituents are relatively illiquid, so-called “liquidity mismatch.” These concerns arise in both the primary or secondary markets.<sup>23</sup>

Liquidity in the *primary* market, where the underlying securities trade, refers to the ability of APs to acquire the underlying assets and transfer them in-kind to the ETF provider for shares in the fund or vice versa. As noted above, creations and redemptions by APs act to correct price deviations between the ETF and underlying basket. However, Pan and Zeng (2018) suggest that APs may exacerbate a price decline in an ETF by “wrong way” trading, particularly in less liquid market segments. In their argument, APs may not efficiently facilitate the arbitrage process under certain circumstances when the individual securities are hard-to-trade – that is, when the magnitude of an AP’s bond inventory positions is large, thus leading to limited risk bearing capability, or when market conditions are stressful such as periods with high volatility, low liquidity, and high short selling costs, which make arbitrage more difficult.

Given their dual role as bond market makers and ETF arbitragers, Pan and Zeng (2018) argue APs may strategically use the ETF creation/redemption process to manage their inventory risk, and these conflicted incentives could further destabilize the market. So, in the case where the ETF price is below the intrinsic value of the basket (Panel A of Exhibit 6) that the AP would *create* more shares (as opposed to redeeming) by delivering up individual bonds to reduce their inventory carrying costs. If the AP were to sell these newly created shares, this could push the price of the ETF down further relative to the basket. But this behavior implies from Exhibit 6 above that the AP is forgoing profit from arbitrage. Further, other participants, such as market makers, may utilize the AP technology or capability to create or redeem as we noted earlier.

Another set of concerns relate to the so-called secondary markets, the venues where ETF shares trade. As previously noted, the trading of ETF shares on exchanges in the secondary market does not directly drive buying and selling of the underlying bonds but rather reflects changes of ownership of the ETF. Purchases and sales of stocks driven by the ETF creation and redemption process account for 3% of all US equity market trading.<sup>24</sup> In that sense, the ETF liquidity in the secondary market (via the creation/redemption mechanism of arbitrage) is generally greater than or equal to the liquidity of the underlying assets, and can add a layer of incremental liquidity to the financial markets. From a financial stability viewpoint, this buffer is additive.

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<sup>23</sup> While commentators often note that share volumes in ETFs have been rising as a fraction of average daily dollar volume it should be noted that these transactions are really exchanges of ownership in the ETF (buyers and sellers meeting on the exchange), not actually transactions with the ETF.

<sup>24</sup> Source: Citi ETF Perspectives, by Scott Chronert, March 12, 2019.

Further investigation is warranted to understand how APs participate under normal and stressful environments, and whether their participation tends to become highly correlated under stress conditions, which might point to a fragility scenario that warrants design improvement. There is also a need to understand the determinants of entry and exit by APs and how these entities compete with other liquidity providers such as market makers.

## **2.5 Liquidity Reporting**

Another frequent topic that arises in the context of funds operating in stressed markets is their liquidity profile. The SEC recently adopted new rules and forms for ETFs and certain mutual funds to report and disclose information related to the liquidity of portfolios.<sup>25</sup> In particular, the US Securities and Exchange Commission (SEC, or Commission) adopted new Form N-PORT which requires specific information about the fund's liquidity profile to be reported to the Commission. In addition, funds are required to provide a narrative regarding their liquidity risk management program within each fund's report to shareholders. Funds are also required to disclose principal risks of investing in a fund, including liquidity risk, as applicable.

The objective of the reporting and disclosure is to broadly promote effective liquidity management throughout the industry and to enhance disclosure to benefit regulators and investors. The reporting and disclosure rules should enable market participants to have insights into fund liquidity, and context around the fund manager's liquidity management processes and oversight.

