Liquidity, Transparency and Disclosure in the Securitized Product Market

Nils Friewald* Rainer Jankowitsch† Marti G. Subrahmanyam‡

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Abstract

We analyze liquidity effects in the US fixed-income securitized product market using a unique data-set compiled by the Financial Industry Regulatory Authority (FINRA), containing all transactions between May 16, 2011 and February 29, 2012. We employ a wide range of liquidity proxies proposed in the academic literature that rely on various information sets. Our results show that the average transaction cost of a round-trip trade is around 66 bp in the securitized product market and that liquidity is quite diverse in the different market segments. In particular, we find that securities that are mainly institutionally traded, issued by a federal authority, or with low credit risk, tend to be more liquid. In addition, we discuss the relation between the measurement of liquidity and the disclosure of information, and provide evidence that transaction cost measures computed at a more aggregate level may still be reasonable proxies for liquidity. This finding is important for all market participants, but particularly for regulators, who need to decide on the level of detail of the transaction data to be disseminated to the market.

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*WU (Vienna University of Economics and Business), Department of Finance, Accounting and Statistics, Heiligenstädter Straße 46–48, 1190 Vienna, Austria; *email:* nils.friewald@wu.ac.at

†WU (Vienna University of Economics and Business), Department of Finance, Accounting and Statistics, Heiligenstädter Straße 46–48, 1190 Vienna, Austria; *email:* rainer.jankowitsch@wu.ac.at

‡New York University, Stern School of Business, Department of Finance, 44 West Fourth, Room 9-68, New York, NY 10012; *email:* msubrahm@stern.nyu.edu

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1 Introduction

The US fixed-income securitized product market is an important financial market that has received much attention in the past few years, especially since the financial crisis. With an average daily trading volume of around $214 billion, it is the second largest fixed-income market in the US, after the Treasury bond market. Its products are traded over-the-counter (OTC), where there is no central market place, or even a clearing house, thus far. Following the financial crisis, in which structured financial products played an important role, the opacity implied by this OTC structure has been widely critized, since traded prices and volumes are not readily observable. Thus, liquidity in the securitized product market, with its complex financial instruments, can be measured only based on potentially unrepresentative or biased information such as quotations from individual dealers.

The Financial Industry Regulatory Authority (FINRA) has, therefore, recently launched a project with the aim of improving transparency in the securitized product market. Starting on May 16, 2011, virtually all trades are required to be reported to a centralized database by broker/dealers. However, FINRA has not yet released this information to the market. We, along with a few other researchers, have received this unique data-set, which allows us to analyze liquidity effects *before* the potential dissemination of the data to the broader market, and thus, before the possible reaction of the market participants to a new regime.[1]

So far, there has been only a modest literature analyzing liquidity effects in the fixed-income securitized product market, which mostly focuses on liquidity at the market-wide level. For example, Vickery and Wright (2010) use the aggregate trading volume of the whole market to analyze liquidity effects. However, this type of analysis, dictated by the constraints of data availability, provides only a very limited view of the securitized product market's liquidity. Moreover, in contrast to other fixed-income markets, the securitized product market consists of rather diverse instruments with potentially different liquidity characteristics. According to FINRA's definitions, these products can be classified into four main segments: Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS) and To-be Announced securities (TBA, forward MBS). A comprehensive study of liquidity for *individual* instruments in the securitized product market has been missing so far.

Our first contribution is, thus, to fill this gap by analyzing a broad range of liquidity proxies for the structured product market, employing product characteristics, trading activity variables and more conceptually sound liquidity measures, that have been proposed in the academic literature in the context of OTC

[1] The current dissemination project follows the earlier FINRA project, which resulted in the establishment of the US corporate bond database, known as the Trade Reporting and Compliance Engine (TRACE.)

markets. In particular, we explore liquidity effects in the four main segments of the securitized product market covering all the different products and compare the results with those from other similar OTC markets, such as those for US corporate or Treasury bonds. In addition, we provide detailed empirical results, by analyzing liquidity in various sub-segments, e.g., based on trade size and credit rating.

Our main contribution, however, is the analysis of the relation between the measurement of liquidity and the dissemination of trading data. As we have access to all the relevant trading information, we can examine whether the detailed dissemination of transaction data provides valuable information, beyond what simple product characteristics or aggregated information would offer. We should emphasize that the various liquidity measures presented in the academic literature in the context of fixed-income markets require different information sets for their estimation, with varying levels of detail. For example, measuring liquidity based on the *round-trip cost* uses the most detailed information, i.e., each transaction needs to be linked to a particular dealer, on each side of the trade. Other liquidity metrics, such as the *effective bid-ask spread* do not need such detailed trade information for their computation; yet transactions need to be flagged as *buy* or *sell* trades. Many other liquidity measures rely on trading data as well: however, they use only the price and/or volume of each transaction. On the other hand, product characteristics or trading activity variables represent simpler proxies, using either static or aggregated data. Thus, the question arises, as to the level of detail of the data that a regulatory authority ought to release to the market, so that market participants can estimate reliable measures of liquidity/transaction costs, without compromising the identity of individual traders or their trading strategies. This issue is important in improving market transparency, in particular in the context of OTC markets, while maintaining trader confidentiality. We provide a regression analysis discussing the explanatory power of various liquidity measures based on different sets of information to address this issue.

For our empirical analysis, we use all traded prices and volumes along with security characteristics provided by FINRA, and credit ratings from Standard & Poor's (S&P). We obtain information for over 117,000 securitized products in the US with about 2.8 million trades, over the period from May 16, 2011 to February 29, 2012. Hence, our data covers the whole fixed-income securitized product market, including even securities with very low trading activity, during this period.

We find a high level of trading activity in the securitized product market with an average daily trading volume of around $214 billion, and an average transaction cost of around 66 bp for a round-trip trade. The TBA segment, which is basically a forward market, has the highest trading volume with $190 billion, whereas the CMO and MBS segments are of the same order of magnitude compared to the US corporate bond market, which has a daily trade volume of around $15 billion. The ABS market is considerably smaller with around $3 billion of daily volume. Liquidity is quite diverse in the four segments. The ABS and MBS segments have round-trip costs of around 40 to 50 bp respectively, which are comparable to that of the US corporate bond market. In contrast, the TBA segment (5 bp) is far more liquid, whereas the CMO segment (98 bp) is considerably less liquid. Furthermore, we find that securities that are mainly institutionally traded, issued by a federal authority, or with low credit risk, tend to be more liquid. In all segments, we find more dispersed trading activity compared to the US corporate bond market, i.e., fewer trades per security, but with higher volumes.

Exploring the various liquidity metrics and the predictive power of the disseminated information in more detail, we show that simple product characteristics and trading activity variables, by themselves, may not be sufficient for measuring market liquidity. In particular, we find, when regressing state-of-the-art liquidity measures on product characteristics and trading activity variables, that the various liquidity measures offer significant idiosyncratic information. Thus, dissemination of detailed transaction data, necessary for the estimation of liquidity measures, is of importance in the structured fixed-income product market. However, there is evidence that liquidity measures that are based on price and volume information only (e.g., the Amihud measure), can explain most of the variation observed in the round trip-cost and effective bid-ask spread measures, although the latter two measures use significantly more trade information. In a second set of regressions, we explain the observed yield spreads using various combinations of liquidity variables and find similar results. Liquidity measures provide higher explanatory power than product characteristics and trading activity variables alone. However, this result is mostly driven by price and volume information. Thus, details regarding the identity of specific dealers involved with a particular trade are not an absolute necessity, in terms of informational value to market participants. Reasonable estimates of liquidity can be calculated based on prices and volumes of individual trades, without divulging dealer-specific information.

