GLOBAL FINANCIAL STABILITY

NOTES

Fund Investor Types and Bond Market Volatility

Yuhua Cai, Anna Helmke, Benjamin Mosk, and Felix Suntheim

Note/2025/002

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Abbreviations

ETF..... Exchange-Traded Fund

OEMF ..... Open-Ended Mutual Fund

Abstract

The increasing prominence of exchange-traded funds (ETFs) and open-ended mutual funds (OEMFs) in corporate bond markets raises important questions about their impact on financial stability. The market turmoil triggered by the outbreak of COVID-19 in March 2020 highlighted vulnerabilities in bond markets related to investment funds, as redemption pressure led to forced sales by OEMFs, which in turn amplified a selloff in underlying markets. While ETFs do not face the same vulnerabilities as OEMFs, they may also transmit shocks to markets, for example, through high liquidity–demand investors as documented during the 2013 Taper Tantrum.

Different structural features of ETFs and OEMFs may result in varying impacts on the underlying securities markets although the evidence is inconclusive. For instance, the guaranteed redemption of OEMF shares at the funds' net asset value can incentivize run-like behavior by investors. By contrast, transactions in ETF shares do not necessarily lead to sales in the underlying market.

ETFs and OEMFs also attract different types of investors, who behave differently, leading to divergences in their impact on the underlying markets. For example, ETF shares can be traded on an intra-day basis and can also be shorted, attracting more short-term investors who are more likely to sell during periods of stress compared with long-term investors.

This note explores the connection between the varied investor profiles of funds and the return volatility of the securities they hold. Based on the security-level data of US ETF and OEMF holdings, the analysis suggests that, on aggregate, a higher ETF ownership share may be associated with lower bond return volatility. However, there is a stark divergence between the behavior of institutional and retail ETF investors and their impact on the underlying market. When a larger share of a bond is owned by institutional investors through ETFs, its volatility tends to be higher. Conversely, retail investors tend to offset this impact of institutional investors. This disparity is not evident for OEMFs.

Policymakers should be aware of the underlying drivers of fund behavior on market stability and would benefit from an understanding of how the structural features of an investment vehicle can attract different investor clienteles. While policymakers might be able to influence these structural features through regulation, the investor allocation to different types of investment vehicles could change in response, potentially changing and shifting risks in nontrivial ways.

Introduction

Open-ended mutual funds (OEMFs) and exchange-traded funds (ETFs) serve as crucial intermediaries between investors and securities markets. Historically, these funds predominantly focused on publicly traded equities. However, since the global financial crisis, they have expanded into less liquid asset classes, including corporate bonds, which tend to be less liquid than, for example, Treasury notes, and can be susceptible to market instability during periods of stress. Yet, corporate bond markets play a vital role in credit provision to the real economy. Therefore, this note focuses on funds' investments in the US corporate bond market, the largest corporate bond market globally. By the end of 2023, US bond funds (including corporate and sovereign bond funds) managed $6.5 trillion, with ETFs and OEMFs accounting for $1.6 trillion and $4.9 trillion, respectively.[1]

ETFs and OEMFs can offer similar portfolio exposures but face different vulnerabilities because of their structural features. Especially passively managed ETFs and OEMFs show significant similarities in their portfolio holdings as they aim to track benchmark indices. However, a key feature of OEMFs is that investors can redeem their shares at the fund's net asset value which gives rise to the so-called payoff complementarities. This creates a first-mover advantage for investors to redeem their shares, potentially incentivizing run-like behavior and contributing to fire sales (Chen, Goldstein, and Jiang 2010, and Cetorelli, Duarte, and Eisenbach 2016). In contrast, ETFs rely on financial intermediaries known as authorized participants, who are incentivized to align the ETF share price with the value of the basket of underlying securities. While this mechanism can partially insulate the underlying securities market from the trading activity in ETF shares, it also introduces potential friction related to the authorized participants' ability to conduct arbitrage (Gorbatikov and Sikorskaya 2022).

Studies indicate that OEMFs can amplify adverse shocks as their design can encourage early redemptions and runs on funds (see, for example, Goldstein, Jiang, and Ng 2017; O'Hara and Zhou 2021; Bouveret and Yu 2021; Ma, Xiao, and Zeng 2022; International Monetary Fund 2022). Especially during times of stress, OEMFs may face large redemptions forcing them to liquidate assets in already illiquid markets, thereby amplifying asset price volatility. For example, during the COVID-19-related market turmoil in February and March 2020, the average OEMF experienced cumulative outflows of about 10 percent of net asset value (Falato, Goldstein, and Hortaçsu 2021). These vulnerabilities are more pronounced for funds with a larger liquidity mismatch, for example, funds offering daily redemptions while investing in illiquid asset classes (Jiang, Li, Sun, and Wang 2022; International Monetary Fund 2022).

Existing evidence on the impact of ETFs on market fragilities is inconclusive. Falato, Goldstein, and Hortaçsu (2021) document that ETFs were more resilient and experienced fewer outflows than comparable OEMFs during the COVID-19-related market turmoil. They attribute this resilience at least partially to the relatively lower sensitivity of ETF flows to fund-level asset illiquidity. Similarly, the International Monetary Fund (2022) finds that bonds predominantly held by ETFs experienced a smaller increase in return volatility during the COVID-19 market turmoil than comparable bonds held by OEMFs.

[1] Based on EPFR statistics. Other funds not classified as bond funds, for example, mixed funds, may also hold bonds.

These empirical results are consistent with theoretical predictions by Helmke (2023), who argues that ETFs may be less prone to transmitting shocks to underlying security markets because transactions in ETF shares do not necessarily lead to sales in the underlying markets.[2] This may temporarily shield the underlying market from the actions of ETF investors. However, Dannhauser and Hoseinzade (2022) find that ETFs created flow-induced pressures in corporate bond markets during the 2013 Taper Tantrum. They attribute this to a *clientele effect*, whereby ETFs attract high liquidity–demand investors who pass on shocks to securities markets.