### **2.5.1 Money Market Funds: Primary Reserve Fund & Subsequent Reforms**

One area where liquidity management has been particularly visible is with money market funds. In October 2016, the SEC implemented sweeping reform for money market funds. The reform of this \$2.7 trillion<sup>26</sup> part of the market was a direct result of the 2008 collapse of the Reserve Primary Fund, a significant victim of the financial crisis that caught certain money market investors by surprise. Among other things, the regulation established three definitive categories of money market funds - retail, government or institutional (or "prime" funds). The rule creates specific restrictions on what investors are allowed to purchase, retail money market funds. This distinction is relevant because retail and government money market funds can continue to trade at stable (i.e. \$1) NAV, but those funds classified as institutional have to float their NAV, similar to other open-end mutual funds. In addition, certain money market funds are permitted to impose liquidity fees when faced with significant redemptions, and can even temporarily suspend withdrawals (known as redemption gates).

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<sup>25</sup> See Securities Exchange Commission, "Investment Company Liquidity Disclosure" (2018), available at: <https://www.sec.gov/rules/final/2018/ic-33142.pdf>.

<sup>26</sup> Since the implementation of these rules, over \$1 trillion AUM has left or been reclassified from these prime, institutional funds.

## 2.5.2 How to Identify and Manage Illiquid Assets

As stated above, the SEC introduced Rule 22e-4 as a final rule in October 2016, creating a minimum standard of liquidity risk management for certain open-end mutual funds, inclusive of ETFs, but excluding money-market funds, which are subjected to more strict standards under the money market fund reform (described above). Among other things, this rule codifies long-standing guidance preventing funds from having greater than a 15% of NAV exposure to holdings classified as illiquid. To conform with this rule, funds are required to classify all portfolio holdings into one of four liquidity classifications (i.e. Highly Liquid, Moderately Liquid, Less Liquid or Illiquid) based on the number of days it takes to convert the holding to cash (or to sell/dispose of the asset for the latter two categories) under normal market conditions. Many funds have implemented regular and ongoing monitoring of their portfolios as part of their written liquidity risk management programs.

## 2.5.3 Forward-Looking Disclosures on Frictions in the ETF “In-Kind” Settlement

In a departure from the original proposal, the SEC was persuaded by industry feedback that ETFs have different liquidity profiles than other open-end mutual funds and thus are subjected to modified requirements under Rule 22e-4. Firstly, if the ETF redeems in-kind<sup>27</sup> (i.e. *de minimis* amount of cash redemptions), then the ETF is exempted from both the liquidity classification requirement, as well as a requirement for the fund’s board to set and maintain a minimum percentage of portfolio holdings invested in highly liquid investments (known as the highly liquid investment minimum). ETFs are also required to consider certain ETF-specific factors when assessing, managing and reviewing liquidity risk.<sup>28</sup> Finally, Exchange-Traded Managed Funds are treated in the same manner as ETFs under the rule.<sup>29</sup>

# 3 ETF and Mutual Funds in Stressed Markets

## 3.1 Impact of Flows

We turn now to a more detailed examination of how open-end mutual funds and ETFs have performed in times of market stress, focusing for the most part on fixed income funds. Recent evidence suggests that flow patterns in corporate bond mutual funds exhibit a concave relation with performance (Goldstein, Jiang and Ng 2017). That is, fund flows are sensitive to weak performance more than they are sensitive to good performance, and that sensitivity is greater

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<sup>27</sup> Via Form N-CEN, there is now public data on this activity.

<sup>28</sup> Rule 22e-4(b)(1)(i)(D). These factors are: (i) the relationship between the ETF’s portfolio liquidity and the way in which, and the prices and spreads at which, ETF shares trade, including, the efficiency of the arbitrage function and the level of active participation by market participants (including APs); and (ii) the effect of the composition of baskets on the overall liquidity of the ETF’s portfolio.