The remainder of the paper is organized as follows: In Section 2, we discuss the importance of transparency in fixed-income markets, particularly for securitized products, and present our research questions. Section 3 describes the data-set as well as the matching and filtering procedures we apply. Section 4 defines and discusses the liquidity proxies that we employ in our empirical analysis. Section 5 presents the empirical results and Section 6 concludes.

2 Transparency in the Securitized Product Market

In this section, we discuss the trading architecture of the securitized product market and its deficiencies with regard to market transparency. Furthermore, we compare the new disclosure requirements of FINRA with previous transparency projects in the US corporate and municipal bond markets. In this context, we also present the relevant literature and motivate our research questions.

Similar to most other fixed-income markets, the US securitized product market has an over-the-counter (OTC) architecture, i.e., trading activity is opaque as transactions take place through a one-to-one contact between an investor and a broker/dealer, or between two broker/dealers. However, in contrast to other fixed-income markets (i.e., Treasury, municipal and corporate bond markets), the market segments and products are quite diverse, as securitized products are based on substantially varied pools of underlying securities and have different cash-flow structures, ranging from simple "pass-through" products to tranches, with their complex risk structures (see Section 3). Given the OTC structure of this market, traded (or even quoted) prices and volumes are generally not observable. As a consequence of this lack in transparency, liquidity measures based on trading costs or market impact of trades can only be estimated using simple measures based on quotation data or market-wide statistics. In such an opaque market environment, the regulation of market activity is difficult, and severe disadvantages can arise for market participants, e.g., high transaction costs for certain types of trades. This effect is exacerbated during periods of crisis, with liquidity and price disadvantage becoming more pronounced particularly when selling pressure intensifies. Thus, the deleterious consequences of the skewed effects of liquidity are of concern to regulators. In response to such concerns about opacity of this market, especially during the financial crisis, FINRA recently started a transparency project for structured fixed-income products, making the reporting of trading activity mandatory for broker/dealers. In the first phase of this project starting on May 16, 2011, *all* trades need to be reported to a centralized database.

FINRA's transparency project for structured products is comparable to its earlier introduction of the Trade Reporting and Compliance Engine (TRACE) for the US corporate bond market, where reporting of all trades within 15 minutes is mandatory for all broker/dealers, with the information being promptly disseminated to the market. TRACE was introduced in multiple phases starting in 2002, and set in place in its current form in October 2004. Much debate concerning the dissemination of the transaction data was ongoing during its early period. In its final version, information about all trades was disseminated, but without revealing the identity of the dealer or the precise volume (the volume is capped at one or five million, depending on the credit quality of the bond).[2] A similar transparency project was also conducted for the municipal bond market by the Municipal Securities Rulemaking Board (MSRB). Initiatives to improve trade transparency for this market started in 1998, and in 2005, similar rules comparable to the corporate bond market were adopted, i.e., making trade reporting within 15 minutes obligatory, and disclosing similar information. The TRACE and MSRB initiatives are milestone transparency projects in the context of OTC markets and have justifiably received a lot of attention in the academic literature. Many studies have used these data-sets to quantify and study liquidity effects in the various stages of their implementation.

Using data from the early stages of the MSRB project, Harris and Piwowar (2006) analyze transactions costs of the municipal bond market for a one year sample starting in November 1999. They find round-trip costs of around 100 bp for institutional trades and show that small retail trades turn out to be twice as expensive. Furthermore, they document that transaction costs increase with credit risk, maturity and bond age. Green et al. (2007b) focus on the municipal bond market as well, using the round-trip cost measure. They find similar transaction costs and decompose these costs into dealers' costs versus market power, showing that dealers have significant market power in retail trading, confirming that smaller trades are more expansive. Based on TRACE data in various stages of its implementation, Bessembinder et al. (2006), Goldstein et al. (2007) and Edwards et al. (2007) use transaction cost measures of liquidity to show that round-trip costs for intermediate trade volumes are in the range of 30 bp to 60 bp. They also provide evidence that these costs are dependent on trade size, credit risk and maturity in the US corporate bond market as well.[3]

In contrast to the aforementioned papers, there have been only a few papers analyzing liquidity effects in the fixed-income securitized product market, which mostly focus on liquidity at the market-wide level, given the constraints of data availability. For example, Bessembinder and Maxwell (2008) and Vickery and Wright (2010) use aggregated trading volumes of the whole market to analyze liquidity effects.

The first focus of this paper is to close this gap by employing a wide range of liquidity measures developed in the academic literature (see Section 4) and providing a detailed analysis of liquidity in the structured product market, in general, and its four segments (ABS, CMO, MBS and TBA), in particular. These segments constitute a diverse range of fixed-income securitized products. In addition, we analyze different sub-segments that turned out to be important in the other fixed-income markets as well, i.e., we compare

[2] More recently, the precise volume is being disclosed with a 18 month delay.

[3] More recent papers quantifing liquidity in these markets provide, in general, similar evidence. However, they rely on other sets of liquidity measures and study different sample periods, see, e.g., Mahanti, Nashikkar, Subrahmanyam, Chacko, and Mallik (2008), Ronen and Zhou (2009), Jankowitsch, Nashikkar, and Subrahmanyam (2011), Bao, Pan, and Wang (2011), Nashikkar, Subrahmanyam, and Mahanti (2011), Lin, Wang, and Wu (2011), Feldhütter (2012), Friewald, Jankowitsch, and Subrahmanyam (2012) and Dick-Nielsen, Feldhütter, and Lando (2012).

institutional to retail traded products and sub-segments based on different credit ratings. We expect to find lower liquidity for retail trades and securities with high credit risk, as is also documented for other fixed-income markets (see, e.g., Harris and Piwowar (2006)). We also analyze two aspects that are unique to the securitized product market. First, many products are issued by federal agencies, i.e., government sponsored enterprises (GSEs), that provide implicit or explicit government guarantees (see Section 3). We compare such products to non-agency issues, expecting to find higher liquidity for agency products. Second, an important fraction of products have complex cash-flow structures offering different tranches based on a certain pool of underlying securities, with special risk structures (see Section 3). We analyze these tranches expecting to document that more senior claims tend to be more liquid.

The second focus of our research is the relation between disclosure requirements and the need for appropriately measuring liquidity. For instance, during the implementation of the MSRB and TRACE projects, a controversial discussion was ongoing whether an increase of transparency (i.e., the dissemination of transaction data) would have a positive effect on market liquidity. Some market observers argued that such transparency in rather illiquid OTC markets expose dealer's inventory and trading strategies to other market participants, and therefore, dealers might reduce their trading activity as a reaction, thus avoiding resulting disadvantages in the price negotiation process. However, recent research on price discovery and liquidity using controlled experiments finds clear evidence of an increase in liquidity when transparency is improved. For example, Bessembinder et al. (2006) compare transaction costs for a sample of insurance company trades in the corporate bond market, before and after the implementation of the TRACE transparency project. They find that transaction costs decreased dramatically (by 50%); even for bonds not subject to reporting requirements, trading costs reduced (by 20%). Goldstein et al. (2007) find similar results in their study of a BBB bond sample. They report that medium to small trades benefit more from transparency. Furthermore, they show that trade volume does not decrease, following greater transparency.[4]

Overall, these papers find that the chosen level of detail of the disseminated data has a positive effect, compared to the regime when no transaction data would be disseminated at all. However, the majority of these papers focus solely on one individual liquidity measure, given the limitations of data availability. Thus, these papers do not ask the question as to how much data should be optimally disclosed to enable market participants to reliably estimate market and liquidity conditions, as they do not comprehensively compare liquidity measures based on different information sets (often this was not possible given the restricted data

[4]For the primary municipal and corporate bond markets Green (2007), Green et al. (2007a) and Goldstein and Hotchkiss (2007) provide similar evidence. They show, both theoretically and empirically, that transparency reduces underpricing, after the dissemination of trading data.

samples available earlier). In this paper, we remedy this lacuna by focusing particularly on the relation between the measurement of liquidity and the dissemination of information, in addition to quantifying liquidity. Thus, we ask how much information should be optimally disseminated and, in particular, whether dealer specific information, such as trader identity and trade direction should be disclosed. Therefore, we measure the efficacy of liquidity metrics that require different levels of detail in the information used for their computation. We analyze two aspects of this question, using different sets of regressions: First, we explore to what extent product characteristics, trading activity variables and liquidity measures, using less information, can proxy for liquidity measures using more or even all available information. Second, we study which liquidity measures can best explain the cross-sectional differences in yield spreads for our sample. These results are important for all market participants and, especially, for regulators, who have to decide on the level of detail of the transaction data to be disseminated to the market.