Differences in funds' investor base could drive market fragilities. ETFs and OEMFs likely attract different types of investors. For example, OEMFs may appeal to investors who do not require intra-day liquidity but are wary of potential short-term mispricing in ETFs (Helmke 2023). In contrast, a significant share of ETF trading activity comes from the intra-day trading by liquidity traders as well as the hedging demands of institutional investors. These types of investors are typically absent from OEMFs, which are often held in retirement accounts such as 401(k) plans, where ETFs are often not available. Therefore, to identify the asset price fragilities associated with the fundamental structures of ETFs and OEMFs, it is essential to consider the investor clientele.

This note examines the relationship between funds' investor profiles and the return volatility of the securities they hold. Based on the security level data of US ETF and OEMF holdings, on aggregate, a higher ETF ownership share is associated with lower bond return volatility. However, there is a notable divergence in the behavior of institutional and retail ETF investors and their impact on the underlying market. When a larger share of a bond is owned by institutional investors through ETFs, the bond's volatility tends to be higher. The opposite is true for retail investors. The same disparity is not evident for OEMFs.

This note is structured as follows: the first section describes the growth and the nature of US corporate bond funds and then zooms in on how institutional investors use ETFs and OEMFs. The second section analyzes the relationship between fund holdings and bond market volatility, distinguishing between institutional and retail ETF and OEMF investors. The final section concludes and offers a forward-looking eye on future research.

[2] In addition, ETFs can select the securities baskets that they want to exchange for ETF shares. Differences between the creation and redemption baskets can help to absorb shocks to the bond market (Todorov 2021).

Investment Funds and the Corporate Bond Market

The Role of Open-Ended Mutual Funds and Exchange Traded Funds in US Corporate Bond Markets

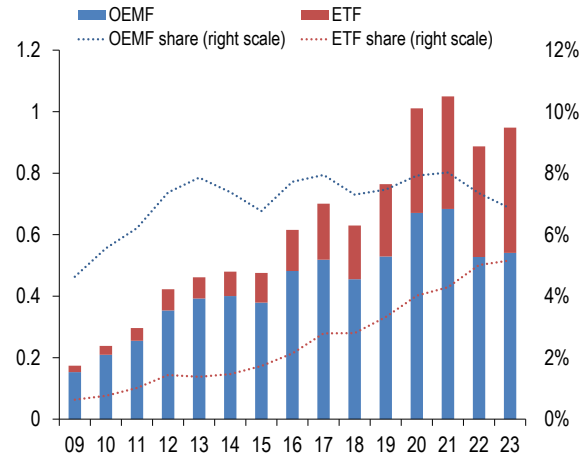
OEMF and ETF holdings of corporate bonds have grown markedly since the global financial crisis. While OEMFs still maintain a larger footprint in US corporate bond markets compared with ETFs, the role of ETFs has grown in recent years (Figure 1, panel 1). Combined, ETFs and OEMFs hold around $1 trillion of US corporate bonds, which represents around 12 percent of corporate bonds outstanding and over 4 percent of credit provided to US nonfinancial corporations (Figure 1, panel 2). As a share of the market value outstanding, their holdings are particularly large in the high-yield corporate bond segment (Figure 1, panel 3). The shift from active to passive investing has contributed to the growth of corporate bond ETFs which predominantly pursue index-based investment strategies, while most OEMFs continue to be actively managed (Figure 1, panel 4).[3]

Figure 1. Growth of ETFs and MFs in Corporate Bond Markets

ETFs and OEMFs have grown in importance, especially in high-yield corporate bond markets. While corporate bond ETFs tend to be passively managed, most OEMFs follow active investment strategies.

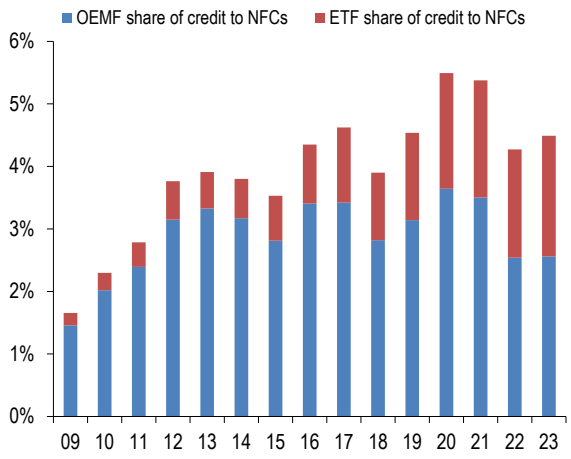
1. US MF and ETF Holdings of Corporate Bonds

(Holdings in USD trillion; percent of amounts outstanding—right scale)



2. US MF and ETF Bond Holdings as a Share of Nonfinancial Corporate Debt

(Percent of credit to non-financial corporations)

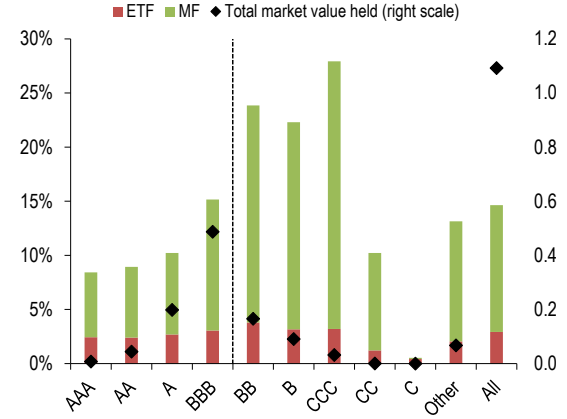


[3] Based on the London Stock Exchange Group Lipper classification. Index funds are classified as passively managed. Note that while there are more active US bond exchange-traded funds (ETFs) than passive ones, active ETFs tend to be smaller than passive ETFs, and weighted by assets under management, passive ETFs dominate.

