The Dealer Warehouse – Corporate Bond ETFs

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ABSTRACT

ETFs add a new layer of market-making to the corporate bond market that improves the market quality of the underlying bonds. Dealers use the flexibility of representative sampling in the primary corporate bond ETF market as a warehouse to manage inventory. We show that bonds with higher selling pressure are included in creation baskets increasing ETF ownership. ETF ownership increases predict credit downgrades and earnings surprises and misses in investment grade bonds. The face value of ETF holdings in investment grade bonds is 9.8% greater on the downgrade date than thirty days prior. By allowing dealers to offset inventory risk in periods of uncertainty, this new layer of market-making leads to a negative relation between ETF ownership and idiosyncratic volatility, especially for the illiquid bonds.

1. Introduction

Corporate bond markets have transformed over the past two decades. Dealers have retreated from the over-the-counter (OTC) market following heighted regulatory constraints (Bao et al., 2018; Bessembinder et al., 2018). Concurrently, the share of corporate bonds held by investors offering a liquidity transformation has grown from 7.2 percent in 2002 to 19.5 percent in 2022.[1] Among these emerging investors, the extent of the liquidity transformation is heightened by the distinctive features of exchange-traded funds (ETFs).

Two features distinguish ETFs from open-end mutual funds. First, the secondary exchange trading of ETFs provides a liquid alternative to the illiquid underlying market. This feature has been utilized by retail investors to access the market, institutional investors to alter exposures, and regulators to stabilize the broader market during COVID-19. Second, the primary ETF market involves the in-kind exchange of a basket of the underlying for ETF shares. The exchange occurs between the ETF and authorized participants (APs), who are often dealers. Rather than exactly replicating the index, corporate bond ETFs use representative sampling. This standard allows funds to hold a subset of the index bonds as constituents and to use smaller, negotiated baskets in the in-kind exchange with APs. In this paper, we study if the primary ETF market is used by dealers to mitigate inventory constraints during periods of idiosyncratic shocks.

[1] The statistics were computed using data from the Financial Accounts Z.1 files from the Board of Governors of the Federal Reserve. A graph of the figures can be found here: https://fred.stlouisfed.org/graph/?g=Wt5M

We first document a positive and statistically significant relation between daily changes in ETF ownership and selling pressure over the past month, defined as twenty-day total volume on the bid-side over total trading volume. Further, bonds with greater selling pressure are more likely to be included in creation baskets and less likely to be included in redemption baskets. The preliminary analysis suggests that the flexibility of representative sampling is used by dealers to avoid holding costly, illiquid corporate bonds in inventory.

Our empirical analysis proceeds by examining two periods of uncertainty where selling pressure is likely to be heightened – downgrades and earnings. We first focus on downgrades to identify periods where corporate bond dealer inventory costs are heightened (Dick-Nielsen and Rossi, 2019). We study downgrades from any of the three main rating agencies that do not cross the investment grade threshold. Doing so ensures the bonds remain on average eligible for the same subset of ETFs. Using daily ETF holdings data, we find that the face value of ETF holdings begins to increase thirty trading days before the downgrade event, consistent with the market anticipating these events (Figure 1).[2] Relative to thirty days before the event the face value of ETF holdings is 9.8% greater for investment grade bonds on the downgrade date. ETF holdings begin to revert

[2] Anecdotally, a bond that is downgraded but remains eligible for inclusion in the largest investment grade ETF, iShares iBoxx investment grade ETF (ticker LQD), experiences a 7.8% increase in LQD ownership in the five days after the downgrade event.

five days after the event but remain approximately 4% higher than the base levels up to thirty days after.

We use a probit regression that controls for bond and trading day fixed effects and other observables associated with ETF inclusion. The results show that an increase in ETF ownership predicts a ratings downgrade, earnings surprises, and missed earnings. A percentage point increase in ETF ownership in the five days prior to the event has a 9% and 15% higher probability of a downgrade in credit rating and earnings miss. The results suggest that dealers absorb underlying market selling pressure from downgrades and then use the ETF primary market to deliver the bonds via in-kind creation. Thus, the dealer can provide liquidity in response to the idiosyncratic event without bearing subsequent inventory risk.

By providing a warehouse for dealers to offset inventory risk in response to shocks, ETFs may impact the price response to these events and thus the bond's idiosyncratic volatility. To investigate the impact of ETFs on the underlying corporate bonds we exploit market details to address common endogeneity concerns. In bond markets benchmark inclusion is dictated by bond and issuer level characteristics that are determined at issuance.[3] By comparing two bonds from the same issuer (Choi et al., 2020), we control for changes in fundamental risk and information environments. We further

[3] Changes in investment grade status are an exception to this statement. In our study we focus on changes within investment grade status rather than across.

restrict the sample to bonds with non-zero ETF ownership to address the endogenous decision by sponsors to include a bond in the ETF universe.

The use of the primary market by market makers to address idiosyncratic bond events suggests that in corporate bond markets ETFs may buffer the illiquid underlying. As described in the alternative hypothesis by Ben-David et al. (2018), ETFs may provide a new layer of market-making power, which dampens liquidity shocks to the underlying. Following this rational, we conjecture whether ETF ownership decreases the volatility of the underlying corporate bonds. As in Cao et al. (2021) and Chung et al. (2019), we compute corporate bond idiosyncratic risk as the variance of the error terms from factor model regressions of daily excess bond returns. We find a negative and statistically significant relationship between ETF ownership and idiosyncratic volatility. The results are robust to issuer-by-date-by-seniority fixed effects and other controls. A one percentage point increase in ETF ownership, which is driven by changes in the primary market, is associated with a 6% decrease in idiosyncratic risk. We further investigate the heterogeneity of the effect and show that the ETF ownership has a stronger effect on less liquid bonds. The result is consistent using alternative definitions of illiquidity – bid-ask spread, imputed round-trip costs, and the Amihud measure .