<sup>29</sup> See Securities and Exchange Commission, “Investment Company Liquidity Disclosure” (2018), available at: <https://www.sec.gov/rules/proposed/2018/ic-33046.pdf>.

when the funds hold less liquid assets and when the overall market illiquidity is higher. In contrast, the flow-to-performance sensitivity for equity mutual funds exhibits a convex shape. This greater sensitivity of outflows to weaker performance points to the possibility of flow-driven fragility in corporate bond funds, driven in part by the first mover advantage of exiting the fund early, since outflows exhibit greater liquidation costs for less liquid funds.

In the context of the possible impact of flows on fixed income market, it is important to keep in mind a key difference between fixed income ETF and mutual fund structures in stressed markets, namely that transaction costs in an ETF are externalized.<sup>30</sup> In other words, remaining investors in mutual fund bear part of the costs of the transaction costs incurred by the participants who redeemed or subscribed. In contrast, the sellers of the ETF shares will transact directly with buyers at a market determined price.

Mutual funds can potentially undertake a number of measures to reduce the “externalization” problem such as holding more cash and highly liquid securities with lower liquidation costs, putting restrictions on redemptions, or possibly an adjustment to the fund’s NAV known as “swing pricing”<sup>31</sup> (Chen, Goldstein and Jiang, 2010; Chernenko and Sunderam, 2016). Since mutual funds normally hold a liquidity buffer, they can potentially supply liquidity at times when other market participants are forced to sell bonds (Wang, Zhang and Zhang 2018; Anand, Jotikasthira and Venkataraman 2018).

Since many ETFs can meet redemption requests<sup>32</sup> in-kind, ETFs can invest more in less liquid securities with an advantage of minimizing tracking error.<sup>33</sup> In theory, when ETF selling activity exceeds ETF buying activity, the creation/redemption process in the primary market is used to

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<sup>30</sup> To illustrate, consider a highly simplified example of hypothetical fixed income mutual fund with one million shares outstanding trading at say \$103 per share. Suppose on a volatile day that there are \$5 million of inflows (subscriptions) and \$20 million of outflows (redemptions) for a net outflow of \$15 million, and the NAV falls to \$100. In the mutual fund example, subscriptions and redemptions will occur at the new NAV of \$100 (we are ignoring arbitrage frictions for simplicity) and the fund manager must sell \$15 million of the underlying assets. The average bid-ask spreads of the underlying assets on this day are (purely for illustrative purposes) assumed to be 0.20%, and so one-way transaction costs are 0.10%. These sales will tend to occur at the bid price of the underlying assets, and hence an average discount of 0.10% to NAV. At the start of the following day, NAV is equal to \$84,985,000, which is calculated as the original \$100 million, minus the \$15 million in sold assets, and also minus the transaction costs of selling. Net selling does not require the ETF manager to interact with the capital markets, meaning investors in an exactly equivalent and hypothetical exchange-traded fund who do not sell will hold a fund whose assets are valued at \$85 million.

<sup>31</sup> In 2016, the SEC adopted rules that allowed certain US open end funds to use swing pricing. See Securities Exchange Commission, “Investment Company Swing Pricing” (2016), available at:

<https://www.sec.gov/rules/final/2016/33-10234.pdf>.

Currently, Form N-CEN data indicates this is not being used in the US.

<sup>32</sup> Not all ETFs redeem in-kind.

<sup>33</sup> Rule 22e-4 under the Investment Company Act prohibits a fund from acquiring any illiquid investment if, immediately after such acquisition, it would have invested more than 15% of its net assets in illiquid investments that are assets. See Securities Exchange Commission, “Investment Company Liquidity Risk Management Programs; Commission Guidance for In-Kind ETFs” (2018), at p. 6, available at: <https://www.sec.gov/rules/interim/2018/ic-33010.pdf>.

handle these imbalances, and any excessive price deviation, thus linking ETFs to the underlying securities. Bhattacharya and O’Hara (2018) study a scenario where the underlying securities are hard-to-trade, which could reflect securities in less liquid markets, or securities that are ordinarily easy to buy and sell but become hard-to-trade under stressful conditions. In such scenarios, market makers in the underlying bonds learn from ETF prices and cannot distinguish between price changes that are relevant for the pricing the specific bond and those that are not relevant. Thus, while ETF trading facilitates price discovery at the portfolio level, the study posits that ETFs may lead to persistent price distortions of individual bonds from fundamentals, and excessive co-movements in returns of individual bonds.