3 Data description

We use a unique data-set compiled by the Financial Industry Regulatory Authority (FINRA) in the course of their recent transparency project. This proprietary data-set comprises of *all* reported transactions by dealers and brokers in the US securitized products market between May 16, 2011 and February 29, 2012. This information will be distributed to market participants in due course, although the level of detail and the time-table for the release are yet to be decided. The data-set contains, as basic attributes, the price, volume, trade date and time, of each individual transaction. Furthermore, it is possible in our data-set to link individual trades to specific dealers as the data comprise of specific broker/dealer information, although the identity of the individual dealers is coded, and hence concealed. In addition, we can distinguish buy- and sell-side trades in the data-set identifying the active customer in each transaction.

The raw data-set comprises of 2,795,867 transactions from 127,299 products. We employ various cleaning and filtering procedures before analyzing the data. First, we clean our data-set by removing transactions that were reported more than once; this occurs especially if multiple parties, who are all obliged to report to FINRA, are involved in a given transaction.[5] Disregarding this duplication would otherwise distort the calculation of trading activity variables as well as some of our liquidity proxies. Second, since the transaction data most likely contain erroneously reported trades, we apply two types of filters, a *price median filter* and *price reversal filter*, similar to the filters suggested for the US corporate bond market data (see e.g., Edwards,

[5]Our filtering procedures are similar to those that are normally applied for the TRACE database (see, e.g., Dick-Nielsen (2009)).

Harris, and Piwowar (2007)). While the median filter identifies potential outliers in reported prices within a certain time period, the reversal filter identifies unusual price movements.[6] After applying these cleaning and filtering procedures, we end up with 1,591,320 reported transactions for 117,350 securitized products.

These securitized products can be classified into four market segments according to FINRA's definition, i.e., Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS) and To-be Announced securities (TBA). The instruments traded in these segments are rather diverse, as securitized products could be based on substantially different cash-flow structures. Furthermore, the securities are issued by multiple federal agencies as well as non-agencies. In the following, we provide a brief summary description for each of the four market segments to place their distinguishing characteristics in perspective.

ABS are created by bundling loans, such as automobile loans or credit card debt, and issuing securities backed by these assets, which are then sold to investors. In most cases, multiple securities, known as tranches, all based on a single pool of underlying loans, with different levels of risk, are offered. In general, payments are first distributed to holders of the lowest risk securities, and then sequentially to higher-risk securities, in order of priority, and hence risk. In general, ABS are issued by private entities rather than Federal agencies ("non-agencies"). *CMO* are instruments similar to ABS, but are backed by pools of mortgage loans. A substantial fraction of these securities offers multiple tranches with differing risk characteristics to the investors. As is to be expected, prices of CMO tranches are often highly sensitive to property prices. Other products in this market segment are "pass-through" securities, which entitle the investor to a pro-rata share of all payments made on an underlying pool of mortgages. These securities are often guaranteed by one of the three federal Government Sponsored Enterprises (GSE), the Government National Mortgage Association (Ginnie Mae), the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac). All three institutions are backed by explicit or implicit guarantees by the US government. *MBS* are similar to CMO securities and represent claims to the cash flows from pools of mortgage loans. However, most MBS are issued by the three GSE and are "pass-through" participation certificates entitling the investor to a pro-rata share of future cash flows. *TBA* are conceptionally different from the three market segments described so far. TBA are forward contracts on MBS where two investors agree on the price and volume for delivering a particular agency MBS at a future date. The precise composition of the pool is not known at the time of the TBA trade; rather, the broad characteristics (issuer, maturity, coupon, price,

[6] The median filter eliminates any transaction where the price deviates by more than 10% from the daily median or from a nine-trading-day median centered on the trading day. The reversal filter eliminates any transaction with an absolute price change deviating from the lead, lag, and average lead/lag price change by at least 10%. These filters are designed to remove most, if not all, errors arising from data-entry.

amount, and settlement date) are agreed upon at the time of the trade. Thus, this market segment is different from the other three market segments since the TBA is a forward market with less specificity in terms of the nature of the underlying instrument.[7]

Based on information provided by FINRA, we can identify the market segment and the issuer of each security, i.e., one of the three federal GSE or a non-agency (private labeller). This difference is particularly interesting for the CMO market segment, where both agencies and private labellers issue securities. Furthermore, we can distinguish whether a security is a pass-through certificate, or represents one of the tranches based on a specific pool of loans. Securities that represent a tranche exist only in the ABS and CMO market segments. For a particular security representing a tranche, we have data on the priority defined by the following types: super-super senior (SSSR), super senior (SSR), senior (SR), mezzanine (MEZ), and subordinated (SUB). Note, however, that we have no information available concerning the underlying pool of loans, nor the attachment and detachment points of the tranches.

In addition, we have basic data about a security's characteristics available. In particular, we know the amount issued, the coupon and maturity. We also obtain credit ratings from Standard & Poor's. However, only a small fraction of the whole universe of securities is rated, especially in the case of agency instruments, which typically do not have ratings. Finally, to explore the liquidity of retail trading, we define transactions involving securities with an average daily trading volume of less than $100,000 as retail trades, conforming to the definitions used by FINRA. These variables and classifications of the overall sample allow us to analyze, in detail, the liquidity of the securitized product market and its segments.

4 Liquidity Proxies

In this section, we introduce the liquidity proxies used in our empirical analysis. The proxies that we present cover virtually all measures proposed in the related literature. We employ simple product characteristics and trading activity variables, using either static or aggregated data. Furthermore, we present state-of-the-art liquidity measures that estimate transaction costs, market impact or turnover using detailed trading data, allowing us to compare the performance of each measure, in terms of its efficancy in estimating liquidity. In this section, we focus on the concepts underlying the liquidity proxies and their relation to the dissemination of data and defer technical details for computing the liquidity measures to the Appendix.

[7] See, e.g., Vickery and Wright (2010) for a detailed description of the institutional features of the TBA market.

Product characteristics are rather crude proxies of liquidity, which rely on the lowest level of information detail, compared to the other categories.[8] Thus, product characteristics are typically applied when there is a limitation in the level of detail in the transaction data. In particular, we use the *amount issued* of a security measured in millions of US dollars. We presume that securities with a larger amount issued to be more liquid, in general. Another important product characteristic is the *time-to-maturity* which corresponds to the time, in years, between the trading date and the maturity date of the security. We expect securities with longer maturities (over ten years) to be generally less liquid, since they are often bought by "buy-and-hold" investors, who trade infrequently. Furthermore, we also consider the instrument's average *coupon* as a relevant proxy. Despite the ambiguity of the relation of the coupon to liquidity and credit risk, we believe that instruments with a larger coupon tend to be less liquid.