This paper contributes to an emerging literature that highlights the results of the flexibility of representative sampling for sponsors, underlying liquidity, arbitrage, and ETF investors. To-date representative sampling is found to allow sponsors to actively manage their baskets to enhance the liquidity transformation (Shim and Todorov, 2021; Koont et al., 2022) but generates a hidden cost for ETF investors due asymmetric information (Reilly, 2022). Further, Pan and Zeng (2019) highlight how balancing inventory constraints impedes ETF arbitrage.

The paper also contributes to the broader research on the impact of ETF ownership on underlying constituents. In equity markets where the underlying are traded on similar exchanges, ETF ownership has been found to increase non-fundamental volatility (Ben-David et al., 2018), comovement (Da and Shive, 2018), stock information efficiency (Glosten et al., 2021) and liquidity comovement (Agarwal et al., 2018). Short selling capabilities of ETFs improves liquidity (Karmaziene and Sokolovski, 2021) and decreases post earnings announcement drift (Huang et al., 2021). Brogaard et al. (2021) and Box et al. (2021) caution that the findings of the equity literature may not be broadly applicable. In corporate bond markets, the impact of ETFs may be distinguished by the extent of the liquidity transformation, the impediments to non-AP arbitrage, and the standard of representative sampling. The literature on corporate bonds has investigated the impact on underlying valuation (Dannhauser, 2017), transmission of fundamental systemic shocks (Dannhauser and Hoseinzade, 2021), liquidity (Holden and Nam, 2019), and commonality in liquidity (Çötelioglu, 2019).

We also contribute to the growing literature on corporate bond market. Recent research examines the contribution of idiosyncratic and systematic risk to returns (Chung et al., 2019; Bai et al., 2021). Overall, the findings of this study have implications for both corporate finance as debt is the largest source of financing for corporations and for asset pricing given the success of ETFs in illiquid markets.

Finally, our study contributes to studies on clientele effects. Investors in fixed income securities may have preferences for specific maturities (Vayanos and Vila (2009), Guibaud, Nosbusch, and Vayanos (2013), Greenwood, Hanson, and Stein (2010), Greenwood and Vayanos (2014)) and these preferences induce firms to adjust bond maturities to cater investors (Butler, Gao, and Uzmanoglu (2019)). We contribute to these studies by demonstrating that future downgrades increase probability of ETF ownership.

2. Data and summary statistics

In this section we detail the data used in our study. Section 2.1 discusses the various sources and the construction of our key variables. Summary statistics are discussed in section 2.2.

2.1. Data sources and measures

Fund level data including assets under management, returns, fees, objective codes, fund name, and expense ratio comes from the Center for Research in Security Prices (CRSP) Mutual Fund Database. We restrict our sample to corporate bond funds using CRSP and Lipper Objective Codes.[4] ETFs are identified using the CRSP indicator flag.

[4] We restrict the sample to funds with CRSP objective codes beginning with IC or Lipper Objective Codes equal to A, BBB, SII, SID, IID, or HY.

Index funds are identified using fund name from CRSP following Appel et al. (2016), Busse and Tong (2012) and Iliev and Lowry (2014) and the CRSP database index fund flag equal to D or B.[5] A fund is identified as an index mutual fund if at any point in fund history it is flagged by the name search or a CRSP identifier and is not flagged as an ETF. We eliminate leveraged or inverse funds.[6] We account for the Vanguard structure by determining the weight of total fund assets managed by the ETF.

Daily ETF holdings data is obtained from Morningstar Direct. We have the full sample of corporate bond ETFs that report daily holdings from May 2017 to October 2022. In addition, we have the holdings of the twenty largest corporate bond ETFs back to January 2015. The twenty ETFs account for 92 percent of December 2020 assets of daily reporting ETFs and 61 percent of total corporate bond ETF assets.[7] We eliminate any holdings reported on full corporate bond market holidays using the SIFMA calendar and any holdings reported on weekends. For bond i from issuer j we compute the total number of holdings by all ETFs, K, on day, t, as:

$$ETF\ Holdings_{i,j,t} = \sum_{k=1}^{K} Notional\ Value_{i,j,k,t}. \quad (1)$$

[5] Index funds are flagged if the CRSP fund name contains the following strings: *SP, DOW, Dow, DJ* or if the lowercase version of the CRSP fund name contains: *index, idx, indx, ind_* (_indicates space), *aggregate, composite, russell, s&p, s and p, s & p, msci, Bloomberg, kbw, nasdaq, nyse, stoxx, ftse, wilshire, Morningstar, 100, 400, 500, 600, 900, 1000, 1500, 2000, 3000, or 5000.*

[6] Inverse and leveraged funds are identified if the lowercase version of their name contains the following strings: *plus, enhanced, inverse, 2x, 3x, ultra, 1.5x, 2.5x.*

[7] Vanguard funds report holdings monthly.