Figure 1 (continued)

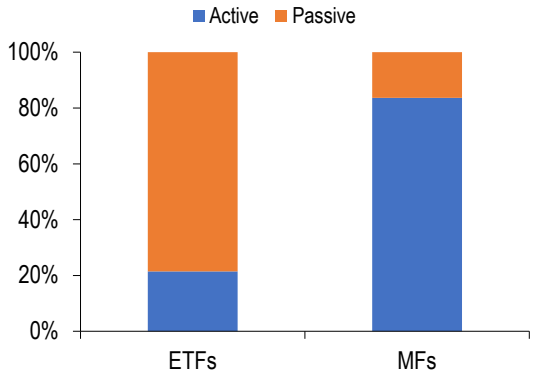
3. ETF and MF Holdings of Corporate Bonds

(ETF and MF holdings in percent of market value outstanding; right scale: total market value in sample, USD trillion)



4. Investment Strategy of ETFs and MFs

(Percent of aggregate assets under management)



Sources: EPFR, FactSet, Bloomberg Finance L.P., Bank for International Settlements; Lipper, Refinitiv; and IMF staff calculations. Notes: NFC = non-financial corporation.

Notes: In panel 3, the dotted line indicates the cutoff between high-yield and investment-grade ratings. In panel 4, US-domiciled bond funds are shown weighted by assets under management as of December 2022. ETF = exchange-traded fund; MF = mutual fund; OEMF = open-ended mutual fund.

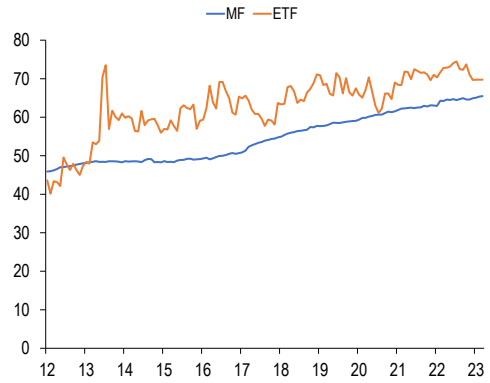
How Do Institutional Investors Use Bond Funds?

Institutional investors constitute a significant portion of the OEMF and ETF investor base. In the US, institutional holdings of bond ETFs and OEMFs have gradually increased from around 50 percent in 2012 to over 60 percent in 2023 (Figure 2, panel 1).[4] Nearly half of ETF shares are held by investment advisors (which includes OEMFs). Other notable institutional investors include banks, insurance companies, trusts, and hedge funds (Figure 2, panel 2).

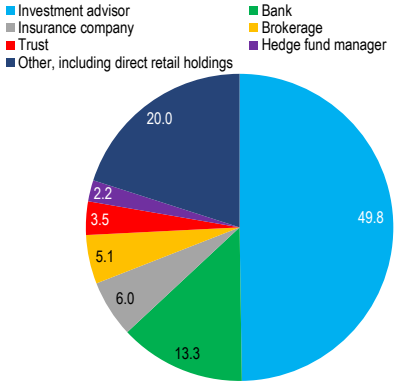
[4] Institutional holdings of open-ended mutual funds are measured by the share of assets under management held in institutional share classes. Institutional holdings of ETF shares are based on 13F filings. Form 13F is a quarterly report required by the US Securities and Exchange Commission for "institutional investment managers" who control over $100 million in assets.

Figure 2. Institutional Investors in Corporate Bond MFs and ETFs
ETF and MF shares are increasingly held by institutional investors.

1. Institutional Holdings of MF Shares
(Percentage of MF assets under management)



2. Breakdown of ETF Investors
(Percentage)



Sources: Lipper; Refinitiv; FactSet; Bloomberg Finance L.P.; and IMF staff calculations.
Notes: Panel 2 shows the investor breakdown by investor type for the ten largest US corporate bond ETFs. ETF = exchange-traded fund; MF = mutual fund.

Institutional investors may hold ETFs for various reasons, including for hedging or speculative purposes. For example, OEMFs may use ETF shares to better manage liquidity, potentially leading to elevated trading activity in ETF shares (Sherrill, Shirley, and Stark 2020).[5] Consistent with this behavior, Dekker, Molestina Vivar, and Weistroffer (2024) showed that open-ended investment funds, the largest group of ETF investors in the euro area, disproportionally reduced their ETF holdings when facing large outflows in March 2020. Similarly, evidence suggests that OEMFs with higher ownership by other funds experienced substantially higher outflows compared with those owned by retail investors (Allaire, Breckenfelder, and Hoerova 2023). Institutional investors may also use ETFs to take directional positions, with ETFs predominantly held by institutional investors facing higher levels of short positions compared with ETFs held by retail investors (Figure 3, panel 1).

OEMF shares are used by institutional investors for different purposes. OEMFs do not offer intra-day liquidity and cannot be shorted but may have advantages in terms of offering a broader range of active strategies. The institutional investor base for OEMFs may, compared with ETFs, therefore be more tilted toward investors with a longer investment horizon and lower turnover ratios, for example, monthly rebalancing as opposed to intra-day trading. Allaire, Breckenfelder, and Hoerova (2023) find for euro area bond funds that in 2019:Q4, 33.2 percent of domestic (euro area) mutual fund ownership came from other investment funds, 17.2 percent from insurance corporations, and 3.2 percent from pension funds. While not directly comparable with the investor breakdown of US corporate bond ETFs (Figure 3, panel 2), the large ownership share of the insurance sector in European bond mutual funds illustrates that the institutional investor bases for ETFs and OEMFs have a different makeup.

[5] See Andrew McCollum, "ETFs: Valuable Versatility in a Newly Volatile Market", Greenwich Associates, 2018. Of the survey respondents, 56 percent indicated that they use ETFs for liquidity management purposes.

