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Abstract

We investigate the relationship between the transactional activity of asset management companies (AMCs) in the non-performing loan (NPL) market and their corresponding debt issuances in a niche bond market in Borsa Istanbul. We analyze the determinants of the trading volume of AMC bonds to determine whether an issue's volume can reflect bond-specific factors after controlling for firm-specific information. We employ pooled ordinary least squares and random effects panel data regressions on a monthly data set of 26 bonds traded between 2012 and 2019. We find that higher trading volume is associated with larger issues, older bonds, and issuers of long-term debt only. These results suggest that the trading volumes of such bonds decrease when NPL transactions become rare due to worsening economic and financial conditions, at which point the investor demand for new issuances declines and the AMCs are forced to issue short-term debt instead to raise funds.

Keywords: asset management company; non-performing loan; corporate bond; trading volume; liquidity

JEL classification: G12; G21; G23

1. Introduction

Asset management companies (AMCs) help banks free their balance sheets of non-performing loans (NPLs) so that banks can lend more to households and businesses and hence improve their profitability and induce economic growth by facilitating funding mechanisms. Much of the research has focused on the role of AMCs in solving the NPL problem in various countries. For instance, Fell et al. (2017) argue that the pile of NPLs in the European Union, as a financial stability issue, may be effectively resolved with the contribution of state-owned (centralized) and/or privately held (decentralized)

AMCs. However, national cases[1] show that there is no one-size-fits-all model for AMCs; rather, the best solution often satisfies system-specific issues.

Turkish banking regulations offer a dual approach for managing NPLs: (1) a centralized approach followed by the government and (2) a decentralized approach followed by the private sector. On the government side, the Savings Deposit Insurance Fund (SDIF)—a public legal entity with administrative and financial autonomy—aids in the resolution of banks in distress. In the private sector, banks and even the SDIF itself are entitled to sell NPLs to AMCs established as joint stock corporations. Turkish AMCs have been involved in the NPL business since 2006, when legislation regarding the foundation and operations of AMCs was enacted. Although the number of selling transactions and AMCs has increased over the years, the dynamics in the secondary NPL market have attracted little attention from the research community. What is more interesting is that AMCs have become leading corporate bond issuers in order to finance their NPL purchases, and a niche market has developed to cater to the investment needs of qualified investors who wish to trade these bonds in Borsa Istanbul since 2012. The emergence of this new habitual mode of finance calls for an empirical investigation on the liquidity of the bonds issued by AMCs, which would also shed light on its association with secondary NPL activity.

Our contribution is twofold. First, we establish a theoretical link between the NPL market and the AMC bond market. This is essential because Turkey, as an emerging economy, is vulnerable to economic and financial shocks that could produce a surge in NPLs as an indicator of the need for effective risk management among banks. In fact, asset quality across all banks has deteriorated so far that NPLs rose from 3% in

[1] A brief overview is given in the Supplementary Material available online.

mid-2018 to 5.4%, reaching a gross amount of roughly EUR 22.6 billion at the end of 2019 due to unstable macroeconomic conditions. Policymakers must therefore closely monitor the potential impacts of high NPLs (World Bank, 2020). In this context, a critical assessment of the risks associated with NPLs that draws evidence from the liquidity in the corporate bond market would be important and timely, since liquidity shrinkage may be pointing to a "greater-than-anticipated" deterioration in loan quality, which would lead to systemic risk in the financial markets as a whole. Second, we apply an empirical methodology for the estimation of potential impacts of well-known factors on the bond liquidity in a unique setting. Turkish AMCs operate like special-purpose vehicles since AMC bonds are issued specifically to finance their NPL transactions by regulation. In this framework, we examine the bond-specific determinants of corporate bond liquidity, as proxied by trading volume. Following the abundant literature reviewed below, we use issue size, bond age, and debt issuance status to reflect the liquidity-related factors, while we use interest rate, credit, and price variability risk to reflect non-liquidity-related factors that affect volume. We also control for firm-specific factors, such as NPL investments, debt level, and operating performance. This methodology allows investigating the bond issuances of other companies operating under similar regulatory regimes.

Our analysis, based on pooled ordinary least squares (OLS) and random effects panel data regressions, reveals that bonds with larger issue sizes, with a longer time of issuance, and that are issued by long-term debt issuers only tend to have higher trading volumes. In addition, we show that bonds of AMCs with considerable level of NPL investments, low debt and high operating performance trade more. We also demonstrate that interest rate risk and credit risk may speculatively increase trading volumes due to the informational asymmetry among the market players. These findings suggest that low

transactional activity in the NPL market due to poor economic and financial conditions would have an adverse effect on the liquidity of AMC bonds.

The remainder of this paper is organized as follows. Sections 2 and 3 explain the study's institutional and conceptual framework, based on a discussion of its motivational background and a literature review, respectively. Section 4 defines our hypotheses. Section 5 describes our data and methodology, and Section 6 presents our results. Finally, Section 7 concludes the paper.

2. Institutional Framework and Motivating Factors

Turkish AMCs are licensed financial institutions subject to the regulations of the Banking Regulation and Supervision Agency (BRSA), the regulatory authority of the Turkish banking industry. By definition, they are joint stock companies incorporated to purchase, collect, restructure, and sell the NPLs of all financial institutions,[2] including the SDIF. While there are no entry barriers, AMCs must obtain permission from the BRSA to initiate these core activities. The regulations also allow AMCs to issue securities (e.g., equities or bonds) with the sole objective of financing their core activities[3].

Though these regulations were introduced in 2006, AMCs started to purchase NPLs in the secondary market, especially from private banks, only in 2008. Since then, NPL portfolio sales have grown 20% per annum (World Bank, 2018), and the size of

[2] NPLs originate from non-bank financial institutions, such as leasing, factoring, financing, and insurance companies as well, but the primary contributors to NPL volume are banks with a share of approximately 95% (PwC, 2018). Therefore, AMCs are clearly bank-dependent.

[3] Article 11-1/(d) of "Regulation on the Establishment and Operating Principles of Asset Management Companies" requires that AMCs can issue bond to purchase NPLs of banks. The regulation is available at https://www.bddk.org.tr/ContentBddk/dokuman/mevzuat_1000.pdf.

retail loans sold—most of which are unsecured, small, and difficult to collect—has consistently been greater than those of corporate, commercial, and small and medium-sized enterprises (SME) loans[4] (PwC, 2018). Non-performing loans are sold through tender offers at substantial discounts in the ordinary course of business. These discount rates have dramatically increased lately, indicating a possible impairment in the quality of NPL portfolios (PwC, 2018). However, the participation of AMCs in the capital market is relatively recent. The first corporate bond issuance took place only in late 2012, by an AMC co-owned by EBRD[5] and an investment holding company. The vast majority of AMC bonds have been issued as floating-interest bearing debt (e.g., the benchmark interest rate plus a predetermined margin) and have been offered to and traded among qualified investors only. Short-term commercial paper appears to have been replacing bonds since 2018. Around 50% of sector assets are funded by debt, including corporate bond issuances, while equity finance accounts for 35% on aggregate (Turkrating, 2020). None of the AMCs has yet gone public.[6]

The number of AMCs registered with the BRSA as of 2019 year-end was 19; there were only five in 2012. Sales of NPLs reached EUR 1.4 billion in 2019, and the prevailing market expectation is that these sales figures will improve due to the increase in NPLs on the seller side (PwC, 2018) and the consequent need to reduce them. However, this would depend on the overall manageability of the NPLs and on the pricing strategies, which would ultimately translate into the risk appetite of both parties.

[4] However, the sudden increase in NPLs in 2019 was triggered by commercial loans due to currency depreciation (World Bank, 2019). In particular, the amount of SME NPLs sold to AMCs exceeded that of retail NPLs for the first time during this period (Turkrating, 2020).

[5] EBRD stands for "European Bank for Reconstruction and Development."

[6] Note that one AMC (Gelecek Varlık Yönetimi A.Ş.) filed with the Capital Markets Board of Turkey for an initial public offering on 26.04.2021.

As a final word on the institutional landscape of the AMC sector, the Banks Association of Turkey recently authorized a well-known consulting company[7] to establish a government-sponsored AMC. Moreover, regulatory changes for AMCs offering potential entry opportunities for foreign players are on the table. These initiatives would not only motivate banks (especially state-owned ones) to remove NPLs from their balance sheets but would also trigger fierce competition in the market (Cafolla et al., 2020).

Turning to our main theme, the link between debt issuing and the NPL purchasing activities of issuer AMCs is shown in Figure 1. The figure depicts the yearly course of both activities in terms of billions of Turkish lira (TL).[8]

Please insert Figure 1 about here.