Monthly holdings are obtained from CRSP. To account for missing observations, we impute monthly holdings as the most recent reported holdings adjusted by the fund's flow. To account for representative sampling, if there is no change in holdings between two CRSP report dates, we use the lagged holdings rather than the imputed value. We impute the bonds held by the ETF share class of Vanguard by taking the percentage of assets in the ETF times the bonds held by the portfolio. To account for missing observations, we impute monthly holdings as the most recent reported holdings adjusted by the fund's flow. To account for representative sampling, if there is no change in holdings between two CRSP report dates, we use the lagged holdings rather than the imputed value. We impute the bonds held by the ETF share class of Vanguard by taking the percentage of assets in the ETF times the bonds held by the portfolio. Following the literature, we compute $ETF\ Ownership$, the total number of shares held by all ETFs, K, over the bond's amount outstanding as shown in the equation below,

$$ETF\ ownership_{i,j,t} = \frac{\sum_{k=1}^{K} Bonds\ held_{i,j,k,t}}{Amount\ outstanding_{i,j,t}}. \tag{2}$$

Active mutual fund ownership, $AMF\ ownership$, and index mutual fund ownership, $IMF\ ownership$ are constructed following equation (3). We adjust ETF and index fund ownership for the Vanguard structure.

Bond trading data comes from the Enhanced Trade Reporting and Compliance Engine (TRACE) filtered for possibly erroneous trades using the methodology of Dick-Nielsen (2009). Following Bao et al. (2018) and Bessembinder et al. (2008), we remove trades of less than $100,000 in par value. We eliminate transactions with prices under $5 following Bali et al. (2021). The return of bond i from issuer j on day t is computed as

$$R_{i,j,t} = \frac{P_{i,j,t} + C_{i,j,t} + AI_{i,j,t}}{P_{i,j,t-1} + AI_{i,j,t-1}} - 1. \tag{3}$$

$P_{i,j,t}$ is the value-weighted transaction price of bond i on day t. $C_{i,j,t}$ is the coupon payment, if any, and $AI_{i,j,t}$ is accrued interest. In our study of bond downgrades, we rely on weekly returns, $R_{i,j,w}$ computed in a similar manner.

To estimate idiosyncratic risk, conduct rolling regressions of daily excess returns on a three-factor bond model following Cao et al. (2021) and Chung et al. (2019). The three-factor bond model of Bessembinder et al. (2008) and Fama and French (1993) uses returns to the Bloomberg Barclays aggregate index from Bloomberg plus factors for the unexpected changes in interest rates, $TERM_t$, and default, DEF_t, computed with data from the Federal Reserve Economic Database.[8] For the corporate bond specific pricing model, we regress the of excess return of bond i from issuer j on trading day t in month m on the returns of factors, f, as follows

$$R_{i,j,t,m} - r_{f,t,m} = \alpha + \beta_1(R_{AGG,t,m} - r_{f,t,m}) + \beta_2 TERM_{t,m} + \beta_3 DEF_{t,m} + \epsilon_{i,j,t,m}. \tag{4}$$

Error terms from the equation (5) regressions are used to compute the monthly measure of idiosyncratic risk as:

$$IR_{i,j,m} = var(\epsilon^F_{i,j,t,m}). \tag{5}$$

[8] Following Fama and French (1993), we define the default factor as the difference in returns between a market portfolio of long-term corporate bonds and long-term government bonds.

2.2. Summary statistics

Using daily data, we show that the ETF ownership varies within bonds over time, is related to corporate events and the variation of this effect across bonds is related to their liquidity.

Table 1 presents changes in ETF ownership leading to a downgrade. We define a downgrade as a decrease in a credit rating by one of the three main rating agencies (e.g., from AA to A). In our sample of 3,810 such downgrades, ETF ownership increases in 27% of cases in the week leading to a downgrade and decreases in 20% cases. On average, over a (two, four) week leading to a downgrade, ETF ownership in investment grade bond increases by 0.012 (0.019, 0.024) p.p. on average.

[Insert Table 1]

Over a week before the downgrade, ETFs tend to purchase more liquid bonds. Using t-tests, we show that the difference in liquidity between bonds that experienced an increase in ETF ownership and other bonds is positive and significant. The p-values are well below 0.01 when we measure illiquidity with bond bid-ask spread, Amihud measure, imputed roundtrip costs or bond age (Table 2). Also, the bonds that experience a growth in ETF ownership before the downgrade appear to be of higher quality or visibility. They have higher ETF ownership, are included in more ETFs, have higher credit ratings, lower coupons and are larger.

[Insert Table 2]

Next, we present summary statistics of our monthly dataset. Table 3 shows that the median bond ETF ownership is 3.4%. This level is similar to the ownership by index mutual funds (2.7%) and active mutual funds (4.8%).

The median bond has value has 1 billion USD amount outstanding. It is 3.7 years of age, has 6.2 years left to maturity and 3.6% coupon payment. We split bond covenants to 4 groups, with financial covenant being the most popular. A bond has 2.5 such covenants on average.

[Insert Table 3]

3. Results

This section details the results of our empirical study. Section 3.1 begins with a study of ETF primary market activity around downgrades. Section 3.2 considers the impact of ETF ownership on broad idiosyncratic risk.

3.1. ETF Primary Market Activity & Idiosyncratic Bond Shocks

To begin we investigate the pattern of primary market activity around downgrade events. A downgrade event occurs if the rating from S&P, Moodys, or Fitch decreases on a given day. To address downgrades clustering in time we consider only events where there is no other rating change in the previous sixty days. We also restrict the sample to downgrades that are not associated with crossing the investment grade threshold by any of the three agencies. Doing so ensures that the potential asset base of ETFs that the bonds are eligible for remains constant and that selling pressure by restricted investors such as insurance companies does not drive the results.