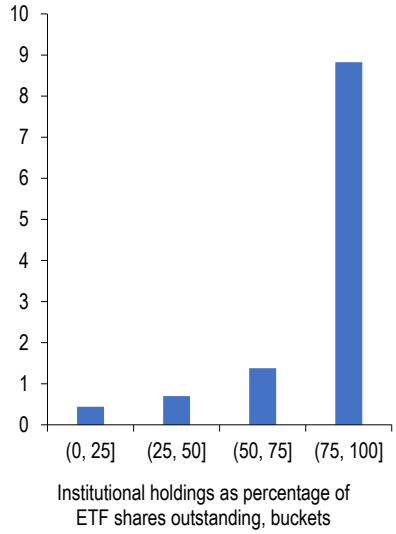
Different investor clienteles appear to behave differently as seen through the lens of fund flows and trading activity. US open-ended bond funds held by institutional investors exhibit more volatile flows than those held by retail investors, especially during times of stress, proxied by the volatility index (Figure 3, panel 2). Similarly, US corporate bond ETFs with a high share of institutional ownership show larger trading volumes during periods of stress (Figure 3, panel 3).

Figure 3. Institutional Fund Investment and Trading Patterns

ETFs with relatively more institutional holdings tend to be shorted more and see higher daily trading volumes that increase further when market stress increases.

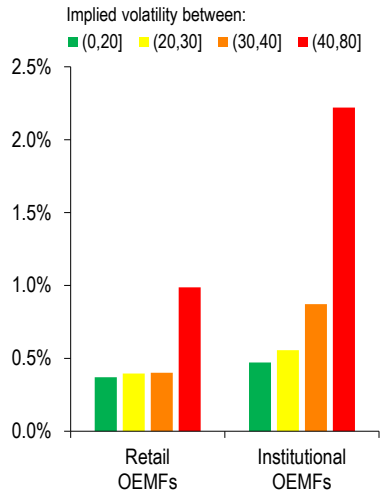
1. Short Positions in ETF Shares by Share of Institutional Ownership

(Short position as percentage of assets under management by bucket)



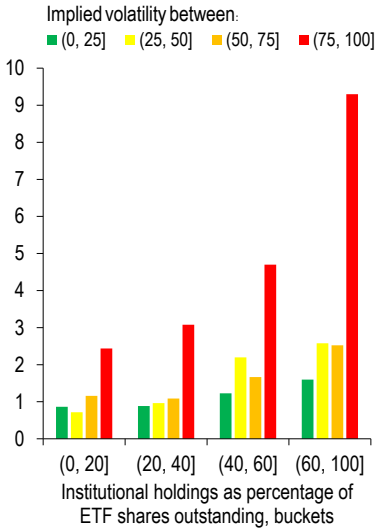
2. Volatility of Weekly Flows for Retail and Institutional Mutual Funds

(Percent of aggregated assets under management by fund type)



3. ETF Trading Volume by Share of Institutional Ownership

(Daily trading volume as percentage of assets under management by bucket)



Sources: Bloomberg Finance L.P.; Lipper; and IMF staff calculations.

Note: ETF = exchange-traded fund; OEMF = open-ended mutual fund. Implied volatility is based on the Chicago Board Options Exchange's Volatility Index, often referred to as the VIX.

Evidence from Fund Flows

Institutional mutual fund flows are more volatile than retail fund flows. Larger outflows pose liquidity risks for mutual funds (Bouveret and Yu 2021), especially if they are forced to liquidate assets in times of stress and impaired market liquidity. From this perspective, institutional mutual funds appear more vulnerable. While 90 percent of weekly retail fund flows range from −0.71 percent to 0.50 percent of assets under management, institutional fund flows range from −0.86 percent to 0.93 percent (Figure 4, panel 1). In addition, institutional OEMF flows tend to be more procyclical than retail OEMF flows (Figure 4, panel 2). On aggregate, funds experience inflows during months with positive index returns and outflows during months with negative returns. This procyclicality of flows could result from end-investors'

reaction to market movements or from fund flows driving market movements. Both effects can contribute to a destabilizing feedback loop, where market movements trigger fund flows, which in turn amplify the initial market movements.

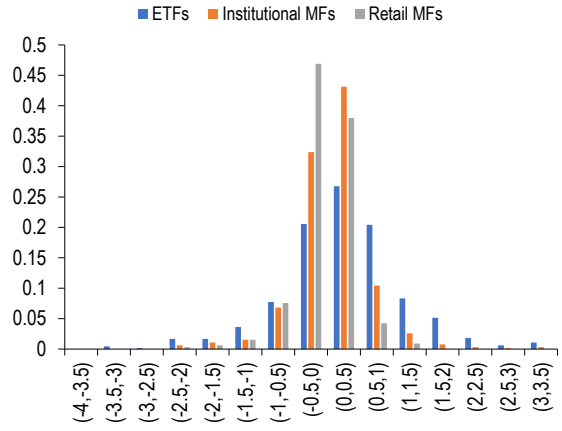
ETF flows may affect the underlying asset markets differently than OEMF flows. ETF flows are more volatile than OEMF flows, with 90 percent of weekly ETF flows in the range of −1.30 percent to 1.81 percent (Figure 4, panel 1).[6] In addition, ETF flows show a stronger correlation with bond market returns, indicating higher procyclicality. However, ETF flows, that is transactions with authorized participants, do not necessarily lead to transactions in underlying security markets. The authorized participants observe the relative mispricing between ETF shares and the underlying securities, as well as any balance sheet costs associated with ETF arbitrage trades, before executing trades. In contrast, OEMFs may be forced to buy or sell at less opportune times. As a result, while corporate bond ETF flows are more volatile than OEMF flows, this does not necessarily imply that they have a more adverse impact on markets.

Figure 4. ETF and MF Flow Stylized Facts

ETF flows are more volatile than MF flows and are also more procyclical.