Figure 1 shows that the amounts of debt finance have often been greater than the amounts paid for NPLs and that, as mentioned, short-term commercial paper has superseded long-term bonds in recent years. These preliminary findings imply that AMCs have started to issue debt for purposes other than their core activities based on NPLs transactions; probably, the objective is to refinance existing debt or to make debt repayments because a great portion of NPL balances has been uncollectable. Furthermore, AMCs seem to have lost their long-term borrowing capacity and have been obligated to issue short-term debt instead. This transformation can also be observed in Figure 2, which shows the maturity structures of AMC bonds. As the figure suggests, bond issuances tend to have smaller maturities on average throughout the

[7] A press release is available at https://www.reuters.com/article/turkey-economy-bad-debt/turkish-banks-hire-ey-as-asset-manager-option-gains-steam-for-npls-idUSL8N2AL3MH.

[8] According to market reports, purchased volumes decreased in 2015 mainly because the prices offered by AMCs did not meet banks' expectations (PwC, 2018).

years, and they suddenly stop in 2019.[9]

Please insert Figure 2 about here.

However, it is often difficult to ascertain the scale of the potential problem since AMCs are privately-held corporations, and public information such as financial statements is largely unavailable. Regulations oblige AMCs to prepare annual financial statements only; these are published on the BRSA website[10] or via the Public Disclosure Platform[11] provided the AMC is a debt issuer. In both cases, most of the financial statements may not contain the information required to match NPL purchases with debt issuances exactly. One indirect means of assessing the link may be to obtain data from public announcements made by the selling party (e.g., listed banks). However, though these announcements are frequently made, they may omit many important figures, even sales prices and purchaser names. Thus, there is a clear need to elaborate on the debt issuing–NPL purchasing relationship in order to develop a deeper understanding of the secondary NPL market. Thus, this study seeks to provide more robust evidence on this relationship by exploiting information on the liquidity of AMC bonds.

3. Conceptual Framework and Literature Review

3.1. Trading Volume as a Measure of Liquidity

Much of the literature on bond liquidity has scrutinized the transactional characteristics

[9] This could also be attributed to the sharp increase in market interest rates in 2018, which may have made floating rate bond issuances more costly for AMCs.

[10] These financial statements are available at https://www.bddk.org.tr/BdrUyg (in Turkish).

[11] The Public Disclosure Platform is a 7/24 electronic system through which the electronically signed notifications of companies are disclosed. Disclosures of AMCs, as issuers to qualified investors, are subject to various exemptions and are largely limited to debt issuances and settlements. The website is at https://www.kap.org.tr/en/.

of bonds. This research has focused on bid-ask spreads (e.g., Chakravarty and Sarkar, 1999; Hong and Warga, 2000; Schultz, 2001; L. Chen et al., 2007; Febi et al., 2018), but the use of trading volume as a liquidity proxy has also been a major area of concern. Kamara (1994), Elton and Green (1998), and Goldreich et al. (2005) establish the link between liquidity in the US Treasury market and prices by using proxies based on trading volume. In the corporate bond market, Chakravarty and Sarkar (1999), Alexander et al. (2000), Goldstein et al. (2007), Mahanti et al. (2008), Helwege et al. (2014) and Hotchkiss and Jostova (2017) measure bond liquidity using trading volume and study its determinants for different types of US corporate bonds.

Research, which uses volume as a proxy for liquidity, finds that frequent trading has a direct impact on inventory carrying costs (Crabbe and Turner, 1995), particularly when dealers cannot easily adjust their inventories due to low trading volume and thus transfer the burden to investors as a specific type of transaction cost, which is eventually reflected in bond prices. Despite this tactic and its widespread use, increased trading may also be seen as evidence of speculative activity induced by information asymmetry (Bamber, 1986; Krinsky and Lee, 1996). Fleming and Remolona (1999) also find that high trading volume may persist along with wide bid-ask spreads. Moreover, Fleming (2001) asserts that trading volume is a poor method of measuring liquidity since it is weakly correlated with other proxies of liquidity, such as bid-ask spreads, yield spreads, and price impacts. In contrast to these findings, Green (2004) shows that increased trade coincides with high liquidity.

3.2. Determinants of Corporate Bond Liquidity

Many researchers have conducted analyses on the determinants of corporate bond liquidity. One of the most often-studied indicators is issue size. Most studies find that a

larger issue is linked to higher corporate bond liquidity (e.g., Fisher, 1959; Crabbe and Turner, 1995; Fridson and Garman, 1998; Hong and Warga, 2000). The intuition stems from the inventory paradigm, which suggests that large issues enable dealers to implement a more effective inventory management system, which cuts inventory holding costs and, as a corollary, trading costs. Thus, investors are more easily compensated for their cash flow needs, and dealers can rebalance their portfolios more smoothly. While this appears to offer an alternative explanation to Schultz (2001), who argues that trading costs decline along with trade size as well as for active dealers, issue size may also be related to transparency level, given that the larger the size, the lower the search costs, as the author emphasizes.[12] Hence, larger issue sizes would imply that the secondary market is more liquid—probably with high trading volumes—as is strongly confirmed by studies such as Alexander et al. (2000), Longstaff et al. (2005), Goldstein et al. (2007), Mahanti et al. (2008), Lee and Cho (2016), Hotchkiss and Jostova (2017), Guo et al. (2017), and Yamani and Rakowski (2019). However, other findings suggest that issue size is not important in explaining corporate bond liquidity (e.g., L. Chen et al., 2007).

The aging of corporate bonds is another issue to consider. The age concept originates in Sarig and Warga (1989) and Warga (1992), who show that liquidity in government bonds decreases as the bond ages because bonds are absorbed into inactive investment portfolios over time and tend to stand still until maturity once they become illiquid. This notion is incorporated in later corporate bond studies, most of which similarly find that older (off-the-run) bonds are less liquid than newer (on-the-run) bonds (Hong and Warga, 2000; Mahanti et al., 2008; Bao et al., 2011). The results are

[12] Edwards et al. (2007) provide a detailed analysis on the relationship between transaction costs and transparency in the corporate bond market.

qualitatively similar when trading volume is used as the proxy for corporate bond liquidity (Alexander et al., 2000; Goldstein et al., 2007; Lee and Cho, 2016; Hotchkiss and Jostova, 2017; Guo et al., 2017; Yamani and Rakowski, 2019). However, a number of studies indicate that there is no evidence of an on-the-run effect in the corporate bond market (e.g. Blume et al., 1991; Longstaff et al., 2005). Nashikkar et al. (2011) also contend that age may not be a good measure of the absorption effect.

Duration or interest rate-related risks could also have a significant impact on corporate bond liquidity. As has been argued, long-dated bonds are generally less liquid since they are more sensitive to changes in their yields, and it takes more time to receive full repayment (Sarig and Warga, 1989; Chakravarty and Sarkar, 1999; Hong and Warga, 2000; L. Chen et al., 2007; Van Landschoot, 2008; Friewald et al., 2012). Guo et al. (2017) confirm the validity of these findings in the context of trading volume. However, the relationship turns out to be more nuanced, because several studies also suggest that high interest rate risk possesses a speculative component of trading (Alexander et al., 2000 [with weak significance]; Goldstein et al., 2007; Lee and Cho, 2016; Hotchkiss and Jostova, 2017). This seems to justify the theoretical framework that posits that volume increases along with return volatility based on the differences in speculators' forecasts (Harris and Raviv, 1993; Kandel and Pearson, 1995; Bamber et al., 1999). In any case, this type of risk is often estimated by a bond's time-to-maturity, defined as the remaining life of the bond between the transaction date and the maturity date. The issue duration (e.g. Alexander et al., 2000), the callability feature of the bond (e.g., Hotchkiss and Jostova, 2017), and duration differences between benchmark index returns for long- and short-term bonds (e.g. Edwards et al., 2007) are among the other proxies of interest rate risk.

Every popular approach used in the research on corporate bond liquidity acknowledges the presence of credit or default risk, which is specified by the credit rating score. It is well-documented that credit rating has an inverse association with spreads (Chakravarty and Sarkar, 1999; Houweling et al., 2005; Van Landschoot, 2008; Friewald et al., 2012; Dick-Nielsen et al., 2012), whereas the findings on its impact on trading volume are inconclusive. Alexander et al. (2000) and Mahanti et al. (2008) use credit rating and find that bonds with lower ratings have higher trading volumes, indicating the speculative notion of credit risk. Hotchkiss and Jostova (2017) suggest that this impact varies considerably across bond and issuer types. For instance, the probability of trading increases along with credit risk for investment grade bonds issued by private firms, while it decreases for those issued by public firms. However, Guo et al. (2017) concur with the spread-focused studies by showing that lower credit risk is associated with higher trading volume.