In Figure 1, we plot the value of bonds held by all ETFs on the trading days relative to the date of downgrade $t = 0$. As shown the value of ETFs increases in the month prior to the downgrade event. This result is consistent with informed traders anticipating ratings events. At the peak ETF holdings of investment grade bonds are 9.6% higher relative to thirty trading days before the downgrade. Thirty days after the event, the holdings of investment grade bonds by ETFs remain elevated at 5% of the level thirty days before the downgrade. In aggregate, close to $1 billion notional value of bonds are included in creation baskets on the event date. The increase in ETF holdings is heightened even more the week surrounding the downgrade. Prior to the event heightened creations are suggestive of the asymmetric information advantage of APs studied by Reilly (2022). The days following the event, downgraded bonds slowly exit the ETFs via redemptions supporting the findings of Koont et al. (2022).

To test the statistical significance of the effect we use the full panel of daily holdings and run the following regression:

$$News_{i,j,d} = \gamma + \beta_1 \Delta ETF\ Ownership_{i,j,d-1} + \beta_2 X_{i,j,d-1} + \epsilon_{i,j,d} \quad (6)$$

The dependent variable is news measure for bond i from issuer j on trading date d. We use three ways of measuring news. *Downgrade* indicates that bonds' credit rating was downgraded by one of the three largest credit rating agencies, but the bond remained of an investment grade. *SUEscore* is a measure of standardized unexpected earnings. *Miss* is a measure of negative unexpected earnings, indicating worse than expected performance. *ΔETFOwnerhsip* is a measure of an increase in ETF ownership over the last 5, 10 or 22 trading days. The vector of time-varying bond-level controls include the log of amount outstanding, the average rating, the log of age, the log of time to maturity and ETF ownership. Standard errors are clustered at the bond and trade date levels. The results of the specification are shown in Table 4.

The key covariate of interest β_1 reflects the ability of ETF ownership to predict negative news. A positive value suggests the bonds are delivered to the ETFs by APs from the ETFs as part of a creation basket.

[Insert Table 4]

The results in Table 4 suggest that an increase in ETF ownership predicts negative corporate events. In particular, a one percentage point increase in ETF ownership is linked to a 8.8% higher probability of a downgrade (Panel A, Column 1), 0.407 lower standardized unexpected earnings (Panel B, Column 1), and 14.8% higher probability of missing these earnings (Panel C, Column 1).

The ETF ownership effect is quite short-lived. An increase only over a week, but not over two or four-week periods, has a significant effect on predicting a downgrade (Table 4, Panel A). The change in ETF ownership predicts earnings surprises and misses over a longer period, but this ability is less pronounced than over a shorter period (Table 4, Panels B and C). Overall, the results of this section suggest that the flexibility of corporate bond ETF primary markets is used to offset inventory accumulation during negative idiosyncratic shock.

3.2. ETFs an Idiosyncratic Risk

In equities, ETF ownership is associated with higher volatility driven by AP and non-AP arbitrage conducting secondary ETF market shocks to the underlying. These results suggest that the liquidity buffer alternative hypothesis of Ben-David et al. (2018) may apply to corporate bond ETFs.

Rather than the framing of traders with liquidity needs migrating to the basket security, our results are suggestive of the additional layer of market-making. That is the ETFs buffer the underlying from either the forced selling of the market maker to avoid inventory risk or from large pricing swings associated with inventory risk. This hypothesis is in line with Bessembinder et al. (2018) conjecture that the bank-affiliated dealers are increasingly less likely to commit their capital to provide liquidity.

To empirically test the effect, using a sample of matched bonds, we run the following monthly regression:

$$IR_{i,j,m} = \gamma_{j,m} + +\beta_1 ETF\ ownership_{i,j,m-1} + \beta_3 X_{i,j,m-1} + \epsilon_{i,j,m} \tag{7}$$

The dependent variable, $IR_{i,j,m}$ is idiosyncratic return volatility of bond i from issuer j in month m. $ETF\ ownership_{i,j,m-1}$ refers to the lagged fraction of bond amount outstanding held by ETFs. The vector X of time-varying bond-level characteristics includes controls for ownership by index mutual funds and active mutual funds, the age, the average rating, illiquidity, time to maturity, the amount outstanding, coupon payments and quantities of various covenants. To prevent firm-specific characteristics mutually affecting ETF ownership and risk, we include firm-time fixed effects and use variation across bonds issued by the same company. In later stages, we apply even a more restrictive procedure. Following Choi et al. (2020) procedure we match bonds by their type – issuer, time, credit rating, type (callable, puttable, sinking) and add firm-time-bond type fixed effects. In this way, we restrict to using variation in ETF ownership across bonds of the same type.

In Table 5 we report the results of regressions from equation (7) using $IR_{i,j,m,t}$ as the dependent variable. The results show that ETF ownership is negatively related to idiosyncratic risk, opposing the findings in equity ETFs. In the simplest regression model, a one percentage point increase in ETF ownership leads to a 0.06 decrease in idiosyncratic risk (Column 1). Controlling for a number of bond characteristics (Column 2), eliminating observations with the largest values of dependent and independent variables (Column 3) and augmenting the regressions with issuer-month fixed effects decreases the coefficient, but preserves its sign and statistical significance. In the most robust regression specification with bond type-month fixed effects, we show that a percentage point increase in ETF ownership leads to a 0.012 decrease in idiosyncratic risk (Column 4). This decrease corresponds to an 21% decline in risk for the median sample bond.

In equity markets, ETF ownership is related to higher return volatility (Ben-David et al., 2018). Our results indicate that in corporate bond market, the ETF ownership reduces this volatility. We suggest that the additional layer of market-making explains the reduced risk. If it is the case, then the ETF ownership should have a stronger negative effect on risk for the less liquid bonds. To estimate the illiquidity effect on risk empirically, we augment our regression (7) with measures of illiquidity and their interactions with *ETFOwnership.* At first, we use four measures of illiquidity – bid-ask spread, imputed roundtrip cost, Amihud (2002) and bond age. Later we replace each of these continuous measures with indicators for whether bond's liquidity is below the median liquidity that month.