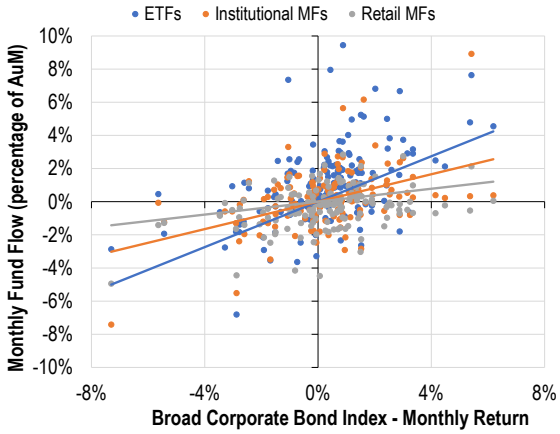
1. Distribution of Weekly Flows for Corporate Bond Funds

(y: Density of weekly fund flows; x: fund flows expressed as percentage of assets under management, in buckets)



2. Fund Flows and Corporate Bond Returns

(Monthly fund flows as percentage of assets under management, asset class returns as monthly index return)



Sources: EPFR; Bloomberg Finance L.P.; and IMF staff calculations.Notes: Returns and volatility are based on the Bloomberg-Barclays US High Yield Corporate Bond Index. ETF = exchange-traded fund; MF = mutual fund, AuM = assets under management.

[6] ETF flows reflect transactions between the ETF and its authorized participants; secondary market trading on the exchange does not constitute a flow in or out of the ETF.

Investment Funds and Bond Market Stability

The Relationship between Bond Market Fragility and Fund Holdings

A granular approach is used to study the impact of bonds' ownership structures on bond return volatility. This note examines the role of fund ownership in bond markets by analyzing, at the *security-level*, how ETF and OEMF holdings of a bond affect its return volatility. Specifically, the relationship between ETF and OEMF ownership and the volatility of returns is analyzed using panel regressions with the following specification for security *i* and quarter *t*:[7]

$$\text{VOL}_t^i = \beta_0 + \beta_{1,\text{MF}} \left(\frac{\text{MF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \beta_{1,\text{ETF}} \left(\frac{\text{ETF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \text{controls}_t^i + \text{fixed effects} + \epsilon_t^i \qquad \text{(Eq. 1)}$$

The dependent variable VOL_t^i is the standard deviation of daily returns of a US corporate bond within quarter *t*, annualized and expressed in basis points. The explanatory variables of interest are the share of bond *i* held by US-based ETFs and the share of bond *i* held by OEMFs, both expressed as a percentage of the security's US dollar amount outstanding at the end of each quarter. Control variables include the security's total market value outstanding and the bond's time to maturity.

There are empirical challenges associated with estimating the effect of funds' ownership characteristics on corporate bond market volatility. The relationship between fund flows and asset prices is complex, with periods of high aggregate uncertainty most likely affecting both. Similarly, feedback effects—where asset markets drive flows and flows affect asset markets—complicate the assessment of causality. Moreover, the volatility of daily returns can be influenced by various factors, including broad market developments, market sentiment, news affecting individual issuers, and security-specific characteristics such as maturity, coupon type, or other features. To address these issues, fixed effects at the quarter, bond type, issuer type, and rating level are included alongside other control variables. These fixed effects aim to absorb factors that could distort the assessed relationship between fund holdings and volatility, allowing for "within-group" comparison of bonds that are as similar as possible, aside from their ownership structure. Regression tables can be found in the Annex 2.

To understand the role of investor clienteles, the analysis distinguishes between institutional and retail holdings. For OEMFs, institutional holdings are computed based on Lipper fund share class classifications.[8] For ETFs, institutional holdings are computed based on SEC 13F filings by institutional investors. ETF and OEMF holdings are then split into two mutually exclusive components, institutional holdings and non-institutional holdings (referred to as retail holdings), to estimate the following panel regression:

[7] Details about the dataset are presented in Annex Table 1.1, Annex Table 1.2, Annex Table 1.3 and Annex Table 1.4.
[8] Importantly, institutional OEMF share classes tend to include investment through defined contribution retirement accounts.

$$\text{VOL}_t^i = \beta_0 + \beta_{1,Inst,\text{MF}}\left(\frac{\text{Inst.OEMF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \beta_{1,Ret,\text{MF}}\left(\frac{\text{Retail OEMF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i}$$
$$+\beta_{1,Inst,\text{ETF}}\left(\frac{\text{Inst.ETF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \beta_{1,Ret,\text{ETF}}\left(\frac{\text{Retail ETF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \text{controls}$$
$$+\text{fixed effects} + \epsilon_t^i \quad \text{(Eq. 2)}$$

The relationship between fund ownership types and volatility may depend on the level of market stress. To investigate how market stress can play a role, an interaction term between holdings and implied equity market volatility is used. Equation 1 is modified to:

$$\text{VOL}_t^i = \beta_0 + \gamma\text{VIX}^t + \beta_{1,\text{MF}}\left(\frac{\text{MF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i} + \beta_{1,\text{ETF}}\left(\frac{\text{ETF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i}$$
$$+\tilde{\beta}_{1,\text{MF}}\left(\frac{\text{MF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i}\cdot\text{VIX}^t + \tilde{\beta}_{1,\text{ETF}}\left(\frac{\text{ETF holdings}}{\text{Amt. Outstanding}}\right)_{t-1}^{i}\cdot\text{VIX}^t + \text{controls}_t^i + \text{fixed effects} + \epsilon_t^i \quad \text{(Eq. 3)}$$

In equation 3, VIX^t is the average quarterly level of the VIX volatility index, which serves as a proxy of market stress. The total effect of OEMF holdings on volatility is reflected by the combination of $\beta_{1,\text{MF}}$ and $\tilde{\beta}_{1,\text{MF}}$ and the level of the VIX. A similar modification can be made to equation 2, by introducing VIX interaction terms for retail and institutional ETF and OEMF holdings. Time fixed effects are dropped from this specification to facilitate the interpretation of the time varying effect of market stress.