Evidence from equity markets suggest that ETF daily returns tend to be negatively auto-correlated and such auto-correlation tends to be more negative when ETF turnover is high, consistent with the idea that ETF prices might contain noise that triggers ETF arbitrage (Da and Shive, 2017). First, it is well understood that when NAV is stale, ETF returns will be more volatile than the underlying index returns. In the view of some researchers, arbitrage activity propagates liquidity shocks from the ETF to the underlying stocks and increases volatility (Ben-David, Franzoni and Moussawi, 2017), and contributes to excessive stock return and liquidity co-movement among underlying stocks (Da and Shive, 2017). Others argue that any “non-fundamental volatility” is limited by arbitrage bounds and that effects ascribed to ETF flows may simply reflect investors’ desires for exposure that are independent of the choice of investment vehicle.

Further research should examine fixed income ETFs and underlying bonds to understand whether similar patterns are observed in individual bonds during normal and stress environments. This investigation seems particularly relevant for fixed income markets since bonds are generally harder to trade than stocks.

## **3.2 Real-World Examples of Funds in Stressed Markets**

Here we present a few real-world examples of stressed markets, and the effects on fund liquidity, pricing, and investor flows. These examples – that are not intended to be comprehensive or representative in any broader sense, but more to flesh out or previous discussions – serve to highlight the complexity of real-world responses. Some of the examples presented show minimal or no impact to fixed income funds while heavily impacting stock markets, while others showcase instances of discrete and cyclical impacts on fixed income markets.

### **3.2.1 Taper Tantrum in 2013**

Unexpected changes in central bank policy can induce significant shifts in fixed income markets. In the summer of 2013, the Federal Reserve unexpectedly proposed ending its quantitative easing program, leading to a significant sell-off in fixed income markets. Corporate bond mutual funds and ETFs experienced a record outflow of \$69 billion in June 2013, with continuing

outflows in subsequent months. Dannhauser and Hoseinzade (2018) study whether the outflows to corporate bond mutual funds and ETFs have an impact on the pricing of the underlying bonds and whether the price effects get subsequently reversed (i.e., price pressure). The study finds that outflows from mutual funds have no significant effect on corporate bond yield spreads following the Taper Tantrum while ETF outflows leads to significant yield movements that are reversed in subsequent months. In their study, a one-standard deviation increase in ETF outflows during the summer of 2013 leads to a 12.6 basis points increase in the yield spread of corporate bonds in summer of 2013. The study posits that intraday liquidity of ETFs is likely to attract short-term traders who focus on the behavior of other traders, rather than on long term fundamentals. The short-term traders tend to sell aggressively in periods of turmoil which affects the underlying bonds held by the ETFs. It is also possible that the results of Dannhauser and Hoseinzade (2018) reflect the fact that prices of liquid bonds adjust (those in the index and hence the ETF) while less liquid bonds do not benefit from the same level of price discovery.

### **3.2.2 Collapse of Third Avenue Credit Focused Fund**

Many market participants have questioned whether the fixed income funds – particularly in high-yield – can sustain heightened selling pressure driven by redemption flows and trade in an orderly fashion during periods of elevated market stress. The collapse of the Third Avenue Credit Focused Fund in a time of market stress in late 2015 received considerable press attention and provides some interesting insights on this topic. By way of context, this particular fund was an actively managed mutual fund specifically focused on very illiquid bonds. Indeed, 90% of the fund’s holdings (as of 7/31/2015) were rated CCC or lower or were unrated.