First, we note that illiquid bonds are riskier. Regardless of the measure we use, the idiosyncratic risk is higher for bonds with higher bid-ask spread, IRC, Amihud measure or age (Table 6). A bond with higher than median bid-ask spread has 0.078 higher idiosyncratic risk, which is 34% more than the median risk in our sample (Table 6, Column 2).

However, increasing ETF ownership lowers return volatility for less liquid bonds. For bonds with higher than the median bid-ask spread, an increase in ETF ownership from 50th to 75th percentile (from 3.4% to 4.8%) is related with 0.042 lower risk (72% of median IR). The effect is consistent when measuring illiquidity with IRC or Amihud measures. The effect is less significant when we measure bond liquidity with a less related measure of its age. The results are consistent when we include issuer-time (Table 6, Panel A) and bond type-time (Table 6, Panel B) fixed effects.

Overall, our results show that the return volatility decreases with ETF ownership. Since the effect rises from the less liquid bonds only, our results are suggestive of ETFs providing an additional layer of market-making.

[Insert Table 6]

4. Conclusion

In this paper we document that the flexibility of ETF in-kind creation and redemption adds a new layer of market-making to the underlying corporate bond market. During periods of idiosyncratic shocks – notably downgrades – dealers deliver downgraded bonds to the ETF in creation baskets. Doing so reduces the inventory risk associated with market making in these bonds. We find that downgraded bonds with greater ETF ownership reach their fundamental price faster than other downgraded bonds from the same issuer. Specifically, the bond returns in the week of the downgrade are less negative and experience less of a reversal. Thus, corporate bond ETFs have become a warehouse for dealers to address idiosyncratic shocks.

The above results suggest that in corporate bonds the flexibility of the in-kind creation and redemption baskets provides a liquidity buffer for market makers. Supporting this conjecture, we find that greater corporate bond ETF ownership lowers the idiosyncratic volatility of bonds. Unique to the corporate bond market, we are able to control for fundamental risk and news by comparing two bonds from the same issuer and same seniority on the same date.

Overall, the results of this paper suggest that the findings of the equity ETF literature may not be applicable to situations where exact replication and instantaneous non-AP arbitrage are impeded by the liquidity mismatch between the ETF and the underlying. Further, the findings of this paper suggest that ETFs in-kind creation and redemption may have altered the microstructure of the underlying OTC market.

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Figures

Figure 1

ETF Holdings Around Bond Downgrades

This figure plots the total number of investment grade bonds held by ETFs around a downgrade by one of the three main rating agencies on date 0. We require no other downgrades to occur in the previous sixty trading days and the bond to maintain its investment grade status.