Empirical studies also consider price volatility, typically postulating that it captures the information uncertainty specific to a bond in the market. Shulman et al. (1993) and Hong and Warga (2000) point out that greater price volatility leads to an increase in bond spreads. Houweling et al. (2005) underline that price (yield) dispersion is a key determinant in pricing bond market liquidity. The volume-related literature finds that uncertainty may also trigger speculative trading activity, as predicted by Harris and Raviv (1993) and evidenced by Alexander et al. (2000) and Lee and Cho (2016). On the other hand, both Hotchkiss and Jostova (2017) and Guo et al. (2017) reach contrary conclusions.

The other oft-cited determinants of corporate bond liquidity include issuer status (i.e., public or private; Alexander et al., 2000; Hotchkiss and Jostova, 2017), coupon rates (Helwege et al., 2014; Guo et al., 2017), number of contributors (Houweling et al.,

2005), missing prices (Houweling et al., 2005), and on/off-the-run indicators (Houweling et al., 2005; Helwege et al., 2014). However, the validity of these arguments for floating rate corporate bonds may be questionable since most of the corporate bond literature has focused on fixed rate straight bonds and has excluded floating rate bonds from the analysis because of their different pricing mechanisms (e.g., Crabbe and Turner, 1995; Elton et al., 2001; Diaz and Navarro, 2002; Perraudin and Taylor, 2004; Goldstein et al., 2007; Das et al., 2014). Thus, the evidence for floating rate bonds is insufficient to support these claims.

4. Hypothesis Development

We pose the following research question given the institutional setting for AMC bond issuances and the literature on the determinants of corporate bond liquidity: Does liquidity in the secondary market for AMC bonds offer insight into the dynamics in the secondary market for NPLs? The linkage between the two secondary markets is clear: By law, AMCs are permitted to issue bonds only to fund NPLs; therefore, high (low) liquidity is a positive (negative) signal for AMCs to purchase NPLs from banks in such a way that high (low) investor demand in the bond market will stimulate (interrupt) the NPL purchases. One may contend that the bond market cannot be considered the only source of funds for financing NPLs; however, as the data suggest, the AMC bond market is a niche market with high-yield opportunities, in which bonds are offered restrictively to "qualified investors"[13] such as investment funds. Thus, a possible lack of

[13] This term is analogous to "Qualified Institutional Buyers" of trade Rule 144A bonds in the US market. Interested readers may refer to Livingston and Zhou (2002) for brief background information on Rule 144A. However, in Turkish setting, qualified investors also involve individual investors such as customers that hold total financial assets excess of 1 million TL or that has eligible work experience and professional licenses in capital markets.

market liquidity and the consequent reluctance of institutional investors to trade in bonds can be attributed to their portfolio management strategies and asset allocation profiles with respect to the ongoing situation in a declining NPL market. One could also argue that inactive trading does not necessarily imply poor market conditions, as it may stem from investor preferences for buy-and-hold strategies. However, again, the data refute this argument by revealing that all AMC bonds are floating rate, which are more suitable for investors who do not intend to hold the bond until maturity due to interest rate risks. This is consistent with the fact that AMC bonds predominate in actively managed fund portfolios.

Given the importance of AMC bond market liquidity for NPL market activity, we now describe our hypotheses concerning our research question. We closely follow Alexander et al. (2000), with minor adjustments, in our theoretical reasoning and examine the liquidity- and non-liquidity-related bond-specific determinants of trading volume. We base our discussion on issue size, bond age, and issuer-debt type for liquidity; and on interest rate risk, credit risk, and price variability for non-liquidity-related factors. We do not consider other potential concerns, such as issuer status or coupon rates for various reasons. For instance, issuer status is irrelevant since all of the AMCs are private companies, and the coupon rate does not matter because Turkey's tax regime does not allow for a clientele effect.

4.1. Liquidity-related Factors of Trading Volume

We propose the following:

H1: There is a positive relationship between issue size and trading volume.

In line with the vast majority of the research, we predict that larger (smaller) issues have a higher (lower) trading volume. Our prediction relies on our observation that investors buy and sell their shares in investment funds so frequently that managers have to redeem shares by liquidating portfolio assets in order to make the required payments immediately. For this reason, a significant portion of investment funds in Turkey invests in short-term or short time-to-maturity instruments.[14] This is also the case for funds, which invest in corporate bonds including those of AMCs. As mentioned, these are mostly actively managed funds and are matched with investors with shorter investment horizons and higher redemption needs.[15] Issue size is therefore expected to allow the fund dealer to execute investor orders quickly, ensuring that the corporate bond inventory is properly managed. In case the results align with our prediction, we would infer that large (small) issue sizes are an indicator of an intense (occasional) NPL purchasing activity, which could be a positive (negative) sign for the future collectability of bad debt in the market.

[14] These can be verified by the Turkey Electronic Fund Trading Platform, a venue that allows comparisons between all Turkish investment funds over a single system, and the Turkish Capital Market Association, a self-regulatory organization for capital market institutions. One of the reports of the former shows fund-based historical trading volumes, while the latter reviews the fund market. These resources are available at http://fundturkey.com.tr/IstatistikiRaporlar/FonBazliIslemHacmi.aspx and in TCMA (2019), respectively. Both facts complement another interesting finding in the stock market: According to a recent report, the average holding period for an equity investor was only 31 days in 2019 (TCMA, 2020).

[15] This stylized "matching" fact has been supported by Gaspar et al. (2005) and Q. Chen et al. (2010).

We propose the following:

H2: There is a negative relationship between bond age and trading volume.

Older bonds are less liquid than newer bonds, as the literature suggests. We argue that, under normal circumstances, this should hold for all types of bonds, be they fixed or floating rate. When bonds are classified in order to determine the most liquid, the lowest age should be preferred because older bonds are ultimately supposed to be owned by "buy-and-hold" investors, at which point they lose their visibility and availability. Accordingly, we expect that newer bonds will have greater liquidity and lower trading costs, which would indicate that investors have new demand for bonds (Lindvall, 1977). If this is the case, then AMCs would enjoy easy access to capital through bond issues with which to engage in NPL purchasing activity more effectively.

We propose the following:

H3: There is a positive relationship between being a pure bond issuer and trading volume.

As noted by DeCosta et al. (2017), many factors may affect a firm's choice of debt maturity, including firm-level concerns, underinvestment problems, and asset–liability matching. In our case, however, the most realistic approach appears to be to attribute this choice to investor demand because the market for AMCs' debt securities is private and is shaped exclusively by qualified investors. Actively managed investment funds are the major players in the market, and it is reasonable to expect a clientele effect in performance management. The portfolio managers of such funds would demand the securities that are able to contribute to the performance of the fund. Hence, the

replacement of long-term bonds with short-term paper may be explained by the changing preferences of investors in generating portfolio returns. It is important to differentiate between an issuer that issues long-term bonds only (single debt) from issuers that concurrently issue short-term commercial paper (dual debt). Making this distinction allows us to compare the trading volumes of the bonds of the two issuer types and identify the impact of demand changes in terms of flight-to-liquidity. For example, if the trading volume of bonds pertaining to a dual debt issuer is found to be lower than that of a single debt issuer, we would infer that illiquidity in the AMC bond market is increasing, the NPL market is in distress, and investors are shifting to more liquid short-term (and potentially high-return) securities (Beber et al., 2009).

4.2. Non-liquidity Factors of Trading Volume

We propose the following:

> *H4: There is a positive relationship between interest rate risk and trading volume.*

The sensitivity of a bond to interest rate fluctuations depends on the bond's longevity. We hypothesize that this sensitivity is reflected in the trading volume of bonds in positive terms. More concretely, we argue that an increased interest rate risk generates a surge in trading volume. Our view is based on the theory that the speculative components of trading may lever the volume even if liquidity is low in the bond market because not all investors interpret public information in the same way, and disagreements lead to higher trading volume. If the results support our proposition, we would conclude that AMCs are able to issue long-term bonds, which is a good sign of credibility (Antoniou et al., 2006), and establish and manage their NPL portfolios more effectively. In practice, bonds with higher interest rate risk (e.g., longer residual

maturity) would still be preferred by investors, who would seek to benefit from their higher coupon payments for a longer period of time, but such buy-and-hold behavior would reduce trading volume and, more importantly, be conditional on the investors' expectation of interest rate increases.

We propose the following:

H5: There is a positive relationship between credit risk and trading volume.