Trading activity variables such as the *number of trades* observed for a product on a given day represents its aggregated market activity.[9] Other similar variables that we calculate on a daily basis, for each product, are the *number of dealers* involved in trading a specific product, and the *trading volume* measured in millions of US dollars. We expect these variables to be larger, the more liquid the product. On the contrary, the larger the *trading interval*, which refers to the time elapsed between two consecutive trades in a particular product (measured in days), the less liquid we would expect the product traded.

Liquidity measures are conceptually based and more direct proxies for measuring liquidity, which need transaction information for their computation. However, the levels of detail of the required sets of information vary considerably across measures. The liquidity measure that uses the most detailed information is the *round-trip cost* measure which can be applied, if the traded prices can be linked to the individual dealer, see, e.g., Goldstein, Hotchkiss, and Sirri (2007). It is defined as the price difference between buying (selling) a certain amount of a security and selling (buying) the same amount of this security by a given trader, within a particular time period. In our analysis, we assume that a "round-trip" occurs within one day, and that the price is not affected by changes in the fundamentals during this period. The round-trip trade may either consist of a single trade on each side or a sequence of trades, which are of equal size, in aggregate, on

[8] Many papers studying bond market liquidity rely on indirect proxies based on product characteristics such as coupon, age, amount issued, industry, and covenants, dictated by the constraints of data availability prior to the release of the TRACE data-set (see, e.g., Elton, Gruber, Agrawal, and Mann (2001), Collin-Dufresne, Goldstein, and Martin (2001), Perraudin and Taylor (2003), Eom, Helwege, and Huang (2004), Houweling, Mentink, and Vorst (2005), and Longstaff, Mithal, and Neis (2005).) Recent papers analyzing larger sets of variables include these proxies as well as more conceptually sound liquidity measures (see e.g., Friewald, Jankowitsch, and Subrahmanyam (2012) and Dick-Nielsen, Feldhütter, and Lando (2012)).

[9] Papers that use market-related proxies based on aggregated trading activity to study bond market liquidity are, e.g., Perraudin and Taylor (2003), Houweling, Mentink, and Vorst (2005), De Jong and Driessen (2006), Friewald, Jankowitsch, and Subrahmanyam (2012) and Dick-Nielsen, Feldhütter, and Lando (2012).

each side. The *effective bid-ask spread* proposed by Hong and Warga (2000) can be computed when there is information about whether a price is either due to a sell or buy side transaction. The effective bid-ask spread is then defined as the difference between the daily average sell and buy prices (relative to the mid-price).

Many other liquidity measures use only the price and/or volume of each transaction. A well-known metric proposed by Amihud (2002), and conceptually based on Kyle (1985), is the *Amihud measure*. It was originally designed for exchange-traded equity markets, but has also become popular for measuring liquidity even in OTC markets. It measures the price impact of trades on a particular day, i.e., the ratio of the price change measured as a return, to the trade volume, given in US dollars. A larger Amihud measure implies that trading a financial instrument causes its price to move more in response to a given volume of trading and, in turn, reflects lower liquidity. An alternative method for measuring the bid-ask spread is the *imputed round-trip cost* introduced by Feldhütter (2011). The idea here is to identify round-trip trades which are assumed to consist of two or three trades on a given day, with exactly the same traded volume. This likely represents the sale and purchase of an asset via one or more dealers to smaller traders. Thus, the dealer identity is not employed in this matching procedure; rather, differences between prices paid by small traders and those paid by large traders based on overall identical volumes are used as measure. The *price dispersion measure* is a new liquidity metric recently introduced for the OTC market by Jankowitsch, Nashikkar, and Subrahmanyam (2011). This measure is based on the dispersion of traded prices around the market-wide consensus valuation, and derived from a market microstructure model with inventory and search costs. A low dispersion around the valuation indicates that the financial instrument can be bought close to its fair value, and therefore, represents low trading costs and high liquidity, whereas a high dispersion implies high transaction costs, and hence, low liquidity. The price dispersion measure is defined as the root mean squared difference between the traded prices and the respective market valuation weighted by volume.

The *Roll measure* developed by Roll (1984) and applied, e.g., by Bao, Pan, and Wang (2011) and Friewald et al. (2012) in the context of OTC markets, is a transaction cost measure simply based on observed prices. Under certain assumptions, adjacent price movements can be interpreted as a “bid-ask bounce” resulting in transitory price movements that are serially negatively correlated. The strength of this covariation is a proxy for the round-trip transaction costs for a particular financial instrument, and hence, a measure of its liquidity. This measure needs the lowest level of detail as only traded prices, and not trading volume or dealer-specific information are used in the computation.

5 Results

In this section, we present the results of our analysis. We first discuss in Section 5.1 the descriptive statistics of our liquidity proxies for the whole fixed-income securitized product market in the US, and its four market segments (ABS, CMO, MBS and TBA). We then compare our results with those from other markets, primarily the US corporate bond market, allowing us to analyze the general level of liquidity in the various segments, with respect to well-known benchmarks. We mainly choose the US corporate bond market for this purpose, as the general structure is most directly comparable to the fixed-income securitized product market. In Section 5.2, we provide more detailed empirical results, by comparing liquidity for different sub-segments and product categories. First, we compare retail versus institutional trades. Second, we explore liquidity effects of different tranche types. Third, we analyze whether liquidity depends on the issuing authority, i.e., we compare the three GSEs with non-agency issues. Fourth, we compare different credit rating grades. In Section 5.3, we present our analysis of the relation between the measurement of liquidity and the level of detail in the dissemination of trading data. Using regression analysis, we explore whether liquidity measures using less detailed information can accurately proxy for measures using more detailed data. In Section 5.4, we explore the effect of liquidity on the prices of structured products. Specifically, we analyze whether liquidity measures can explain differences in yield spreads across securities.

5.1 Liquidity Effects in the Securitized Product Market

First of all, we discuss descriptive statistics of the trading activity of securitized products at a market-wide level. Table 1 presents the average daily number of products traded, the number of trades and the traded volume in the market as a whole. On average, we observe 3,245 different traded securities, 13,326 trades and an aggregate trade volume of $214 billion, per day. The securitized product market has a much higher daily trading volume than the US corporate debt market or the US municipal bond market, each of which have an average daily trading volume of around $15 billion (see, e.g., Vickery and Wright (2010)). However, the average daily trading volume of the securitized market is much lower, compared to the US Treasury securities market, with an average daily traded volume of around $500 billion (see, e.g., Bessembinder and Maxwell (2008)).

Trading in the securitized market consists of three different segments of the spot market, i.e., ABS, CMO and MBS, and the TBA market, which is basically a forward market. In this sense, the volume in the TBA market cannot be directly compared with the other three (spot) markets. We find an average daily traded volume in the TBA market of $189.8 billion. The average traded volumes in the spot market are $2.7 billion (ABS), $9.1 billion (CMO), and $13.4 billion (MBS), respectively. Roughly speaking, the MBS segment trades as much, and the CMO segment somewhat less than the *entire* US corporate bond market, on average, each day. The TBA segment is much larger than each of these markets, while the ABS segment is much smaller.

The total number of securitized issues that are traded during the entire sample period is 117,350, which again is larger than the total number of corporate bond issues traded during the same period. For example, Friewald et al. (2012) report around 35,000 traded corporate bonds, albeit over a much longer time period (October 2004 to December 2008). Analyzing the corporate bond market using the TRACE database for the same time period as our present data-set, i.e., between May 16, 2011, to February 29, 2012, for we find around 30,000 traded bonds.