In December 2015, the US high-yield corporate bond market saw a surge in volatility associated with declining commodity prices. On December 9, 2015, it was announced that the Third Avenue Credit Focused Fund (TFCIX) was halting redemptions, news that further exacerbated investor concerns surrounding the US high-yield market. The Third Avenue incident rekindled fears that high-yield bond funds would be “forced sellers” during periods of already heightened selling pressure. During the period surrounding this highly unusual closing of a US mutual fund that coincided with selling pressure in the broader high-yield market, data suggests that high-yield ETFs may have actually served as a stabilizing force by providing a second source of liquidity on exchanges; in December 2015, redemptions in US high-yield ETFs totaled \$1.16 billion vs. \$6.4 billion for high-yield mutual funds.

### **3.2.3 Flash Events of 2010 and 2015**

A broader market issue that concerns both investors and regulators are “flash events,” marked by sharp price movements and subsequent reversals in compressed time intervals. In the “Flash Crash” of May 6, 2010, the Dow Jones Industrial Average dropped almost 1,000 points in 20 minutes. Many well-known stocks briefly traded at unreasonable prices, including some that traded at pennies. Exchange-traded funds were disproportionately represented among the



securities most affected with prices diverging widely from their underlying NAVs, which led some commentators to draw a connection between the sharp market moves on May 6 to the pricing and trading of these instruments.

Madhavan (2012) provides an analysis to explain why an event like the Flash Crash had not been observed before in financial market history focusing on market structure changes, including increased market fragmentation, high frequency trading, and the proliferation of new venues and notes: “The safeguards and reforms that have been implemented in the US equity markets should help slow down a potential future market disruption similar to the Flash Crash. But they have not eliminated the possibility that another Flash Crash would occur, albeit with a different catalyst or possibly in a different asset class.”

Indeed, flash events have taken place in other asset classes since 2010, including US Treasury bonds and currencies, where ETFs assets are minor. On October 15, 2014, the yield on the 10-year US Treasury note fell to 1.86% before reversing to 2.13% within a 15-minute time interval. A Joint Staff Report (2015) by staff of US Treasury, the Federal Reserve, and financial regulators found that the intraday yield change was eight standard deviations greater than normal and noted: “For such significant volatility and a large round-trip in prices to occur in so short a time with no obvious catalyst is unprecedented in the recent history of the Treasury market.” This report found that the speed and size of the yield changes seems to trace back to the evolving structure of the Treasury market, including the role of automated trading. As another example, the value of the UK pound sterling dropped by more than 6 percent against the US dollar in just a few minutes on October 6, 2016, falling to a record low of \$1.1378 (as reported in McDonald 2016). A very recent flash event in currencies occurred on January 2, 2019, when the Japanese Yen increased 8% against the Australian dollar in just 7 minutes, levels that had been maintained for almost a decade.<sup>34</sup> These examples suggest flash events are related to recent market structure changes.

In US equities, a flash event in August 2015 that resembled the 2010 Flash Crash led many industry participants including asset managers, brokers, and exchanges, to organize to affect many important changes in market structure. It is, however, important to note that these flash events were equity market events, affecting equity ETFs and stocks. Fixed income funds generally traded smoothly without undue disruption.

### **3.3 Recent Observations: US High-Yield Markets in 2018**

In 2018, we observed considerable volatility in high yield ETFs with negative returns and large outflows relative to assets under management. Funds in stressed periods experienced elevated secondary exchange volumes, elevated listed options activity, and premiums/discounts in line with price discovery and bid-ask spreads of underlying bonds. As of the start of 2018, the US high-yield market, represented by the outstanding market value of the ICE BofAML US High