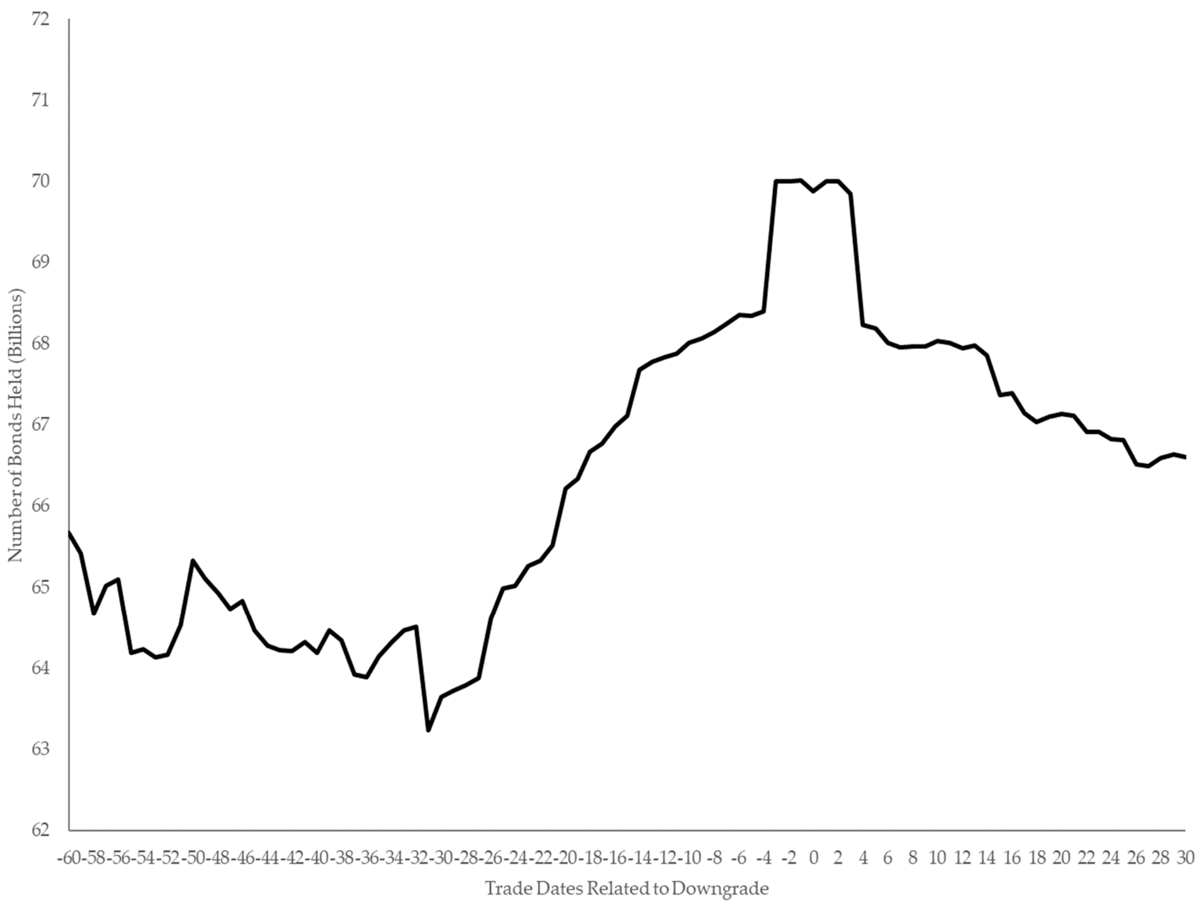

Table 1

Change in ETF ownership and selling pressure

This table present regressions on the relation between changes in investment grade ETF ownership and selling pressure in individual corporate bonds. Selling pressure is the total volume in a bond that is executed on the bid-side over the past twenty days. The selling volume is normalized by the total trading volume over the same period. Columns (1) – (2) present the results of regressions of the change in daily ETF ownership of a bond a selling pressure proxy. Column (1) controls for bond characteristics and column (2) adda liquidity controls. All regressions include bond and trading date fixed effects and standard errors clustered at the bond and trading-day levels. Columns (3) – (4) present the results of logistic regressions for a bonds likelihood of a creation event. The dependent variable is equal to one if the change in ownership is positive, and zero otherwise. Columns (5) – (6) present the results of probit regressions for a bond's likelihood of a redemption event. The dependent variable is equal to one if the change in ownership is negative, and zero otherwise.

	(1) ΔETFOwnership	(2) ΔETFOwnership	(3) Creation	(4) Creation	(5) Redemption	(6) Redemption
Selling Pressure (t-20 →t-1)	0.188***	0.214***	0.009*	0.049***	-0.467***	-0.460***
	(0.013)	(0.013)	(0.005)	(0.005)	(0.006)	(0.006)
Rating (t-1)	-0.046***	-0.044***	0.037***	0.028***	0.052***	0.045***
	(0.018)	(0.016)	(0.000)	(0.000)	(0.001)	(0.001)
Log(AO) (t-1)	2.100***	2.008***	1.029***	0.978***	1.080***	1.044***
	(0.249)	(0.222)	(0.002)	(0.002)	(0.002)	(0.002)
Log(Age) (t-1)	-0.317***	-0.309***	-0.055***	0.009***	-0.021***	0.020***
	(0.019)	(0.019)	(0.001)	(0.001)	(0.001)	(0.001)
Log(T2M) (t-1)	0.326***	0.337***	-0.191***	-0.190***	-0.051***	-0.048***
	(0.034)	(0.034)	(0.001)	(0.001)	(0.001)	(0.001)
TurnoverOTC (t-20 →t-1)		0.079		2.168***		1.337***
		(0.202)		(0.018)		(0.021)
Avg Amihud (t-20 →t-1)		0.000		0.000		0.000
		(0.000)		(0.000)		(0.000)
Observations	9,188,943	8,933,725	9,188,945	8,933,728	9,188,945	8,933,728
R-squared	0.019	0.019				
Bond FE	YES	YES	NO	NO	NO	NO
Trading Day FE	YES	YES	NO	NO	NO	NO

Table 2

Summary statistics: ETF ownership around downgrade events

This table presents summary statistics for the change in ownership around 3,810 downgrades. A downgrade defines a credit rating downgrade by one of the three main rating agencies (e.g., AA to A). *ΔETF Ownership i* represents a change in bond's ETF ownership (%) over the last *i* trading days.

	mean	sd	p25	p50	p75
ΔETF Ownership 5	0.012	0.243	0	0	0.002
ΔETF Ownership 10	0.019	0.267	0	0	0.013
ΔETF Ownership 22	0.024	0.296	-0.006	0	0.042

Table 3

Summary statistics: Bond characteristics around downgrade events

This table reports the results of t-tests -- we compare bonds with an increased ETF ownership (*Increased*) and other (*Not increased*) bonds. We split our observations to 1) events with bonds experiencing an increase in ETF ownership over five days leading to a downgrade and 2) other events. We compare liquidity measures – bid ask spread (*BidAsk*), Amihud measure (*Amihud*, x 10^6), imputed roundtrip cost (*IRC*), bond age (*Age* in years) – and other bond characteristics *ETFOwnership*, the number of ETFs that owns the particular bond issue (*CountETFs*), assets outstanding (*AOm* in millions), *Coupon* and *Rating.*

	Not increasing	Increasing	Difference	p-value
Illiquidity measures				
BidAsk	0.658	0.476	-0.182	0.000
Amihud	0.061	0.049	-0.012	0.000
IRC	0.003	0.002	-0.001	0.000
Age	6.112	5.215	-0.896	0.000
Bond characteristics				
ETFOwnership	1.196	1.875	0.678	0.000
CountETFs	7.484	11.914	4.430	0.000
AOm	736.354	1015.117	278.763	0.000
Coupon	4.329	3.895	-0.434	0.000
Rating	7.232	7.109	-0.124	0.033

Table 4

ETF Ownership and Uncertainty Events

This table reports the results of the following panel regression:

$$News_{i,j,d} = \gamma + \beta_1 \Delta \text{ETF Ownership s}_{i,j,d-1} + \beta_2 X_{i,j,d-1} + \epsilon_{i,j,d}$$

The dependent variable *News* is a measure of news released about bond *i* from issuer *j* on day *d*. We use three measures of news –standardized unexpected earnings (*SUE*), an indicator of missed earnings (*Miss*, D=SUE<0) and a credit rating downgrade by one of the three main rating agencies (*Downgrade*). *ΔETF Ownership* $s_{i,j,d-1}$ – is an increase in the fraction of bond amount outstanding held by ETFs for bond *i*, issuer *j* over the last *s* days. The regression includes the following vector *X* of bond-level controls, but the tables do not report them -- the log of age, the average rating, the log of time to maturity, log of amount outstanding, *ETFOwnership*. Standard errors clustered at the issue and month level are presented in parenthesis below the coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level.