The average daily number of traded issues (3,245) in the securitized product market is only about 50% of the number of issues traded in the US corporate bond market per day, see, e.g., Friewald et al. (2012). Approximately te same ratio can be observed for the average daily number of trades. Thus, these comparisons indicate that while overall more instruments are traded in the securitized product market, these trade less often than corporate bonds, albeit with a higher volume per trade. Figure 1 shows the time series of the daily number of trades and trade volume for the four market segments. Generally, for the spot markets, we encounter a stable pattern of trading activity. However, for the TBA market, we find a cyclical pattern of trading activity, with significantly greater trading activity in the first half of each month, potentially driven by the issuance schedule.

Focusing on the trading activity and liquidity of the individual securities, we present summary statistics (mean, standard deviation, and correlation) for the product characteristics, trading activity variables and liquidity measures for the whole securitized product market as well as for the market segments. Table 2 provides the means of the various variables, which are averaged both over time and the cross-section of the respective sub-samples. In the ABS segment, we observe an average amount outstanding of around $509 million, compared with $406 million in the MBS, and $88 million in the CMO segments, per issue. In comparison, Friewald et al. (2012) report for the US corporate bond market an average amount outstanding of $320 million, per issue. Trading activity and liquidity in the securitized market seem to be rather dispersed across the four segments. Overall, the TBA market shows the highest trading activity per security. On average, around nine dealers are active each day per security, with 53 trades and a traded volume of $1.3 billion per security. In the other segments, we observe a lower number of active dealers (on average between one and two dealers). Furthermore, the number of trades (around two trades) and the traded volume (around $8 million) are far lower. In comparison, for the US corporate bond market, Friewald et al. (2012) report an average of 3.5 trades and a trade volume of $4.7 million. Thus, as already indicated, we find fewer trades, but with a higher average trade size, for securitized products in the spot market, compared with the US corporate bond market.

As expected, the TBA market is the most liquid segment of the securitized product market. The round-trip trading cost is around 5 bp, compared to 39 bp in the ABS, 48 bp in the MBS and 98 bp in the CMO segments. This ranking is preserved for all the liquidity measures that we consider, e.g., for the price dispersion measure we find 10 bp for the TBA, 35 bp for the ABS, 63 bp for the MBS and 80 bp for the CMO segment. In comparison, Friewald et al. (2012) report for the US corporate bond market a price dispersion of 42 bp, on average. Thus, according to this metric, the TBA and ABS segments are more liquid than the corporate bond market and the other two markets are less liquid. We find a rather high Amihud measure for the securitized product market (4.6% change in price per $100,000 of traded volume). This result turns out to be caused by retail trades, where some small trades lead to high returns, i.e., are far above or below the average traded price. Retail trading appears to be expensive in this market, especially for products with dispersed trading activity, leading to high search costs (see Section 5.2).

Tables 3 and 4 presents the standard deviations and the correlations of the product characteristics, trading activity variables and liquidity measures. The standard deviations are quite comparable to the US corporate bond market, with the exception of the Amihud measure, for which the standard deviation is higher (as emphasized above). Focussing on the correlation, we find that the product characteristics show a low level of correlation with each other as well as with the other variables. However, the trading activity variables and the liquidity measures show rather high levels of correlation within both groups (on average 0.50). Interestingly, the trading activity variables do not show high levels of correlation with the liquidity measures (less than 0.24 in absolute terms). This result indicates that the sets of information provided by the different groups of variables vary considerably from each other.

5.2 Liquidity Effects in Different Sub-segments of the Market

In this section, we study liquidity effects of four different sub-segments of the structured product market. We start by comparing liquidity effects between retail and institutional trades. We define trades with an average daily trading volume of less than $100,000 as retail trades, in accordance with the definition used by FINRA. Table 5 presents the liquidity proxies for the ABS, CMO and MBS market segments. In the TBA market segment, we observe (as expected) an extremely low number of retail trades, as forward markets are primarily used by institutional investors. Therefore, we do not report statistics for that particular market segment.

We observe that around 10% of all observations are retail trades in the ABS market segment, while the fractions of retail trades in the CMO and MBS market are much larger at approximately 50% and 30%, respectively. Retail traders in the CMO market segment apparently focus on instruments with a much lower amount outstanding of approximately $36 million, compared with the institutional sub-segment with $144 million. We find in all market segments that retail traders invest in instruments with somewhat higher coupons, e.g., 5.65% vs. 4.81% in the MBS market. Considering the number of trades, we find that for retail traded securities, the number is lower in all market segments, compared with the institutional sub-segments, e.g., 1.29 vs. 1.7 trades in the ABS market, on average.

Focusing on the liquidity measures, our analysis shows that retail investors in the ABS market segment are confronted with a significant lower liquidity, i.e., essentially all our liquidity measures indicate that trading costs are about three times higher for retail investors than their institutional counterparts. For example, the price dispersion measure in the retail traded segment amounts to 100 bp, whereas it is only about 32 bp in the institutional sub-segment. For the CMO market segment, we find similar results, albeit with a smaller difference in transaction costs: retail trades encounter around 50% higher trading costs than institutional trades. Retail investors in the MBS market segment fall in between, having to face approximately twice the transaction costs compared to institutional investors. Overall, we find that the liquidity of retail trades is, by far, lower than for institutional trades. As in the case of the introduction of TRACE for the corporate bond market (see, e.g. Edwards et al. (2007)), we would expect that these transaction costs would decrease after the timely dissemination of transaction data in the securitized product market, as well.

In our second analysis, we explore liquidity effects of different types of tranches in the ABS and CMO market segments. In these segments, it is common that multiple securities, known as tranches, with a hierarchy of credit risk levels, all based on one pool of underlying loans, are offered (tranches are not relevant for the MBS and TBA markets, where products have mostly "pass-through" structures.) Payments are first distributed to holders of low risk securities, and then to higher-risk securities, in order of priority. The tranche sizes can differ substantially from structure to structure, and the rules for distributing the payments to the different tranches are often complicated. However, in general terms, the tranches are often classified into one of the following groups (ranked in descending order of priority): super-super senior (SSSR), super senior (SSR), senior (SR), mezzanine (MEZ) and subordinated (SUB). Table 6 shows the results of various liquidity proxies for the different seniority types of the tranches.

In the ABS market segment, we find that trading is concentrated in the SR tranches. We do not observe any trading activity in the SSSR tranches, and nearly no activity in the SSR tranches, indicating that these tranches may not be commonly traded. Hence, we do not report the statistics for the liquidity proxies of the SSSR and SSR tranches. The average amount outstanding of $591 million for the SR tranches is much larger than for the MEZ ($48 million) and the SUB tranches ($117 million). Accordingly, we find that the trading volume is larger for the SR tranches. Our analysis shows an interesting pattern when examining the liquidity measures: the most liquid tranches are the senior-most tranches. However, the second most liquid tranches are the subordinated ones. For example, the imputed round-trip costs are 31 bp, 104 bp and 61 bp for the SR, MEZ and SUB tranches, respectively. Thus, the intermediate tranches are the least liquid tranches in this market segment. In general, we find similiar results for the CMO market segment. However, there is trading activity in all tranche types (SSSR to SUB). The largest tranches are the SSR tranches (average size of $222 million), and the smallest the SUB tranches (average size of $30 million). The trading volume is the highest for the more senior tranches, and the lowest for the subordinated tranches. As for the liquidity measures, we find that the intermediate tranches are less liquid than the other tranches (see, e.g., price dispersion measure).

In the third analysis, we compare securities issued by the three federal GSE, i.e., the Federal Home Loan Mortgage Corporation (Freddie Mac – FH), the Federal National Mortgage Association (Fannie Mae – FN) and the Government National Mortgage Association (Ginnie Mae – GN), with non-agency securities (Others). This comparison is provided for the CMO market segment, where sufficient observations are available for all groups. Table 7 provides the liquidity proxies for the securities issued by different agencies and their non-agency counterparts.