The consensus is that the credit quality of a bond is associated with its liquidity. When trading volume is considered, this association is likely based on the speculative impact of ratings due to a wide divergence of opinion about the true value of the bonds. In these situations, liquidity would tend to be low. Another explanation for such low liquidity would be that high-rated bonds are preferred by buy-and-hold investors and are traded less frequently. We propose that trading volume increases along with credit risk. On the other hand, the increase in credit risk would be an informative signal of deterioration in the borrowing capacity of the AMCs, which would also imply that the secondary market for NPLs is under severe stress.

We propose the following:

H6: There is a positive relationship between price variability and trading volume.

Our final hypothesis is derived from return volatility, another non-liquidity factor of volume. The theoretical explanation is that a positive relationship exists between volume and the absolute value of price reactions to public (Harris and Raviv, 1993) or private (Shalen, 1993) information. This is conceptualized again as an outcome of

heterogeneous investor beliefs affecting the required rates of returns in the bond market. Greater volatility in returns would induce speculative trading activity. The expected positive association between volatility and volume would indicate that the informational asymmetries between investors may be so pronounced that they reflect material uncertainty in the NPL market.

5. Data and Methodology

This study analyzes a comprehensive dataset on the trading volume of all government and corporate bonds traded in Borsa Istanbul on a daily basis. Each bond is associated with specific information about its days-to-maturity, days-to-coupon, accrued interest, price, yield, quantity traded, value traded, and number of trades. These data extend to 2009, but, since we confine ourselves to a special case, our data cover the period between the debut of the AMC bond market in September 2012 and December 2019. During this time, 27 corporate bonds were offered by eight AMCs; however, one of the bonds was never traded, which left us with 26 sample bonds from seven issuers. All of the bonds bear interest at floating rates and are privately placed to qualified investors. Part A of Table S1 (see Supplementary Material available online) locates the trading pattern of these AMC bonds in the corporate bond universe. We also report commercial paper issued by AMCs in Part B for comparison purposes.

Although we cannot give an exact picture of the bond (i.e., floating rate) and investor (i.e., qualified) status in the market due to data limitations, the corporate bond data in Table S1 suggests an overall dramatic increase in the trading of short-term commercial paper relative to long-term corporate bonds. This applies to AMCs' debt securities as well and seems to be concomitant with the large amount of commercial paper issuances displayed in Figure 1. The trading volume of AMC bonds corresponds roughly to a 5%

market share throughout the sample period, which was about 9% between 2016 and 2018, while its average growth rate is more than double that of the whole market. In a bank-dominated debt market where banks are the largest issuers[16] , and though AMC bonds are offered to and traded among qualified investors only, these figures indicate that the market for these bonds is a fairly niche one characterized by its high growth potential, as its products are attractive to institutional investors. Among these, actively managed funds, which have short-term investment horizons, stand out. Further, the fact that even money market funds invest in AMC bonds suggests that these bonds may not be considered completely illiquid instruments. This is reflected in Table 1, which shows the prominent features of the 26 bond issuances of AMCs in our sample.

Please insert Table 1 about here.

Part A of Table 1 reveals that AMC bonds have an average maturity and average time since issuance (age) of about two and one years, respectively, meaning that older bonds are tradable. Average time-to-maturity is slightly above 400. Bonds start to trade immediately after an average 25 days following their issuance. Only two bonds (7.70%) enter the market later than the average time of first trading. The bonds pay coupons nine times on average, and the bond interest rates are reset at these times. Fund investing horizon data reveal that AMC bonds are included in relatively short-term investment funds on average. Lastly, price variation is low for these bonds. Part B indicates that bond issuers have recently started to prefer short-term debt. On the other hand, Part C shows that the credit risk of the issuers has decreased. The disappearance of "B" grades

[16] Around 78% of the issuances belong to banks. These data can be obtained from an update institutional report available (in Turkish) at https://www.tspb.org.tr/wp-content/uploads/2020/07/TurkiyeSermayePiyasasi2019r.pdf#page=16 (p. 22). Note that banks are also the dominant players in the fixed income trading business, with 85% of market share (TCMA, 2019).

is due to subsequent upgrades in rating revisions.

Following Alexander et al. (2000), we report the daily trading activity of AMC bonds in the market in Table 2.

Please insert Table 2 about here.

First, the average daily number of trades of 0.15 indicates 3 trades per month and 37.5 trades per year. This trading frequency seems low. Moreover, an average bond trades around 10% of the days during its life in the market. At first glance, we are led to postulate that AMC bonds are not actively traded at all. On the other hand, annual turnover figures suggest that bonds cannot be strictly considered as buy-and-hold instruments because there are signs of high turnover that indicate significant trading interest. The trade size, which is the quantity traded, also suggests that bonds are generally traded in bulk amounts. This low frequency–high quantity trading nature suggests the portfolio rebalancing behavior of actively managed investment funds as short-term investors (Downing and Zhang, 2004).[17] Table S2 in the Supplementary Material available online reports a more comprehensive version of Table 2.

Based on this dataset, we employ pooled OLS and random effects panel data regression methodologies to investigate the potential determinants of AMC bond trading volume. In the first step, our baseline empirical models are as follows:

$$VOL_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 AGE_{it} + \beta_3 SHORT_{it} + \beta_4 RESET_{it} + \beta_5 RATING_{it} + \beta_6 PRICE_{it} + \varepsilon_{it} \quad (1)$$

$$VOL_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 AGE_{it} + \beta_3 SHORT_{it} + \beta_4 RESET_{it} + \beta_5 RATING_{it} + \beta_6 PRICE_{it} + \omega_{it}, \quad \omega_{it} = \varepsilon_{it} + v_{it} \quad (2)$$

[17] An unreported analysis shows virtually no correlation between trade count and volume (0.05).

In both equations, VOL, SIZE, AGE, SHORT, RESET, RATING, and PRICE are the bond-specific variables of interest denoting trading volume, issuance size, bond age, issuer-debt type, interest rate risk, credit risk, and price variability, respectively. ε_{it} is the cross-sectional error term, while ω_{it} is the composite error term, including v_{it}, the individual observation error term. Although daily data are available, we prefer to perform monthly regressions because, though an average AMC bond is traded more (31%) throughout its life, its daily trading frequency is relatively low (10%). We also mitigate any potential noise and fluctuations in the market by sampling monthly rather than daily. The total number of pooled observations is 484. Since some of the bonds do not trade every month, our pooled data have an unbalanced panel structure.[18]

Our dependent variable, VOL, is the average market value of trades for the bond each month (Mahanti et al., 2008). Issue size (SIZE) is the natural log of the bond's par value outstanding. This amount does not change for a given bond during the sample period because bonds are subject neither to repurchase nor to conversion. Bond age (AGE) is the time since issuance in days (converted to years). SHORT is a dummy variable that takes one if the bond issuer is also a commercial paper issuer in the given month and zero otherwise. We use reset frequency (RESET) to measure the duration or interest rate risk. Reset frequency is a more accurate proxy than time-to-maturity since it is more relevant to floating rate bonds. The intuition is that the greater (lower) the reset frequency, the smaller (bigger) the duration due to coupon rate adjustments made to reflect the market interest rate (Fabozzi, 2002).[19] Another variable is the credit risk of the issuer, where rating grades (RATING) are assigned a cardinal scale ranging from 1

[18] We replicate our analysis using daily data. The results, available on request, are qualitatively unchanged.

[19] Note that coupon payment dates always correspond to reset dates in our sample.

(lowest) to 8 (highest) on a monthly basis [20] (L. Chen et al., 2007). Our last bond-specific variable is price variability (PRICE), measured as the average squared bond return in the transaction month, to indicate uncertainty (Hong and Warga, 2000).

On the other hand, various firm accounting variables have been used as proxies for firm-specific information in similar model settings (see T.K Chen et al. (2011), Liao Siewert and Vonhoff (2011), Han and Zhou (2014) among others). Consistent with this literature, in the next step, we augment our baseline models in Eq. (1) and Eq. (2) as follows:

$$VOL_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 AGE_{it} + \beta_3 SHORT_{it} + \beta_4 RESET_{it} + \beta_5 RATING_{it} + \beta_6 PRICE_{it} + \sum \beta_J CV_{it} + \varepsilon_{it} \quad (3)$$

$$VOL_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 AGE_{it} + \beta_3 SHORT_{it} + \beta_4 RESET_{it} + \beta_5 RATING_{it} + \beta_6 PRICE_{it} + \sum \beta_J CV_{it} + \omega_{it}, \quad \omega_{it} = \varepsilon_{it} + v_{it} \quad (4)$$

In our model specifications in Eq. (3) and Eq. (4), CV denotes firm-specific control variables. These variables are NPL investments scaled by total assets (NPLR), debt level measured by the "NPLs to debt ratio" (DBTR), and operating performance proxied by EBITDA margin (OPINR).[21]

We perform tests for two additional versions of our equations that differ only in the dependent variable. In these versions, the dependent variable gauges the relative

[20] As reported in Panel C of Table 1, the lowest and the highest grades are BBB- and AA, respectively. To identify the eight notches in between these two grades, our cardinal assignment is set to range from 1 to 8. We also use a dummy variable that takes the value of one if the rating grade is above B. The results are substantively similar.