Results

ETF ownership is, on average, associated with lower bond return volatility. Consistent with the findings in IMF (2022), bonds held by ETFs experience less of an increase in volatility than comparable bonds held by OEMFs or other investors (Figure 5, panel 1). Specifically, a one percentage point increase in the share of a bond's value outstanding held by ETFs is associated with a 13 basis points lower return volatility, after controlling for other factors (Annex Table 2.1, column 1).

The investor base matters. ETF holdings attributable to institutional investors are associated with higher bond return volatility while a larger share of ETF holdings attributable to retail investors is associated with lower volatility. Specifically, a one percentage point increase in the share of a bond's outstanding value held by institutional ETF investors is associated with a 27 basis points increase in return volatility (see Annex Table 2.1, column 2). In contrast, a one percentage point increase in the share of a bond's outstanding value held by retail ETF investors is associated with an 85-basis-point decrease in return volatility. There is no similar divergence between institutional and retail share classes of OEMFs.

The role of institutional investors is amplified during periods of stress. In line with previous work (International Monetary Fund 2022), OEMF holdings are associated with higher bond return volatility at high levels of market stress (Figure 5, panel 2). By contrast, a higher share of ETF holdings is not associated with an increase in return volatility even at high levels of market stress. However, the

divergence between institutional and retail ETF holdings becomes more pronounced during periods of elevated market stress (Figure 5, panel 3). At high levels of market stress, institutional ETF holdings are associated with sizable adverse impacts on volatility, followed by institutional OEMF holdings. This observation is consistent with the hypothesis that institutional investors use ETFs to manage risks and liquidity shocks that materialize during stress episodes, which are then passed on to the underlying markets.

The divergence between institutional and retail holdings is more pronounced for ETFs. For example, the mitigating impact of retail investors on bond return volatility seems to be larger for ETFs than for OEMFs (Figure 5, panel 1). There are two explanations for this observation: first, ETF and OEMF investor types, retail or institutional, may differ in their investment behaviors. Institutional ETF investors may stand out in particular; they might engage in more frequent trading, shorting, and might generally have a shorter investment horizon than institutional investors holding OEMF shares. Second, the investment vehicle's structural features matter. Even if the retail investors in ETF shares would be very similar to the retail investors in OEMF shares, differences in terms of the relationship between holdings and bond volatility can arise because of differences in the investment vehicles design. As previously noted, the market for underlying securities is partially shielded from the trading activity in ETF shares, while by contrast, OEMFs could be subject to forced sales. If the design features of ETFs indeed explain the benign impact of retail ETF holdings on bond return volatility, then these design features should also help to partially (but not necessarily fully) offset the impact of the more aggressive investment behavior of institutional ETF investors.

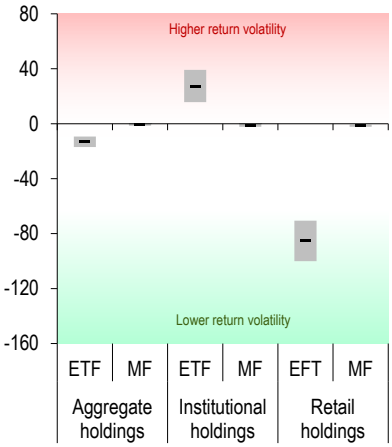
Robustness tests suggest that self-selection of bonds into OEMF and ETF portfolios is limited and does not qualitatively alter the conclusions of the analysis. A primary source of endogeneity arises from the "self-selection" of bonds into OEMF and ETF portfolios based on unobserved characteristics. To test for this type of endogeneity, the analysis was performed for various restricted subsamples constructed based on bonds' ownership structure (Annex Table 2.2). Coefficient signs remain unchanged, and also the magnitudes of coefficients are comparable. Annex Table 2.3 demonstrates that the results are stable under different fixed effect specifications.

Figure 5. The Relationship between ETF and MF Holdings and Bond Volatility

ETF holdings are, on aggregate, associated with lower bond return volatility. However, larger institutional ETF holdings drive volatility higher.

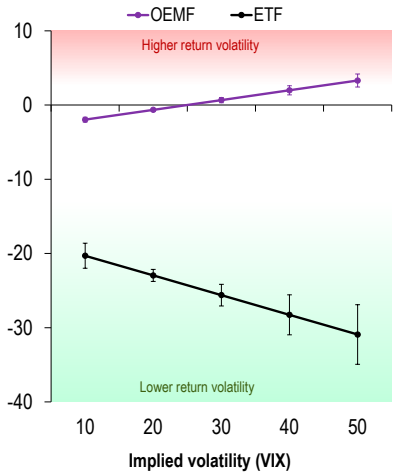
1. Bond Volatility and Institutional/Retail ETF/MF Holdings

(Dimensionless coefficients; units: basis points of annualized return volatility per percentage point of holdings)



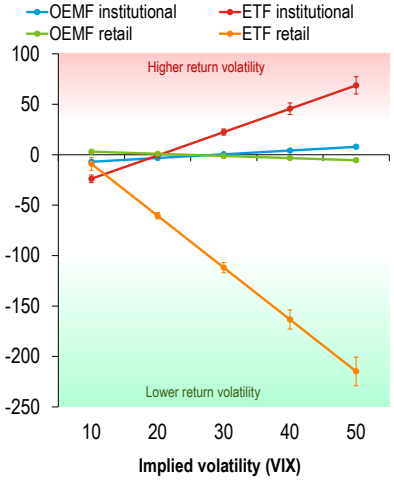
2. Bond Volatility and ETF/MF Holdings at Different Stress Levels

(Dimensionless coefficients; units: basis points of annualized return volatility per percentage point of holdings)



3. Bond Volatility and Institutional/Retail ETF/MF Holdings at Different Stress Levels

(Dimensionless coefficients; units: basis points of annualized return volatility per percentage point of holdings)



Sources: Bloomberg Finance L.P.; Refinitiv; Lipper; and IMF staff calculations.
Notes: Regression tables can be found in Annex 2. ETF and MF holdings are computed at security level and expressed as a percentage of the security's outstanding amount. The dependent variable is the quarterly volatility of daily returns, annualized, and expressed in basis points. ETF = exchange-traded fund; MF = mutual fund; OEMF = open-ended mutual fund.