We find that non-agency trades have slightly larger outstanding amounts (around $120 million) than agency trades (FN: $93, FH: $90 and GN: $42 million), whereas the number of dealers and trades is of comparable size. In terms of their liquidity measures, we find that securities issued by agencies have lower transaction costs compared to non-agencies. For example, the imputed round-trip cost is about 95 bp for GN and amounts to around 74 bp for FN and FH, whereas it is 114 bp for non-agencies. Among the securities issued by a GSE, we find on the basis of imputed round-trip costs and effective bid-ask spreads that securities issued by Ginnie Mae are somewhat less liquid than the securities of other agencies, potentially because of the smaller issue sizes.

In the fourth analysis, we explore the liquidity effects for different rating grades, i.e., AAA, AA, ..., CCC/C. We present results for the ABS market segment, where around 25% of all securities are rated. In the MBS and TBA segments, ratings play a minor role as securities issued by GSEs are, in general, not rated. The same is true for the CMO market, where less than 10% of the securities have credit ratings.

We document that securities with better credit ratings have larger outstanding amounts: around $400 million for AAA, AA and A, compared to $232 million for BBB, and less than $150 million for BB, B and CCC/C. As expected, we observe lower coupons for better rated securities. Interestingly, we find a higher trading volume for high risk securities ($16 million for CCC/C compared to $7 million for AAA), whereas the number of dealers and trades is comparable in all rating classes. Analyzing the liquidity measures, we find the clear result that better rated securities are more liquid, i.e., have lower transaction costs. For example, the round trip costs are 14 bp for AAA rated securities, and roughly linearly increase to 117 bp for CCC/C rated issues. Similar results can be found based on all other liquidity measures.

5.3 Liquidity and the Dissemination of Information

In this section, we discuss the relation between liquidity and the dissemination of information. Our data-set and the specific institutional setting permit us to do so, since we as researchers have access to information that is presently not available to all market participants. Overall, this analysis allows us to examine whether the dissemination of transaction data provides valuable information to market participants, beyond what liquidity measures based on more aggregate information would provide. This may help regulators to determine whether the dissemination of transaction data without association with particular dealers (as currently planned by FINRA) is sufficient from the perspective of improving market transparency. Furthermore, it provides insights into the informational value of different liquidity measures.

We can assign the available liquidity proxies to three groups depending on the level of detail in the information that is required for their computation. The first group comprises of product characteristics that rely on the most basic information available for almost every fixed-income instrument. The second group consists of trading activity variables for the individual products, e.g., the number of trades or volumes, aggregating the available information on a daily basis. The third and most important group is composed of liquidity measures at the product level that need detailed trading information. The round-trip costs measure requires the most detailed transaction data in this group, i.e., the individual trades have to be linked to the specific dealers involved in the transaction. The effective bid-ask spread does not require dealer-specific information; however, the transactions have to be flagged as buy- or sell-side trades. The Amihud, price dispersion and imputed round-trip cost measure only require the price and volume information of each trade.

The Roll measure needs the least information, since it only relies on the price of each trade. Comparing the product characteristics and trading activity variables to the liquidity measures allows us to determine whether information about individual trades adds to the market's understanding of liquidity.

The descriptive statistics and the correlations presented in the previous section provide first indications of the informational value of the various liquidity measures. When analyzing the liquidity of the different market and sub-segments, the liquidity measures offer additional findings compared to the analysis of product characteristics and trading activity variables. For example, when comparing the different market segments, higher trading activity is not always associated with lower transactions cost. The correlation analysis hints in the same direction: There is low correlation between the product characteristics and the liquidity measures (the highest correlation is 0.22 in absolute terms) and between trading activity variables and liquidity measures (up to 0.24 in absolute terms). Thus, it seems that liquidity measures that rely on more detailed transaction data can provide important additional information, according to this perspective.

To further emphasize this point, we provide a set of regressions, focussing on securities without implicit (or explicit) guarantees by the US government.[10] We follow the Fama and MacBeth (1974) procedure, using weekly averages of all variables, to explore whether each of our defined liquidity measures (lm) can be explained by product characteristics and trading activity variables. We use the following regression for this analysis:

$$\begin{aligned} lm_{it} \quad = \quad & \beta_0 + \beta_1 \cdot trd_{it} + \beta_2 \cdot vol_{it} + \beta_3 \cdot dlr_{it} + \beta_4 \cdot tint_{it} + \beta_5 \cdot amti_{it} + \beta_6 \cdot mty_{it} \\ & + \beta_7 \cdot cpn_{it} + \sum_j \gamma_j \cdot control_{ijt} + \epsilon_{it}, \end{aligned} \tag{1}$$

where $lm \in \{rtc, ebas, ami, irtc, pdisp, roll\}$ is the set of liquidity measures that we would like to explain, each in turn (i.e., round-trip cost, effective bid-ask spread, Amihud measure, imputed round-trip costs, price dispersion measure and Roll measure), trd is the number of trades, vol the trading volume, dlr the number of dealer, $tint$ the trading interval, $amti$ the amount issued, mty the time-to-maturity and cpn refers to the coupon.[11] We control for retail trading, tranche seniority, registered securities and credit rating in our regressions. This analysis allows us to explore whether measures of transaction costs or price impact, which

[10] The descriptive statistics show that liquidity effects play a more important role for non-agency securities, since agency securities represent only pass-through structures with guarantees. Therefore, the data dissemination policy would be more relevant for non-agency securities.

[11] We follow common practice and use logarithmic values of the traded volume, amount issued and Amihud measure in our regression analyses, due to the wide range of values for these variables across securities.

use more detailed data, can be proxied by more basic variables that use less detailed information.

Table 9 shows the results of this analysis. We present six regressions, with each explaining one of the liquidity measures by product characteristics and trading activity variables. In the first regression, explaining the round trip cost measure, we find an R^2 of 40.4%. We obtain similar explanatory power for the effective bid-ask spread, the imputed round-trip cost measure and the price dispersion measure. We find a much higher R^2 for the Amihud measure (82.6%), and a much lower one for the Roll measure (23.6%). Analyzing the effect of the explanatory variables, we observe for the trading activity variables that products with a higher trading volume are significantly more liquid, i.e., have lower transaction costs. For the product characteristics, we find that larger issues are more liquid, and higher coupons indicate lower liquidity, as expected. Overall, however, liquidity measures contain significant idiosyncratic information that is not included in the other variables. The only exception to this finding is the Amihud measure, for which most of the variation can be explained by product characteristics and trading activity. The Amihud measure is particularly closely related to trade volume (see the t-statistic of this variable). Hence, this measure offers significantly less idiosyncratic information in the structured product market.

Given these results, it seems evident that liquidity measures provide additional insights beyond that contained in the basic data on product characteristics and trading. Less obvious is the question of whether liquidity measures using more detailed data provide more insights into liquidity effects than do simpler ones. Analyzing the descriptive statistics, we find that the different liquidity measures lead to the same results when comparing different market and sub-segments at an aggregate level. Again, the correlation analysis hints in the same direction, as the correlations between these measures are quite high (on average 0.53, with a maximum of 0.92).