[21] We use widely used indicators in assessing the financial healthiness of AMCs in our models. However, we also replace these indicators with various common variables such as debt-to-assets ratio and operating cash flows to debt ratio in our analyses. We obtain similar results, which are available on request.

quantity of trading as measured by the natural log of the average daily number of bonds traded and by the average daily turnover during the month (Alexander et al., 2000). We assert that the total number of trades may not be a good proxy in our case since they are performed among qualified investors in large quantities (Petrasek, 2012).

Data characteristics, shown in Table S3 (in the Supplementary Material available online) show that trading volume is positively (negatively) correlated with issue size, bond age, NPL to assets ratio and EBITDA margin (issuer-debt type, reset frequency, credit rating and NPLs to debt ratio). Significantly positive and relatively high correlations among NPL investments, debt level and credit rating imply that leverage is associated with NPLs and credit risk incorporates both information. Our methodological approach in employing the empirical models in Eqs (1) to (4) for these variables is outlined in the Supplementary Material available online.

In the last step, we perform robustness checks. First, we include firm and year fixed effects in our regressions. Controlling for firm fixed effects is important because bond issues may be concentrated in a small set of firms and potential unobservable firm heterogeneity may affect our estimations (Han and Zhou, 2014). Second, we employ pooled and panel logit models since the dependent variable(s) has a truncated distribution. The logit model is specifically suited for estimating the probability of trade (Hotchkiss and Jostova, 2017).

6. Results

6.1. Baseline and Augmented Model Results

Table 3a shows the results of our regressions demonstrated in Eqs (1) to (4). The Ramsey–Reset test we use to determine whether there are omitted variables in the

pooled OLS indicates that no unobserved individual effects are omitted, as we fail to reject the null hypothesis of no omitted variable (*p*-value = 0.28). Hence, we proceed with the pooled OLS at the first stage.

Please insert Table 3a about here.

According to the preliminary results of our pooled OLS model (Eq. [1]) shown in column (1) of Table 3a, all of the coefficients are statistically significant, where those of SIZE and AGE have positive signs, while those of the rest have negative signs. Our diagnostic tests largely suggest controlling for heteroskedasticity and serial correlation using clustered standard errors. We thus use robust standard errors clustered by cross-sectional units (i.e., bonds). The results (Eq. [1] adj.) reported in column (3) of Table 3a confirm our previous findings except for SHORT and PRICE, the estimated coefficients of which are insignificant. Following the pooled OLS analyses, the Breusch–Pagan LM test shows that the null hypothesis is strongly rejected, implying that the random effects model is better. We provide the preliminary results of our random effects model (Eq [2]) in column (5) of Table 3a. In this case, although the coefficient signs are the same as those under other model variations, SIZE and RATING appear to be insignificant. As a final step, we control for heteroskedasticity and serial correlation across panels and obtain similar values for our variables (Eq. [2] adj.), as displayed in column (7) of Table 3a. The results remain largely unchanged when we consider our augmented models (Eq. [3], Eq. [3] adj., Eq. [4] and Eq. [4] adj.) presented in columns (2), (4), (6) and (8) of Table 3a. With regard to the firm-specific variables, our analysis provides a positive (negative) relationship between NPL investments as well as operating profitability (debt level) and trading volume.

Our discussion starts with SIZE. The coefficient for SIZE suggests that the trading volume in the market for larger AMC bonds issues is higher than that for

smaller issues, in line with the literature (Alexander et al., 2000; Longstaff et al., 2005; Goldstein et al., 2007; Mahanti et al., 2008; Lee and Cho, 2016; Hotchkiss and Jostova, 2017; Guo et al., 2017; Yamani and Rakowski, 2019). These statistical results can be considered to support our view that it is the intensity of the NPL market activity that requires AMCs to raise funds via bond issuances. If the intensity is high (low), the bonds will be larger (smaller), and their trading volume will thus be higher (lower). Put differently, as the future collectability of bad debt in the market erodes, AMCs will demand deeper discounts, which will in turn lead to smaller potential bond issues that are less liquid and should therefore offer higher liquidity premiums. In that sense, it would be justifiable to relate the worsening conditions in the NPL market to the low liquidity in the AMC bond market. Our findings regarding the NPL investments validate this argument since the positive and significant coefficient of NPLR indicates that trading volume increases with NPL purchases, which may require new issuances.

The coefficient of AGE is consistently significant in our models and, most interestingly, its sign is positive. It appears that AMC bonds are more actively traded in the later months of issuance, which contradicts the literature and our expectations (Alexander et al., 2000; Goldstein et al., 2007; Lee and Cho, 2016; Hotchkiss and Jostova, 2017; Guo et al., 2017; Yamani and Rakowski, 2019). We recognize that contrary evidence is available (Blume et al., 1991; Longstaff et al., 2005), but the unexpected result may be due to the floating rate nature of AMC bonds. We do not intend to challenge nor compete with the well-known inverse relationship between bond age and liquidity; rather, further discussion in the context of floating rate corporate bonds, as is in our case, would assist in evaluating the existing literature. The question in our case is “Why do the older bonds trade more actively than younger ones?” This may be due to the following reasons. First, investors may perceive bonds with

distinctive characteristics differently. Certain conditions can revive trading activity by bringing investors' attention to these bonds. For instance, floating rate bonds with lower time-to-maturities may trade more during crisis periods because they offer higher coupons than newer issues and perform well in a rising interest rate environment. Second, floating rate bonds may be treated as newly issued bonds upon each reset date. A typical newly issued fixed rate bond would tend to sell very close to par, but the price of seasoned ones would vary widely from par. However, floating rate bonds would sell at their par value at every reset date, blurring the difference between old and new. Indeed, a floating rate bond behaves like a short-term zero-coupon bond maturing at the next reset date. Third, since floating rate bonds initially lack certainty in the future income stream of coupon payments, investors may favor older bonds, which would be less subject to changes in the interest rate path. Another possible explanation for this result is that qualified (i.e., institutional) traders may tend to trade seasoned bonds more actively (Downing and Zhang, 2004). Apart from these mostly hypothetical explanations, our findings may also suggest that investors do not demand new AMC bonds but, rather, trade these bonds later, probably when the uncertainty associated with the cash flow-generation capacity of NPLs is lower. Investor interest in these bonds would start to increase when the AMC shows itself able to pay the coupon payments (liabilities) with cash collected from NPLs (assets).

The negative coefficient of SHORT should be interpreted with caution. This dummy variable is an indicator of AMC type as issuer, and its value is zero if the AMC is a pure bond issuer. Its negative relationship with liquidity suggests that the trading volume of such an issuer is higher than that of an issuer that issues commercial paper at the same time. This finding enables us to argue that the investor preference for short-term securities, which complements our finding of a preference for older bonds in

substance, causes a liquidity shrinkage in the market for long-term securities. Not surprisingly, the short-term investment trend may be regarded as the investors' reaction to deteriorating NPL market circumstances and their demand for more liquidity.

RESET, denoting interest rate risk, is inversely related with liquidity. Had we used time-to-maturity to proxy for duration risk, we would be making an inference based on the longevity of the bonds issued. However, we use reset frequency instead. Thus, the negative sign of the coefficient of RESET indicates that, as reset frequency decreases and duration risk increases, trading volume increases, as expected. This result is consistent with Alexander et al. (2000), Goldstein et al. (2007), Lee and Cho (2016), and Hotchkiss and Jostova (2017). The implication is that increasing the reset frequency to build up credibility through arrangements for a relatively low share of debt, in order to have interest rates reset relatively quickly, leads to reduced volume in the market.

For RATING, we obtain the expected results as well (Alexander et al., 2000; Mahanti et al., 2008): Bonds with lower ratings trade more actively. The negative sign implies that, as rating scores decrease and credit risk increases, trading volume surges. Thus, as long as the increase in the trading volume of AMC bonds is associated with credit ratings, one would evaluate the conditions in the NPL market. This can be partly explained by the leverage and the operating performance of AMCs as well. High debt level (DBTR) and low operating profitability (OPINR) indicate financial distress, which may trigger a rating downgrade leading to a high speculative component of volume.