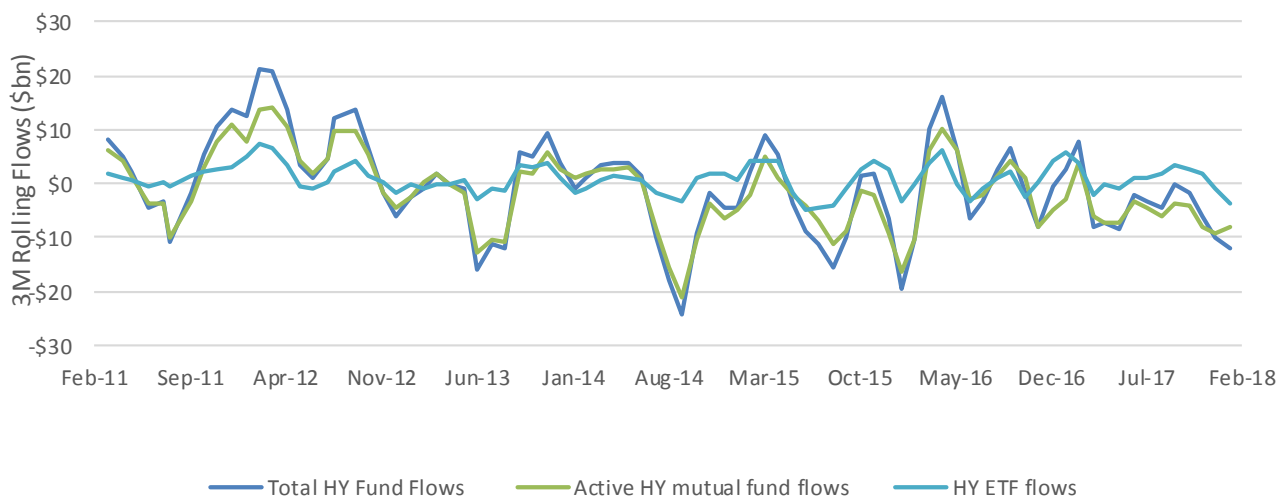
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<sup>34</sup> See “Flash-Crash Moves Hit Currency Markets” by Ruth Carson and Michael G Wilson, Bloomberg, January 3, 2019, available at

Yield Index, was about \$1.3 trillion. There are \$47 billion of assets in high-yield ETFs, vs \$267 billion in high-yield mutual funds that seek to beat a benchmark index (“active mutual funds”).<sup>35</sup> Thus high-yield ETFs represent 3.5% of the US high-yield market while high-yield active mutual funds represent 20.5% of the US high-yield market. For the early part of 2018, high-yield active mutual funds have experienced larger and more volatile flows consistent with past periods of high-yield fund outflows as shown in Exhibit 7 below. While this is admittedly a narrow 3-month window of time, it illustrates the broader point that ETF flows are not necessarily more volatile than active mutual fund flows.

**Exhibit 7:**

**US high-yield Funds (Active Mutual Funds and ETFs) – 3 Month Rolling Net Flows**



**Source:** Lipper, BlackRock, as of 1/31/2018.

In summary, in observed historic periods of stressed market conditions, ETFs have generally served as vehicles of price discovery. The ratio of secondary to primary volume rises in such times as buyers and sellers interact on organized exchanges. There is no evidence that fixed income funds have had liquidity problems in a limited number of scenarios including the collapse of Third Avenue Fund (2015), the Taper Tantrum (2013) and the Flash Crash (2010).

**4 A Roadmap for Further Research**

The diversity of real-world experiences highlighted in the previous section suggest the limitations to what we know. While the discussion so far has focused on summarizing the subcommittee’s findings regarding a focused set of topics, we turn now to areas where our conclusions are limited and where we feel there is a greater need for research. The subcommittee does not have a view on which entities should conduct this research, but rather

<sup>35</sup> Source: Barclays, Morningstar Direct, as of 1/31/2018.

seeks to identify gaps in our understanding and a possible roadmap for future investigation. This is also not intended to be an exhaustive list; the subcommittee recognizes that there are many important questions that lie beyond the scope of the present report. We see three general areas for future research.