To further analyze these relationships, we present a second set of regressions using, again, the Fama and MacBeth (1974) procedure, where we regress –as a representative example– the measure using the most detailed analysis, i.e., the round-trip cost, on product characteristics, trading activity variables and all the other remaining liquidity measures, in a nested fashion. Thus, we explore whether liquidity measures based on *less* information can be a good proxy for the round-trip costs. The regression equation is

$$\begin{aligned} rtc_{it} \quad = \quad & \beta_0 + \beta_1 \cdot ebas_{it} + \beta_2 \cdot ami_{it} + \beta_3 \cdot irtc_{it} + \beta_4 \cdot pdisp_{it} + \beta_5 \cdot roll_{it} + \beta_6 \cdot trd_{it} \\ & + \beta_7 \cdot vol_{it} + \beta_8 \cdot dlr_{it} + \beta_9 \cdot amti_{it} + \beta_{10} \cdot mty_{it} + \beta_{11} \cdot cpn_{it} + \sum_j \gamma_j \cdot control_{ijt} + \epsilon_{it}, \quad (2) \end{aligned}$$

where *rtc* is the round-trip cost, *ebas* the effective bid-ask spread, *ami* the Amihud measure, *irtc* the imputed round-trip cost, *pdisp* the price dispersion measure, *roll* the Roll measure, *trd* the number of trades, *vol* the traded volume, *dlr* the number of dealers, *amti* the amount issued, *mty* the time-to-maturity and *cpn* refers to the coupon. Again, we control for retail trading, tranche seniority, registered securities and credit rating. We use different specifications of the above equation, i.e., the full model and other nested specifications, with only one liquidity measure being used as an explanatory variable in each of them, successively.

Table 10 shows the results for this analysis presenting the six specifications. In regressions (1) to (5) we use each of the liquidity measures, in turn, plus all trading activity variables and product characteristics to explain the round-trip costs. When adding just one individual proxy to the regression analysis, we find that the imputed round-trip cost, the effective bid-ask spread and the price dispersion measure are the best proxies with an R^2 of around 60%, whereas the Amihud and Roll measure only slightly increase the R^2, compared to regressions without liquidity measures. When adding all liquidity measures to the regression equation, we find in regression (6) an R^2 of 74%, i.e., the explanatory power increases significantly when adding all these proxies. Similar results can be found when explaining the effective bid-ask spread by liquidity measures using less information.

Overall, we find evidence that liquidity measures using more detailed data can be proxied reasonably well by similar measures using less data. However, at least information on prices and volumes of the individual trades needs to be available, for the computation of these measures. Therefore, the dissemination of trade data is important to understand the market activity and to measure liquidity at the product level. Reasonable estimates of liquidity can be calculated based on prices and volumes of individual trades. However, details regarding the specific dealers involved with a particular trade or the driver of the trade are not an absolute necessity, in terms of informational value. Thus, a data dissemination policy comparable to TRACE, where the focus is on the dissemination of the trading activity without dealer-specific information, seems appropriate in this context. We discuss further the importance of this dissemination policy in the next section, in the context of pricing.

5.4 Liquidity Effects and Yield Spreads

In this section we explore the cross-sectional relation between liquidity and yield spreads in the structured product market, focussing again on securities without implicit (or explicit) guarantees by the US government. We analyze whether liquidity measures can explain a reasonable proportion of the cross-sectional variation in yield spreads. We compare these results to those from the US corporate bond market and further discuss the issue of the level of detail in the disseminated data.

For this analysis we compute, for each individual transaction, the related yield of the structured product, based on the trade price and expected coupon payments. Furthermore, we determine the yield of a synthetic risk-free bond based on the swap rate curve at the same time.[12] The dependent variable in our analysis is the yield spread between the individual structured product's yield and the benchmark yield for the same duration. We use the Fama and MacBeth (1974) procedure on weekly averages of all variables to explain the observed yield spreads for the product characteristics, trading activity variables and liquidity measures. In doing so, we use the following regression:

$$
\begin{aligned}
yldspr_{it} \quad = \quad & \beta_0 + \beta_1 \cdot rtc_{it} + \beta_2 \cdot ebas_{it} + \beta_3 \cdot ami_{it} + \beta_4 \cdot irtc_{it} + \beta_5 \cdot pdisp_{it} + \beta_6 \cdot roll_{it} \\
& +\beta_7 \cdot trd_{it} + \beta_8 \cdot vol_{it} + \beta_9 \cdot dlr_{it} + \beta_{10} \cdot tint_{it} + \beta_{11} \cdot amti_{it} + \beta_{12} \cdot mty_{it} \\
& +\beta_{13} \cdot cpn_{it} + \sum_j \gamma_j \cdot control_{ijt} + \epsilon_{it}, \qquad (3)
\end{aligned}
$$

where *yldspr* is the yield spread, *rtc* the round-trip cost, *ebas* the effective bid-ask spread, *ami* the Amihud measure, *irtc* the imputed round-trip cost, *pdisp* the price dispersion measure, *roll* the Roll measure, *trd* the number of trades, *vol* the traded volume, *dlr* the number of dealers, *tint* the trading interval, *amti* the amount issued, *mty* the time-to-maturity and *cpn* refers to the coupon. Again, we control for retail trading, tranche seniority, registered securities and credit rating.

Table 11 presents the results based on different specifications. Regression (1) in the table includes only the control variables and has an adjusted R^2 of 33.5%, i.e., the control variables provide reasonable explanatory power, as previously indicated when presenting the descriptive statistics. Regressions (2) to (7) focus on the liquidity measures including each of the six liquidity measures, individually. Regression (8) includes all these measures taken together. Starting with Regression (2), i.e., including the round-trip cost measure, we find that that the adjusted R^2 increases to 37.6%, indicating that liquidity is an important risk factor in the pricing of structured products. A one standard deviation increase of the liquidity measure increases the yield spread by 34 bp (standard deviation of the spread is 2.67%). As expected, the round-trip cost measure using the most detailed information provides the highest R^2. It is noteworthy that when we use the imputed round-trip cost measure as an explanatory variable instead, as in Regression (3), we obtain almost the same explanatory power (37.4%). All other measures, when individually used as variables, provide an

[12]Feldhütter and Lando (2008) show that riskless rates based on swap rates are the best proxies to be used as benchmarks.

explanatory power of around 35%. In Regression (8), where we include all the liquidity measures, the R^2 increases to 39.7%. As the liquidity measures quantify similar aspects of liquidity at least to some extent, not all of them turn out to be statistically significant in this specification, due to the potential multi-collinearity. It is noteworthy that the round-trip costs and the effective bid-ask spread measures are both insignificant, indicating that similar information is provided by the other measures. This result strengthens the findings of the previous section that dealer-specific information and buy or sell-side flags are not absolutely essential, in terms of incremental informativeness, in computing reliable liquidity metrics. Thus, trade-specific reporting of prices and volumes seems to be sufficient for pricing purposes.

Regression (9) and (10) provide results using trading activity variables and product characteristics, respectively, as explanatory variables. Regression (11) is the full model, including all the explanatory variables. In this model, the results for the liquidity measures are confirmed. Analyzing the effect of the trading activity variables in the full model, we find economically significant results only for the trading interval, i.e., an increase of the trading interval by one standard deviation is associated with an increase in the yield spread of 20 bp. The information contained in the other trading activity variables, e.g., traded volume, seems to be adequately represented by the liquidity measures. However, more important are the results for the product characteristics. The most important variable in the full model turns out to be the coupon. A one standard deviation higher coupon (i.e., an increase by 130 bp) results in an increase of 113 bp in the yield spread. Thus, the coupon rate has the highest explanatory power of all variables, indicating that a higher coupon is associated with higher risks, e.g., credit risk, for a certain product, in particular when there is no credit rating available. The original amount outstanding shows important effects as well, where a one standard deviation increase leads to 43.9 bp decrease in the yield spread. Thus, larger issues have lower yield spreads. The maturity of a structured product is related to the yield spread as well, indicating that longer maturities are associated with somewhat lower spreads. However, compared with the other product characteristics, the maturity is of minor importance. Overall, the full model has an R^2 of 54.2%. Analyzing the incremental explanatory power of the liquidity measures alone, we find that these variables cover around 10% of the explained variation in the yield spread. A similar result is reported in Friewald et al. (2012) for the US corporate bond market. Thus, liquidity is an important driver of yield spreads in the structured product market and, therefore, dissemination of trading activity is important, given the size and complexity of this market.