Finally, PRICE has a negative but insignificant coefficient. This may appear to conflict with the research (Alexander et al., 2000; Lee and Cho, 2016) but is compatible with the bond type. Since our sample comprises floating rate bonds only and price variation is not a major issue for these bonds because of rate adjustments, it would be

reasonable to conclude that price (return) variability in AMC bonds may not affect trading volume.

Table 3b and Table 3c present the results of our models with quantity traded and turnover as the dependent variable. Almost all variables have the same signs, but with changing significance levels.

Please insert Table 3b about here.

Please insert Table 3c about here.

6.2. Robustness Check

We demonstrate the findings of our analyses with firm and year fixed effects in Table S4 in the Supplementary Material available online. We obtain similar results for SIZE and AGE variables. However, other bond-specific variables appear to have lost their statistical significance. On the other hand, firm-specific variables continue to exhibit significant and expected results.

In our pooled and panel logit analyses (see Table S5 in the Supplementary Material available online), the dependent variable is monthly bond volume and it takes the value 1 if the bond trades and the value 0 otherwise. SIZE (RATING) has a significant positive (negative) impact on trading volume in all regressions. The coefficients of NPLR, DBTR, and OPINR are statistically significant, particularly, in the pooled logit model.

Overall, we can conclude that our estimations are largely robust to potential informational risk effects even after we compare bonds issued by the same firm (fixed effects analyses) and issue size, credit risk, NPL investments, debt level, and operating performance are associated with the probability of trade (logit analyses).

7. Conclusion

This study discusses how the bond market may reflect concerns about the NPL market, focusing on the role of AMCs in both markets in Turkey. The discussion is based on the strong link between the two markets, which can be captured explicitly by observing the liquidity in the bond market, as AMCs are permitted to issue bonds only to fund and invest in NPLs. Our rationale is that low trading activity in this niche corporate bond market may go beyond the secondary market by also affecting the ability of AMCs to raise funds in the primary market. More importantly, the level of trading in the market may signify the extent to which investors know about the state of the NPL business. This would not be surprising, since AMC bonds are issued (traded) solely to (among) qualified investors who have the professional experience and knowledge required to evaluate the issue and the issuer.

On these legal and conceptual grounds, we shed light on the determinants of the trading volume of AMC bonds. Possible liquidity-related (issue size, bond age, issuer's debt issuance status) and non-liquidity-related (interest rate risk, credit risk, price variability) bond-specific determinants as well as firm-specific variables are tested via pooled OLS and random effects panel data regressions. Our results show that the trading activity for bonds that have larger issue sizes, that are older, and that are issued by long-term-only borrowers is higher. Interest rate risk and credit risk are speculative components of trading volume, however. Non-performing loan investments, debt level and operating performance also affect the trading volume.

These findings are attributable to the NPL market activity. Increased NPL transactions would be considered a sign of economic recovery because the collectability of bad loans would improve. Thus, AMCs would need to raise more funds to manage

their NPL portfolios effectively. This need would be served by issuing bonds with larger sizes, which would enhance liquidity in the bond market. Contrary to expectations, a higher level of trading associated with older bonds reflects investors' preference for a watch-and-wait approach for AMC bonds. Accordingly, it appears that they invest in these bonds in later periods to avoid bearing the potential risks of the issue(r) earlier, which may also be inherent in their floating rate nature. We thus infer that a greater risk of uncollectible accounts and longer collection cycles defer investments in AMC bonds, depriving their market of liquidity in earlier periods. Another aspect of this kind of investor behavior is that investors seem to prefer short-term to long-term debt securities of the same issuer. This short-term mentality may be rationalized based on the investors' professional judgment that the NPL market is highly risky. After all, the severity of the problems in the NPL market would be traceable from the trading volume of the AMC bond market. On the other hand, speculative activity due to interest rate risk and/or credit risk may also increase volumes. For instance, a reduction in the reset frequency of bonds in the market or a downgrade in the rating of the issuer due to high leverage and low profitability may give rise to speculative trading, and this may lead to concerns about the AMC's ability to operate the NPL business.

This study is not without its limitations. The data are relatively limited due to the characteristics of this niche market. Bonds are privately placed with, and traded solely among, qualified investors and bear floating interest rates. This makes their transaction frequency incomparable with that of fixed rate or publicly offered bonds. Moreover, the obvious link between the NPL market and the AMC bond market cannot be directly measured using our empirical methodology, primarily because we lack the financial information that would enable us to show an exact match between NPLs and

bonds. Hence, our methodological framework is built on the presumption of such a correspondence. In addition to addressing these limitations, future studies should also examine the role of these special bonds, which are invested mostly by investment funds, may be playing in portfolio diversification. Studying the market microstructure in order to distinguish AMC bonds from other corporate bonds and to search for the existence of "informed trading" in AMC bonds would be another area of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

DECLARATION OF COMPETING INTEREST

We have no conflict of interest to declare.

Appendix A. Supplementary data

The following are the Supplementary data to this article:

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Table 1: Main characteristics of AMC bonds traded in Borsa Istanbul

Part A: Trading Characteristics

	Mean	Max.	Min.	5th	95th
Par value outstanding (TL)	37,269,231	90,000,000	8,000,000	12,000,000	74,500,000
Maturity (days)	765.73	1,092	540	546	1,092
Time-to-maturity (days)	409.47	881.79	200.56	220.95	644.82
Age (days)	356.85	815.75	169.61	204.62	482.10
Age at the time of first trading (days)	24.81	290	2	2.25	157.75
Below (%)	*92.30*			*7.70*	*92.30*
Above (%)	*7.70*			*92.30*	*7.70*
Coupon/reset frequency (times)	8.89	18	6	6.50	12
Fund investing horizon (days)	371.31	3,107.22	0	35.41	1,224.69
Price (TL)	102.41	103.70	100.75	101.38	103.53

Part B: Issuer Characteristics

# of issuers	2012	2013	2014	2015	2016	2017	2018	2019
Pure bond	1	2	3	2	2	3	5	1
Bond and paper	0	0	0	1	1	1	1	3

Part C: Rating Characteristics

# of rated bonds	AA	AA-	A-	BBB+	BBB	BBB-	Total
2012		1					1
2013		4				1	5
2014		5			1	1	7
2015		7			4	1	12
2016		7		6			13
2017	7	1	6	1			15
2018	6		6				12
2019	5		3				8

Note: This table displays the main features of AMC bonds in the 2012-2019 period. Part A shows the basic trading characteristics on a monthly basis for each bond in average (Mean), maximum (Max.), and minimum (Min.) terms and in different percentiles (5^{th} and 95^{th}). Par value outstanding is the issue size; maturity is the length of time over which repayments are made; time-to-maturity is the amount of time left until it matures as of the time of trading; age is the time since issuance; age at the time of first trading since issuance; coupon/reset frequency shows how frequently the bonds make coupon payments/adjust to market rates; fund investing horizon is the weighted average maturity of a portfolio that invests in AMC bonds; price is the price of the bond. Part B indicates the number (#) of AMCs that issue corporate bonds only (pure bond issuers) and bonds together with commercial paper (bond and paper issuers). Part C shows the number (#) of bonds that received various ratings. In the rating methodology of the credit rating agencies in the Turkish bond market, grades range between AAA and D with 22 different notches. A sample document on rating notations is available at http://www.jcrer.com.tr/Upload/Files/Reports/492_RATINGNOTATIONS.pdf.

Table 2: Daily trading activity of AMC Bonds Traded in Borsa Istanbul

	Trading Volume	Trade Size	Annual Turnover	# of Trades	% of Days the Bond Trades
Mean	74,310.20	72,497.20	51.14%	0.15	10.39
Median	48,899.36	47,905.22	44.08%	0.13	9.92
Std. Dev.	62,841.62	61,222.13	37.90%	0.12	6.86
Max.	222,254.04	217,129.12	152.11%	0.54	28.69
Min.	5,016.61	4,903.85	2.94%	0.01	0.73
5^{th}	6,839.08	6,698.72	8.92%	0.02	1.75
95^{th}	200,793.40	195,640.41	122.79%	0.36	22.43

Note: This table contains daily volume measures for 26 AMC bond issuances for the 2012–2019 period. Trading volume is the average market value of trades for the bonds. We calculate the number (#) of trades (trade count) and trade size (quantity traded) by finding the average for each bond issue and then computing the mean over all bonds. The percentage of days the bond trades is found by dividing the total number of days in which a bond trades at least once by the total number of days over its maturity. The annual turnover is calculated for each bond by multiplying the daily trading size by 250 and dividing by the number of bonds outstanding.