Panel A: Downgrade	(1) Downgrade	(2) Downgrade	(3) Downgrade
ΔETF Ownership 5_{d-1}	0.088**		
	(0.038)		
ΔETF Ownership 10_{d-1}		0.038	
		(0.031)	
ΔETF Ownership 22_{d-1}			0.019
			(0.021)
Observations	1,063,198	1,063,198	1,062,483

Panel A: SUE	(1) SUE	(2) SUE	(3) SUE
ΔETF Ownership 5_{d-1}	-0.407*		
	(0.211)		
ΔETF Ownership 10_{d-1}		-0.291**	
		(0.119)	
ΔETF Ownership 22_{d-1}			-0.132**
			(0.066)
Observations	110,865	110,867	110,678
R-squared	0.005	0.005	0.005

Panel C: Earnings Miss	(1) Miss	(2) Miss	(3) Miss
ΔETF Ownership 5_{d-1}	0.148***		
	(0.051)		
ΔETF Ownership 10_{d-1}		0.132***	
		(0.035)	
ΔETF Ownership 22_{d-1}			0.093***
			(0.021)
Observations	112,065	112,067	111,871

Table 5

Summary statistics: monthly values

This table presents summary statistics for the variables used in the sample over the period from 2015 to 2022. IR is a measure of bond's idiosyncratic risk. *ETF Ownership*, $IMF\ Ownership$ and $AMF\ Ownership$ represent the fraction of bond's amount outstanding owner by ETFs, index mutual funds and active mutual funds, in %. The following variables represent bond's issuance level characteristics. AOm is the bond's amount outstanding in millions, $T2M$ and Age are bond's time to maturity and age in years. *Rating* is the numeric conversion of the letter rating (AAA = 1, AA+ = 2, AA = 3, AA- = 4, and so forth). *Coupon* is a bond's coupon rate in %. The next variables count the number of restrictions on dividend payout (*Dividend*), events (*Event*), financial (*Financial*), investments (*Investment*). The following variables represent bond (il)liquidity measures -- the fraction of bond's amount outstanding traded over the counter ($TurnoverOTC$), the average bid-ask spreads (*BidAsk*), imputed roundtrip cost (IRC) and Amihud (2002) illiquidity measure (*Amihud*).

	count	mean	sd	p25	p50	p75
IR	132,971	0.172	0.312	0.020	0.058	0.172
Ownerhsip						
ETFOwnership	132,971	3.614	1.636	2.348	3.442	4.750
IMFOwnership	132,971	2.826	1.287	2.009	2.695	3.495
AMFOwnership	132,971	6.047	5.071	2.217	4.766	8.491
Issue characteristics						
AOm	132,971	1,232.956	790.585	750.000	1,000.001	1,500.000
T2M	132,971	9.831	9.030	3.562	6.204	10.029
Age	132,971	4.298	2.784	2.128	3.650	5.860
Rating	132,971	7.303	2.212	6.000	7.667	9.000
Coupon	132,971	3.621	1.353	2.800	3.600	4.400
Covenants						
Dividend	132,971	0.022	0.228	0.000	0.000	0.000
Event	132,971	1.411	0.880	1.000	1.000	2.000
Financial	132,971	2.451	1.699	1.000	2.000	4.000
Investment	132,971	1.267	1.082	1.000	1.000	2.000
Liquidity						
TurnoverOTC	128,722	0.074	0.070	0.029	0.050	0.090
BidAsk	128,574	0.442	0.415	0.177	0.308	0.547
IRC	128,684	0.003	0.002	0.001	0.002	0.003
Amihud	128,717	0.038	0.041	0.011	0.023	0.048

Table 6

Idiosyncratic return volatility

This table reports the results of the following panel regression:

$$IR_{i,j,m} = \gamma_{j,m} + \beta_1 ETF\ ownership_{i,j,m-1} + \beta_2 X_{i,j,m-1} + \epsilon_{i,j,m}.$$

The dependent variable is idiosyncratic return volatility of bond i from issuer j in month m. *ETFOwnership* refers to the fraction of bond amount outstanding held by ETFs. The vector X of time-varying bond-level controls includes the ownership of index mutual funds (*IMFOwnership*) and active mutual funds (*AMFOwnership*), the log of age (*log_Age*), the average rating (*Rating*), Amihud (2002) illiquidity measure (*Amihud*), the log of time to maturity (*log_T2M*), log of amount outstanding (*log_AO*), *Coupon.* The regression also controls for the number of restrictions the bond has on dividend payout (*Div_covenant*), events (*Event_covenant*), financial (*Financial_covenants*), investments (*Investment_covenants*). The regressions include issuer-month fixed effects (Columns 1-4) and bond type-month fixed effects (Column 4). Observations with top 5% IR or ETF Ownership values are removed from the panel (Column 3). Standard errors clustered at the issue and month level are presented in parenthesis below the coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level.