First, the theoretical and empirical evidence regarding the impact of the growth in fixed income indexing (via mutual funds or ETFs) on the liquidity of the underlying bond markets is not, as we have reviewed, conclusive. This is a large, complex and important area for future research. This comment also applies to other asset classes. In particular, it would be valuable to quantify possible price effects associated with index membership, and also to understand whether the existence of ETFs in particular improves or detracts from the liquidity of the underlying bonds, and in a related manner, to price discovery at the security level. Further research should examine fixed income the underlying bonds held by bond funds to understand whether similar patterns are observed in individual bonds during normal and stress environments. This investigation seems particularly relevant for fixed income markets since bonds are generally harder to trade than stocks.

Second, the evidence to date suggests that premiums and discounts for fixed income ETFs are not necessarily evidence of mispricing or of challenges to liquidity. When the ETF share price trades at a premium or a discount to the value of the securities held by the ETF, there is an economic incentive for creation or redemption. However, such ETF-related, primary market trading may<sup>36</sup> lead to trading in the underlying constituents as described earlier. Clearly, there is scope for more academic research on this subject including the link between primary market activity and actionable arbitrage opportunities. As a topic for future study, it would be interesting to track the efficacy of the arbitrage process (say using data from form N-CEN) under stressful market conditions. Specifically, there is a need to better understand the role of Authorized Participants and their activities in relation to market volatility.

Third, as discussed above, flash events highlight the need for further research on liquidity gaps in increasingly fast-moving markets, and the role played by market structure and market participants, such as high frequency traders. Similarly, there is still much to be learned about the behavior of traders and the flows they induce in times of market stress. We would also recommend further analysis of whether secondary market trading in fixed income ETFs may serve as a source of price discovery and as a way for buyers and sellers to meet without necessarily impacting the underlying securities, particularly during periods of market stress.

## 5 Conclusions

While the increase in demand for fixed income funds is relatively recent, we are able to observe some similarities in their function and market impacts to those of more familiar equity

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<sup>36</sup> It is also possible the AP offsets any creation or redemption activity in derivatives markets versus trading individual bonds.

products. Although the existing body of research on equity ETFs may help inform avenues for further research on fixed income ETFs and their market impacts, it is important to understand the unique pricing and liquidity characteristics of fixed income markets. Recognition of these differences better informs our understanding of the arbitrage mechanism and the roles of APs in fixed income ETFs. With this understanding, we are better situated to identify potential investment and systemic risks associated with fixed income funds, and to begin analyzing further observations under, and implications of, stressed market conditions.

The Subcommittee believes this report and its underlying research are comprehensive based on market knowledge to-date, however ongoing research on this topic will be useful, especially during stressed market periods, given the dearth of specifically relevant research available. Further research could address limitations to our current understanding by examining relationships between fixed income ETFs and their underlying securities under prolonged or unusual conditions. Ongoing research might seek to:

- 1) Address gaps in our current understanding related to:
  - Mutual funds and less liquid holdings;
  - Behavior of fixed income ETF investors in extreme risk situations; and
  - Potential for APs to exacerbate a stressed market situation through their actions up to, and including, simultaneous withdrawal.
- 2) Evaluate the creation and redemption process pertaining to:
  - The number of APs active on any given day under various conditions and whether their participation is correlated.
- 3) Link the collection and categorization of new data sources to data that are currently available including:
  - Data highlighted in the FIMSAC bond fund subcommittee comment letter on investor education<sup>37</sup>; and
  - Transaction level data on bonds and data on fund flows.

As new data on fixed income transactions, liquidity, fund flows, and the actions of market participants in volatile environments become available, we might better understand these relationships, as well as better clarify unique factors impacting fixed income funds, their underlying bonds, investors and the broader fixed income markets.

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<sup>37</sup> <https://www.sec.gov/spotlight/fixed-income-advisory-committee/fimsac-etf-investor-education-and-data-recommendation.pdf>

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