Table 3a: Results (Pooled and Panel Regressions) - Trading Volume

	Pooled OLS				Random Effects			
Regressors	(Eq. [1])	(Eq. [3])	(Eq. [1] adj.)	(Eq. [3] adj.)	(Eq. [2])	(Eq. [4])	(Eq. [2] adj.)	(Eq. [4] adj.)
SIZE	0.47*** (3.49)	0.48*** (3.54)	0.47* (1.95)	0.48** (2.19)	0.21 (0.87)	0.24 (1.07)	0.58*** (3.79)	0.55*** (3.53)
AGE	0.41*** (4.19)	0.44*** (4.42)	0.41*** (2.84)	0.44*** (3.11)	0.39*** (3.94)	0.44*** (4.33)	0.26** (2.55)	0.29*** (2.71)
SHORT	-0.42** (-2.37)	-0.01 (-0.06)	-0.42 (-1.57)	-0.01 (-0.05)	-0.61*** (-3.07)	-0.28 (-1.21)	-0.43** (-2.26)	-0.10 (-0.43)
RESET	-0.11*** (-4.14)	-0.09*** (-3.25)	-0.11*** (-6.09)	-0.09*** (-3.93)	-0.09** (-2.11)	-0.11* (-1.91)	-0.11*** (-3.70)	-0.10*** (-2.89)
RATING	-0.08*** (-2.84)	-0.07* (-1.67)	-0.08* (-1.88)	-0.07 (-1.19)	-0.03 (-0.52)	-0.01 (-0.20)	-0.08*** (-2.25)	-0.08 (-1.59)
PRICE	-0.02** (-2.26)	-0.02* (-1.68)	-0.02 (-1.36)	-0.02* (-1.11)	-0.02** (-2.01)	-0.02* (-1.70)	-0.00 (-0.01)	0.00 (0.14)
NPLR		1.75*** (2.67)		1.75* (1.87)		1.16 (1.46)		1.53** (2.00)
DBTR		-0.98*** (-2.72)		-0.98* (-1.73)		-0.80* (-1.86)		-0.71* (-1.89)
OPINR		0.45*** (2.80)		0.45** (2.46)		0.49*** (2.81)		0.40** (2.30)
Constant	5.87*** (2.61)	5.06** (2.17)	5.87 (1.41)	5.06 (1.32)	10.11** (2.56)	9.17** (2.39)	4.07 (1.62)	3.93 (1.48)
R^2	0.10	0.13	0.10	0.13	0.09	0.12	-	-
F-stat [prob.]	9.26 [0.00]	7.54 [0.00]	13.22 [0.00]	12.88 [0.00]	-	-	-	-
Wald chi^2-stat [prob.]	-	-	-	-	29.23 [0.00]	39.49 [0.00]	35.75 [0.00]	39.52 [0.00]
Obs.	484	484	484	484	484	484	484	484
Ramsey–Reset [prob.]	1.29 [0.28]	0.76 [0.52]	-	-	-	-	-	-
Heteroskedasticity [prob.]								
Breusch–Pagan test	1.54 [0.22]	2.32 [0.13]	-	-	-	-	-	-
White test	60.77 [0.00]	94.57 [0.00]	-	-	-	-	-	-
LR test	-	-	-	-	64.39 [0.00]	58.69 [0.00]	-	-
Serial Correlation [prob.]								
Cumby–Huizinga test	7.92 [0.01]	9.52 [0.00]	-	-	-	-	-	-
Arrellano–Bond test	5.22 [0.00]	5.03 [0.00]	-	-	-	-	-	-
Box–Pierce LM test	-	-	-	-	25.60 [0.00]	23.42 [0.00]	-	-
Breusch–Pagan LM test	-	-	-	-	10.50 [0.00]	8.40 [0.00]	-	-

Note: This table shows the results of our pooled ordinary least squares and random effects panel regressions. Figures in columns (1), (3), (5) and (7) are derived from standard models for each regression, while columns (2), (4), (6) and (8) reflect the results obtained from models in which we control for heteroskedasticity and serial correlation. Dependent variable is trading volume. SIZE is issue size; AGE is bond age; SHORT is a dummy variable that indicates whether the issuer is a pure bond issuer; RESET is the reset frequency; RATING indicates the rating grade of the issuer; PRICE denotes the variation in price. NPLR is the NPLs to assets ratio; DBTR is the NPLs to debt ratio; OPINR is the EBITDA margin. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 3b: Results (Pooled and Panel Regressions) - Quantity Traded

	Pooled OLS				Random Effects			
Regressors	(Eq. [1])	(Eq. [3])	(Eq. [1] adj.)	(Eq. [3] adj.)	(Eq. [2])	(Eq. [4])	(Eq. [2] adj.)	(Eq. [4] adj.)
SIZE	0.86*** (5.18)	0.89*** (5.34)	0.86*** (2.81)	0.89*** (3.31)	0.51 (1.61)	0.54* (1.71)	1.01*** (5.37)	0.97*** (5.13)
AGE	0.23* (1.86)	0.28** (2.29)	0.23 (1.15)	0.28 (1.50)	0.24** (1.99)	0.32*** (2.62)	0.04 (0.34)	0.10 (0.74)
SHORT	-0.15 (-0.69)	0.09 (0.35)	-0.15 (-0.48)	0.09 (0.26)	-0.51** (-2.09)	-0.34 (-1.20)	-0.31 (-1.31)	-0.09 (-0.32)
RESET	-0.08** (-2.45)	-0.05 (-1.53)	-0.08** (-2.54)	-0.05* (-1.70)	-0.08 (-1.09)	-0.06 (-0.86)	-0.09** (-2.39)	-0.07* (-1.63)
RATING	-0.09** (-2.39)	-0.02 (-0.48)	-0.09 (-1.52)	-0.02 (-0.39)	-0.03 (-0.45)	0.04 (0.51)	-0.09** (-2.39)	-0.03 (-0.48)
PRICE	-0.03** (-2.19)	-0.01 (-1.07)	-0.03 (-1.28)	-0.01 (-0.67)	-0.02 (-1.51)	-0.02 (-1.12)	0.00 (0.15)	0.01 (0.52)
NPLR		1.65** (2.05)		1.65 (1.54)		0.68 (0.50)		1.29 (1.38)
DBTR		-1.68*** (-3.77)		-1.68** (-2.29)		-1.33** (-2.43)		-1.30***(-2.68)
OPINR		0.26 (1.28)		0.26 (1.42)		0.42** (1.94)		0.16 (0.69)
Constant	0.02 (0.01)	-0.45 (-0.16)	0.02 (0.00)	-0.45 (-0.09)	5.64 (1.05)	5.64** (1.04)	-2.38 (-0.76)	-1.69 (-0.52)
R^2	0.08	0.11	0.08	0.13	0.07	0.12	-	-
F-stat [prob.]	7.05 [0.00]	6.44 [0.00]	3.41 [0.01]	3.83 [0.00]	-	-	-	-
Wald chi^2-stat [prob.]	-	-	-	-	12.51 [0.05]	39.49 [0.00]	35.22 [0.00]	41.50 [0.00]
Obs.	484	484	484	484	484	484	484	484
Ramsey–Reset [prob.]	2.15 [0.09]	0.16 [0.92]	-	-	-	-	-	-
Heteroskedasticity [prob.]								
Breusch–Pagan test	5.34 [0.02]	7.39 [0.01]	-	-	-	-	-	-
White test	52.94 [0.00]	83.33 [0.01]	-	-	-	-	-	-
LR test	-	-	-	-	53.25 [0.00]	42.92 [0.01]	-	-
Serial Correlation [prob.]								
Cumby–Huizinga test	7.58 [0.01]	8.71 [0.00]	-	-	-	-	-	-
Arrellano–Bond test	5.74 [0.00]	5.55 [0.00]	-	-	-	-	-	-
Box–Pierce LM test	-	-	-	-	32.98 [0.00]	30.13 [0.00]	-	-
Breusch–Pagan LM test	-	-	-	-	28.30 [0.00]	19.00 [0.00]	-	-

Note: This table shows the results of our pooled ordinary least squares and random effects panel regressions. Figures in columns (1), (3), (5) and (7) are derived from standard models for each regression, while columns (2), (4), (6) and (8) reflect the results obtained from models in which we control for heteroskedasticity and serial correlation. Dependent variable is quantitiy traded. SIZE is issue size; AGE is bond age; SHORT is a dummy variable that indicates whether the issuer is a pure bond issuer; RESET is the reset frequency; RATING indicates the rating grade of the issuer; PRICE denotes the variation in price. NPLR is the NPLs to assets ratio; DBTR is the NPLs to debt ratio; OPINR is the EBITDA margin. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 3c: Results (Pooled and Panel Regressions) - Turnover