Discussion and Conclusions

This note provides evidence that ETF ownership of corporate bonds is generally associated with lower bond return volatility. It is well documented that OEMFs can transmit non-fundamental demand shocks to security markets, thereby increasing asset price volatility (International Monetary Fund 2022). However, some prior evidence points toward equity ETFs increasing asset price volatility (Ben-David, Franzoni, and Moussawi 2018). This note sheds light on the underlying dynamics and suggests that differences between institutional and retail ETF investors could explain the mixed results in the literature, depending on the ownership structure of the bonds in the considered samples.

The analysis underscores the importance of clientele effects when assessing the impact of ETFs on bond market volatility. While ETFs ownership of bonds is, on aggregate, associated with lower return volatility, there is a significant divergence between institutional and retail ETF ownership. While retail ETF ownership may act as a stabilizing force, institutional ETF holdings are associated with higher return volatility, especially during periods of heightened market stress. These findings corroborate recent work that suggests that institutional investors, notably OEMFs, may use ETF shares as a buffer against outflows, especially during stressed market conditions.

Future research should further explore the nature of these clientele effects**.** While the analysis in this note distinguishes between institutional and non-institutional investors, a more detailed breakdown of the different types of institutions could provide deeper insight into the mechanisms at play. In addition, examining the role of funds' management approaches (active versus passive) could shed further light on these dynamics.[9] It is also important for policymakers to understand how the structural features of an investment vehicle affect its investor clientele as changes to these structural features could lead to a reallocation of investor clienteles, merely transferring vulnerabilities rather than resolving them.

The role of ETFs for market stability needs to be investigated further. While the results in this note seem to paint a benign picture regarding the relationship between ETF holdings and market volatility, further research is needed. First, the large adverse impact of institutional ETF holdings on market volatility at higher levels of stress needs to be understood better. Second, the role of friction in the share creation and redemption mechanism requires further investigation. Finally, higher frequency data and different market stability measures could shed further light on the impact of ETFs and their different investor types during major selloffs. For example, the relationship between bond returns during flight-like episodes and holdings by ETFs/OEMFs could be informative for assessing financial stability risks.

[9] In unreported results, we find that passively managed fund holdings tend to be associated with higher bond return volatility. This may be driven by active funds' greater discretion to avoid trading certain bonds at times when liquidity is limited.

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Annex 1. Dataset

The empirical analysis is based on a dataset comprising the following data sources.

Annex Table 1.1. Description of Dataset

Data Source	Level	Notes	Key
Bloomberg Finance L.P.	Fund (ETF)	Fund strategy; estimate of institutional holdings; short positions	Fund ticker/ISIN
Refinitiv	Security	Bond price, volatility, market value outstanding, static security characteristics	Bond ISIN
Lipper	Fund (MF)	Share class sizes (institutional, non-institutional)	Fund ISIN
FactSet	Fund × Security	Fund holdings by ISIN	Fund ISIN, security ISIN

Note: ETF = exchange-traded fund; MF = mutual fund; ISIN = International Securities Identification Numbering.

Securities are included in the sample if they are classified as corporate bonds. Corporate bonds need to meet both of the following criteria:

1. Denoted as fixed income securities.
2. Issued by nonfinancial corporations and financial services companies.

Annex Table 1.2. Description of Variables

Variable	Description	Units
ETF	ETF holdings of security	Holdings expressed as a share of the security's outstanding amount for the given quarter, in percent
ETF institutional	Share of ETF holdings of security attributable to institutional investors	
ETF retail	Share of ETF holdings of security attributable to non-institutional investors, which are assumed to be retail	
MF	MF holdings of security	
MF institutional	Share of MF holdings of security attributable to institutional investors	
MF retail	Share of MF holdings of security attributable to non-institutional investors, which are assumed to be retail	
Active	Share of holdings of security by actively managed funds (MFs and ETFs)	
Passive	Share of holdings of security by passively managed funds (MFs and ETFs)	
Value outstanding	Market value outstanding of the given security in the given quarter	
Time-to-maturity	Time to maturity in years	
Time FE	Quarterly Fixed Effect	
Issuer type FE	"FIN," "CORP"	
Bond type FE	"STR," "FLO," "CVT," "IXL," "ZER"	
Rating FE	"NR," "A," "BBB," "BB," "B," "CCC," "AA," "D," "AAA," "CC," "C"	

Note: ETF = exchange-traded fund; FE = fixed effect; MF = mutual fund.

Annex Table 1.3. Dataset Descriptive Statistics

Periods covered	2013:Q3–2022:Q4
Number of unique ETFs	317
Number of unique mutual funds	1,926
Number of unique bond ISIN	15,887
ETFs: assets under management (interquartile range)	$193.2 million to $5,867.2 million
MFs: assets under management (interquartile range)	$552.7 million to $11,720.6 million

Note: ETF = exchange-traded fund; MF = mutual fund.

Annex Table 1.4. Variable Descriptive Statistics

Variable	Unit	25th Percentile	Median	75th Percentile
MF	Holdings as a percentage of security's outstanding	3.0	7.4	14.9
ETF		0.1	1.2	3.1
MF institutional		1.6	4.0	8.4
MF retail		0.8	2.5	6.1
ETF institutional		0.1	0.8	2.1
ETF retail		0.1	0.3	0.9
Outstanding value	Million US dollar	334	522	871

Note: ETF = exchange-traded fund; MF = mutual fund.