	(1) IR	(2) IR	(3) IR	(4) IR
ETFOwnership	-0.060***	-0.010***	-0.011***	-0.012***
	(0.004)	(0.002)	(0.001)	(0.002)
IMFOwnership		-0.001	0.001	0.002
		(0.001)	(0.001)	(0.001)
AMFOwnership		0.000	-0.000	-0.000
		(0.000)	(0.000)	(0.000)
TurnoverOTC		-0.174***	-0.102***	-0.114***
		(0.025)	(0.011)	(0.025)
log_Age		0.024***	0.016***	0.018***
		(0.005)	(0.002)	(0.005)
Rating		-0.015***	-0.005**	0.012
		(0.005)	(0.002)	(0.009)
Amihud		1.242***	0.577***	0.980***
		(0.110)	(0.034)	(0.143)
log_T2M		0.125***	0.091***	0.102***
		(0.010)	(0.004)	(0.012)
log_AO		-0.076***	-0.045***	-0.052***
		(0.006)	(0.002)	(0.006)
Coupon		0.002	-0.001	0.002
		(0.002)	(0.001)	(0.002)
Dividend_cov		-0.017**	-0.013***	-0.012*
		(0.007)	(0.005)	(0.007)
Event_cov		-0.001	-0.000	-0.001
		(0.002)	(0.001)	(0.002)
Financial_cov		-0.001	-0.001	-0.000
		(0.002)	(0.001)	(0.002)
Investment_cov		0.001	-0.000	-0.001
		(0.002)	(0.001)	(0.002)
Constant	0.390***	1.600***	0.915***	0.940***
	(0.014)	(0.114)	(0.043)	(0.133)
Observations	132,971	128,417	114,438	56,721
R-squared	0.657	0.742	0.667	0.733
Issuer-month FE	YES	YES	YES	YES
Issuer-month-type FE	NO	NO	NO	YES
Controls	NO	YES	YES	YES
Remove			p95	

Table **7**

Idiosyncratic return volatility and bond illiquidity

This table reports the results of the following panel regression:
$IR_{i,j,m} = \gamma_{j,m} + \beta_1 ETF\ ownership_{i,j,m-1} + \beta_2 Illiquidity_{i,j,m-1} + \beta_3 Illiquidity_{i,j,m-1}$ x $ETF\ ownership_{i,j,m-1}$ $\beta_4 X_{i,j,m-1} + \epsilon_{i,j,m}$. The dependent variable is idiosyncratic return volatility of bond i from issuer j in month m. *ETFOwnership* refers to the fraction of bond amount outstanding held by ETFs. We use two forms of *Illiquidity* measures – the continuous values (*Illiq*) and the indicators taking values of one for above month-median values (*HighIlliq*) – and the interactions between these measures and *ETFOwnership.* We use four measures of *Illiq* – median values of bid-ask spread (*BidAsk*), imputed roundtrip costs (*IRC*), Amihud (2002) illiquidity measure (*Amihud* x 10^6) and the log of bond age (*log_Age*). The vector *X* controls for the time-varying bond-level controls but the tables do not report their coefficients -- the fraction of bond amount outstanding owned by index mutual funds and active mutual funds, the log of age, the average rating, Amihud (2002) illiquidity measure *Amihud*, the log of time to maturity, log of amount outstanding, *Coupon,* the number of restrictions the bond has on dividend payout, events, financial and investments. The regressions include issuer-month fixed effects (Panel A) and bond type-month fixed effects (Panel B). Standard errors clustered at the issue and month level are presented in parenthesis below the coefficient. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BidAsk	BidAsk	IRC	IRC	Amihud	Amihud	log_Age	log_Age
Panel A: Issuer-Month	IR	IR	IR	IR	IR	IR	IR	IR
Illiq_ETFOwnership	-0.079***		-13.726***		-0.800***		-0.003*	
	(0.005)		(0.928)		(0.050)		(0.002)	
HighIlliq_ETFOwnershi		-0.030***		-0.026***		-0.020***		-0.000
		(0.002)		(0.002)		(0.002)		(0.002)
ETFOwnership	0.019***	0.004	0.019***	0.003	0.016***	0.001	-0.006***	-0.010***
	(0.003)	(0.002)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)
Illiq	0.324***		42.964***		3.071***		0.034***	
	(0.018)		(3.474)		(0.158)		(0.009)	
HighIlliq		0.078***		0.060***		0.018***		-0.011
		(0.006)		(0.007)		(0.006)		(0.008)
Observations	128,244	128,244	128,378	128,378	128,417	128,417	128,417	128,417
R-squared	0.764	0.748	0.755	0.747	0.757	0.748	0.742	0.742

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	BidAsk	BidAsk	IRC	IRC	Amihud	Amihud	log_Age	log_Age
Panel B: Type-Month	IR	IR	IR	IR	IR	IR	IR	IR
Illiq_ETFOwnership	-0.060***		-10.004***		-0.588***		-0.003*	
	(0.005)		(1.004)		(0.055)		(0.002)	
HighIlliq_ETFOwnersh		-0.021***		-0.017***		-0.012***		-0.000
		(0.002)		(0.002)		(0.001)		(0.002)
ETFOwnership	0.011***	-0.003	0.010***	-0.004**	0.008***	-0.005***	-0.009***	-0.012***
	(0.002)	(0.002)	(0.003)	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Illiq	0.329***		36.461***		2.586***		0.029***	
	(0.028)		(4.457)		(0.220)		(0.010)	
HighIlliq		0.069***		0.037***		0.003		-0.005
		(0.008)		(0.007)		(0.006)		(0.009)
Observations	56,717	56,717	56,721	56,721	56,721	56,721	56,721	56,721
R-squared	0.752	0.737	0.742	0.737	0.743	0.739	0.733	0.733