	Pooled OLS				Random Effects			
Regressors	(Eq. [1])	(Eq. [3])	(Eq. [1] adj.)	(Eq. [3] adj.)	(Eq. [2])	(Eq. [4])	(Eq. [2] adj.)	(Eq. [4] adj.)
SIZE	0.02*** (7.38)	0.02*** (7.30)	0.02** (2.28)	0.02** (2.45)	0.05*** (4.13)	0.05*** (4.08)	0.01* (1.78)	0.01** (2.06)
AGE	0.01*** (2.76)	0.01*** (2.99)	0.01** (2.44)	0.01*** (2.77)	0.00 (1.35)	0.00 (1.61)	0.00** (2.24)	0.00** (2.45)
SHORT	-0.01** (-2.17)	0.00 (0.31)	-0.01 (-1.32)	0.00 (0.25)	-0.01*** (-2.58)	-0.01 (-1.18)	-0.00 (-0.81)	-0.00 (-0.01)
RESET	-0.02*** (-2.74)	-0.00* (-1.93)	-0.00** (-2.28)	-0.00 (-1.52)	-0.00 (-0.51)	-0.00 (-0.51)	-0.00*** (-3.21)	-0.00** (-2.23)
RATING	-0.00 (-1.45)	-0.00 (-0.69)	-0.00 (-0.85)	-0.00 (-0.46)	0.00 (1.56)	0.00 (1.51)	-0.00*** (-3.22)	-0.00** (-2.34)
PRICE	-0.00 (-1.08)	-0.00 (-0.66)	-0.00 (-0.95)	-0.00 (-0.72)	-0.00 (-0.51)	-0.00 (-0.38)	-0.00 (-0.14)	-0.00 (-0.38)
NPLR		0.04*** (2.71)		0.04* (1.71)		0.01 (0.36)		0.02 (1.50)
DBTR		-0.02** (-2.53)		-0.02 (-1.49)		-0.01 (-0.60)		-0.01 (-1.34)
OPINR		0.01*** (3.32)		0.01** (2.42)		0.01*** (2.58)		0.01** (2.50)
Constant	0.46*** (8.38)	0.44*** (7.77)	0.46** (2.51)	0.44** (2.67)	0.84*** (4.33)	0.84*** (4.25)	0.13*** (2.64)	0.13*** (2.69)
R^2	0.16	0.18	0.16	0.18	0.11	0.13	-	-
F-stat [prob.]	15.00 [0.00]	11.71 [0.00]	3.47 [0.01]	3.22 [0.00]	-	-	-	-
Wald chi^2-stat [prob.]	-	-	-	-	29.43 [0.00]	36.12 [0.00]	34.05 [0.00]	43.68 [0.00]
Obs.	484	484	484	484	484	484	484	484
Ramsey–Reset [prob.]	14.21 [0.00]	27.24 [0.00]	-	-	-	-	-	-
Heteroskedasticity [prob.]								
Breusch–Pagan test	384.72 [0.00]	405.53 [0.00]	-	-	-	-	-	-
White test	208.95 [0.00]	254.14 [0.00]	-	-	-	-	-	-
LR test	-	-	-	-	478.05 [0.00]	481.19 [0.00]	-	-
Serial Correlation [prob.]								
Cumby–Huizinga test	4.59 [0.03]	4.69 [0.03]	-	-	-	-	-	-
Arrellano–Bond test	5.37 [0.00]	5.17 [0.00]	-	-	-	-	-	-
Box–Pierce LM test	-	-	-	-	22.68 [0.00]	19.72 [0.00]	-	-
Breusch–Pagan LM test	-	-	-	-	35.01 [0.00]	28.91 [0.00]	-	-

Note: This table shows the results of our pooled ordinary least squares and random effects panel regressions. Figures in columns (1), (3), (5) and (7) are derived from standard models for each regression, while columns (2), (4), (6) and (8) reflect the results obtained from models in which we control for heteroskedasticity and serial correlation. Dependent variable is annual turnover. SIZE is issue size; AGE is bond age; SHORT is a dummy variable that indicates whether the issuer is a pure bond issuer; RESET is the reset frequency; RATING indicates the rating grade of the issuer; PRICE denotes the variation in price. NPLR is the NPLs to assets ratio; DBTR is the NPLs to debt ratio; OPINR is the EBITDA margin. ***, ** and * denote significance at the 1%, 5%, and 10% levels, respectively.

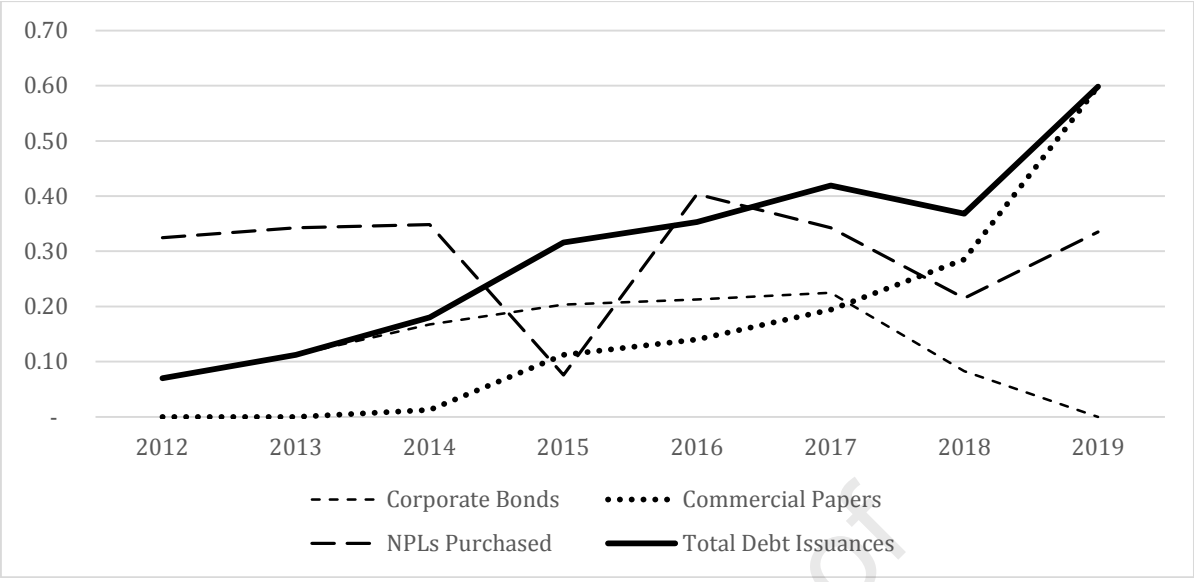

Figure 1: AMC debt issuances and NPL purchases (in billions of TL)
Note: This figure plots the course of AMC debt issuance and NPL purchase activity over the 2012–2019 period. The short-dashed line represents bond issuances, the dotted line represents commercial paper issuances, the solid line represents the combination of the two, and the long-dashed line represents NPL purchases. Note that not all AMCs are bond/paper issuers. Hence, NPL purchases in this figure reflect the transactions of AMCs as a whole.

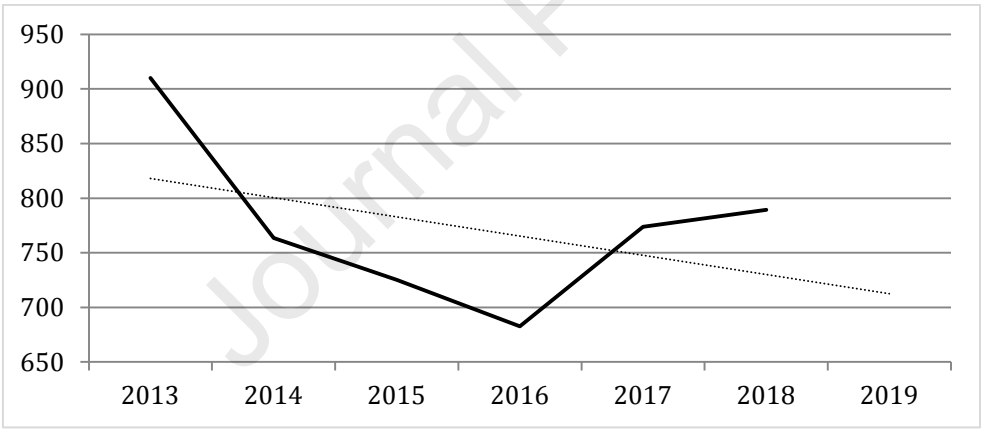

Figure 2: Maturity structures of AMC bonds (in days)
Note: This figure plots the average maturity structures of AMC bonds in each year between 2012 and 2019.