Annex 2. Regression Tables

This annex provides regression tables for the main result presented in this note. Table 2.1 shows the full results presented in Figure 5, panel 1. Annex Tables 2.2 and 2.3 provide additional regressions to test robustness of the results.

Annex Table 2.2 tests whether self-selection skews the results. Self-selection could undermine the causal interpretation if—for example—funds would seek out less or more volatile bonds or if other factors affect both a security's volatility and its likelihood to be held by ETFs and mutual funds. The regression is performed in subsamples, whereby subsamples are bound by the share of a security's outstanding that is held by either ETFs or mutual funds. The results are consistent across various buckets, suggesting that self-selection does not play a major role.

In Annex Table 2.3, different combinations of fixed effects are used to test the sensitivity of the results to different groupings. Once again, the results show a consistent picture.

Annex Table 2.1. Regression: Institutional versus Retail Bond Holdings of ETFs and MFs

	ETF vs. MF		Inst. vs. Ret.	
ETF	-13.18***	(1.89)		
MF	-0.62	(0.37)		
Market value outstanding	0.01	(0.01)	-0.00	(0.01)
Time-to-maturity	32.68***	(2.03)	33.17***	(2.10)
ETF institutional			27.42***	(5.78)
MF institutional			-1.18**	(0.53)
ETF retail			-85.29***	(7.24)
MF retail			-1.48***	(0.37)
Constant	437.81***	(25.69)	435.77***	(25.99)
Time FE (T)	yes		yes	
Issuer type FE (IT)	yes		yes	
Bond type FE (BT)	yes		yes	
Rating FE (R)	yes		yes	
Clustering	T		T	
Observations	245,773.00		245,773.00	
R^2	0.54		0.55	
Adjusted R^2	0.54		0.55	

Note: Standard errors are given in parentheses. The dependent variable is the quarterly volatility of daily returns, for each individual security, annualized and in basis points. BT = bond type fixed effects; ETF = exchange-traded fund; FE = fixed effect; IT = issuer type fixed effects; MF= mutual fund; R = rating category fixed effects; T = time fixed effects.

*p < .1; ** p < .05; *** p < .01.

Annex Table 2.2. Robustness: Self-Selection

	Main Result (all *F*)		0% < *F* < 5%		5% < *F* < 10%		*F* > 10%	
ETF institutional	27.42***	(5.78)	53.52***	(10.29)	39.53***	(10.14)	27.97***	(5.07)
MF institutional	-1.18**	(0.53)	1.76	(1.96)	5.10*	(2.89)	-0.34	(0.80)
ETF retail	-85.29***	(7.24)	-150.40***	(21.67)	-144.56***	(13.95)	-75.76***	(6.93)
MF retail	-1.48***	(0.37)	1.91	(2.52)	-1.86	(2.58)	-0.92	(0.60)
Value outstanding	-0.00	(0.01)	-0.04***	(0.01)	0.02**	(0.01)	0.00	(0.01)
Time-to-maturity	33.17***	(2.10)	34.33***	(2.15)	35.05***	(2.49)	30.29***	(1.95)
Constant	435.77***	(25.99)	427.87***	(24.53)	368.14***	(41.70)	452.96***	(27.58)
Time FE	yes		yes		yes		yes	
Issuer type FE	yes		yes		yes		yes	
Bond type FE	yes		yes		yes		yes	
Rating FE	yes		yes		yes		yes	
Clustering	T		T		T		T	
Observations	245,773		69,655		56,224		117,727	
R^2	0.55		0.53		0.64		0.52	
Adjusted R^2	0.55		0.53		0.64		0.52	

Note: Standard errors are given in parentheses. *F* denotes the combined share of security held by ETFs and mutual funds. The dependent variable is the quarterly volatility of daily returns, for each individual security, annualized and in basis points. Error terms were clustered by time (quarter). ETF = exchange-traded fund; FE = fixed effect; MF = mutual fund.

* $p < .1$; ** $p < .05$; *** $p < .01$.

Annex Table 2.3. Robustness: Fixed Effects

	Fixed Effects (main result): T + IT + BT + R		Fixed Effects: T × IT × BT × R		Fixed Effects: T × I		Fixed Effects: T × I × BT × R	
ETF institutional	27.42**	(5.78)	29.80***	(2.76)	35.73***	(2.18)	34.23***	(0.23)
MF institutional	-1.18**	(0.53)	-0.70*	(0.36)	-1.33***	(0.24)	0.31	(5.04)
ETF retail	-85.29***	(7.24)	-88.75***	(6.21)	-99.94***	(5.71)	-101.78***	(0.18)
MF retail	-1.48***	(0.37)	-1.70***	(0.30)	-0.39**	(0.19)	-0.50***	(0.00)
Value outstanding	-0.00	(0.01)	-0.00	(0.00)	0.01***	(0.00)	0.01***	(0.26)
Time-to-maturity	33.17***	(2.10)	33.33***	(0.93)	34.28***	(0.26)	35.50***	(3.54)
Constant	435.77***	(25.99)	430.55***	(11.81)	397.42***	(3.86)	384.98***	
Fixed effects	T + IT + BT + R		T × IT × BT × R		T × I		T × I × BT × R	
Clustering	T		T × IT × BT x R		T x I		T x I x B T x R	
Observations	245773.00		245522.00		224208.00		218190.00	
*R*2	0.55		0.59		0.82		0.85	
Adjusted *R*2	0.55		0.58		0.78		0.81	

Standard errors in parentheses. BT = bond type fixed effects; ETF = exchange-traded fund; I = issuer fixed effects; IT = issuer type fixed effects; MF = mutual fund; R = rating category fixed effects; T = time fixed effectsNote: Standard errors are given in parentheses. The dependent variable is the quarterly volatility of daily returns, for each individual security, annualized and in basis points. .

* $p < .1$; ** $p < .05$; *** $p < .01$.

PUBLICATIONS

Fund Investor Types and Bond Market Volatility
NOTE/2025/002