6 Conclusion

The US market for structured financial products played an important role during the financial crisis. The opacity of its over-the-counter (OTC) trading architecture has been widely criticized, especially as this market represents the second largest fixed-income market in the US, after the Treasury bond market. To address this concern, the Financial Industry Regulatory Authority (FINRA) recently started a transparency project to close this gap. Starting with May 16, 2011, virtually all trades in the structured product market are required to be reported to a centralized database, which we use in this study including reported transactions up to February 29, 2012. However, the database has not yet been disseminated to the market, as the level of detail and the time-table are yet to be decided. Meanwhile, we have received access to this unique data-set.

We analyze the liquidity effects in the securitized product market, in general, and in the four main market segments (ABS, CMO, MBS and TBA), in particular, which cover rather different products, and compare these results to the liquidity in other fixed-income markets. We employ a wide range of liquidity proxies proposed in the academic literature, which was not possible previously, due to the non-availability of trading data. Our main contribution is the analysis of the relation between the measurement of liquidity and the dissemination of trading data. In particular, we explore whether liquidity measures based on less detailed information may still be reasonable proxies of liquidity. This is an important issue in improving market transparency, without compromising the identity of individual dealers or their trading strategies.

In our empirical analysis, we find a high trading volume in the fixed-income securitized product market, with an daily average of around $214 billion and an average transaction cost of 66 bp for a round-trip trade. The liquidity of the ABS and MBS market is comparable to the US corporate bond market. In contrast, the TBA segment is far more liquid, whereas the CMO market is considerably less liquid. In all four segments, we find more dispersed trading activity compared to other fixed-income markets, i.e., fewer trades per security but with higher volumes. Furthermore, we find that securities that are institutionally traded, are issued by a federal authority, and have low credit risk tend to be more liquid.

Exploring the relation between the various liquidity proxies and the depth of the dissemination information, we find that product characteristics or variables based on aggregated trading activity, by themselves, are not sufficient proxies for market liquidity. The dissemination of the price and volume of each individual trade is important to quantify liquidity effects, particularly when explaining yield spreads. However, we also find evidence that liquidity measures that use additional dealer-specific information (i.e., trader identity and sell/buy side categorization) can be efficiently proxied by measures using less information. Hence, dealer identity need not be compromised in the interest of improving market transparency. In our regression analysis, we find that liquidity effects cover around 10% of the explained variation in yield spreads. Thus, the dissemination of trading activity is essential, given the trade volume and complexity of this market. These results are important for all market participants and, especially, for regulators, who have to decide on the level of detail of the transaction data to be disseminated to the market.

A Appendix: Definitions and Computation of Liquidity Measures

This Appendix contains the exact definitions of the liquidity measures that we apply in our empirical analysis. We compute the liquidity measures for each financial instrument individually using the following notation. With $p(t_{i,j})$ and $v(t_{i,j})$ we denote the trade price and volume of a transaction observed at time $t_{i,j}$ on trading day i for trade j. We use $n(t_i)$ to refer to the observed number of trades of a financial instrument on trading day t_i.

Round-trip Cost uses the most detailed information. Each transaction needs to be assigned to a particular dealer d. The round-trip cost is then defined as the price difference between buying (selling) a certain amount of a security and selling (buying) the same amount of this security by the same dealer. More precisely, for a given trading day t_i we define a round-trip trade q of dealer d as a sequence of consecutive buy transactions with trade prices $p^b_{d,q}(t_{i,j})$ followed by a sequence of sell transactions with prices $p^s_{d,q}(t_{i,j})$ (or vice versa) of the same dealer d such that $\sum_j v^b_{d,q}(t_{i,j}) = \sum_j v^s_{d,q}(t_{i,j})$, where $v^b_{d,q}(t_{i,j})$ and $v^s_{d,q}(t_{i,j})$ denote the trade volumes belonging to the round-trip trade q of dealer d. Thus, the round-trip trade may either consist of a single trade on each side or a sequence of trades on trading day t_i. The round-trip cost is then given as

$$rtc(t_i) = \frac{1}{m(t_i)} \sum_{d,q} \left(p^s_{d,q}(t_{i,j}) \frac{v^s_{d,q}(t_{i,j})}{\sum_j v^s_{d,q}(t_{i,j})} - p^b_{d,q}(t_{i,j}) \frac{v^b_{d,q}(t_{i,j})}{\sum_j v^b_{d,q}(t_{i,j})} \right), \tag{4}$$

where $m(t_i)$ denotes all round-trip trades on trading day t_i for a financial instrument. Thus, we use volume-weighted prices to compute the round-trip cost measure for trading day t_i.

Effective Bid-Ask Spread is the difference between daily average sell and buy-price relative to the average mid-price. Thus, transactions need to be flagged as *buy* or *sell* trades. Formally it is defined as

$$ebas(t_i) = \frac{\overline{p}^s(t_i) - \overline{p}^b(t_i)}{1/2 \cdot \left(\overline{p}^s(t_i) + \overline{p}^b(t_i)\right)}, \tag{5}$$

where $\overline{p}^s(t_i) = 1/n^s(t_i) \sum_{j=1}^{n^s(t_i)} p^s(t_{i,j})$ and $\overline{p}^b(t_i) = 1/n^b(t_i) \sum_{j=1}^{n^b(t_i)} p^b(t_{i,j})$ refers to the average sell and buy price on trading day t_i.

Amihud measure measures the average price impact of trades on a particular trading day t_i, i.e., it is defined as the ratio of the absolute price change given as a return $r(t_{i,j}) = \frac{p(t_{i,j})}{p(t_{i,j-1})} - 1$ to the trade volume

$v(t_{i,j})$, measured in US dollars:

$$ami(t_i) = \frac{1}{n(t_i)} \sum_{j=1}^{n(t_i)} \frac{|r(t_{i,j})|}{v(t_{i,j})}. \tag{6}$$

Imputed round-trip cost is an alternative way of measuring bid-ask spreads. The idea here is to identify round-trip trades which are assumed to consist of two or three trades on a given day, with exactly the same traded volume. This likely represents the sale and purchase of an asset via one or more dealers to smaller traders. Formally, for a given trading day t_i we define an imputed round-trip trade w as a sequence of two or three transactions with trade prices $p_w(t_{i,j})$ and identical volumes $v_w(t_{i,j})$. The imputed round-trip cost is then defined as

$$irc(t_i) = \frac{1}{b(t_i)} \sum_{w} \left(1 - \frac{\min_j p_w(t_{i,j})}{\max_j p_w(t_{i,j})}\right), \tag{7}$$

where $b(t_i)$ refers to the number of all imputed round-trip trades on trading day t_i for a financial instrument.

Price dispersion measure is defined as the root mean squared difference between the traded prices and the respective market valuation weighted by volume, i.e., for each day t_i it is defined as

$$pdisp(t_i) = \sqrt{\frac{1}{\sum_{j=1}^{n(t_i)} v(t_{i,j})} \sum_{j=1}^{n(t_i)} (p(t_{i,j}) - u(t_i))^2 \cdot v(t_{i,j})}, \tag{8}$$

where $u(t_i)$ refers to the market valuation for trading day t_i, which we assume to be the average traded price on that day. We require at least three observations on a given day for calculating the price dispersion measure, i.e. $n(t_i) \geq 2$.

Roll measure is a proxy for round-trip transaction costs and is defined as

$$roll(t_i) = 2 \cdot \sqrt{-\operatorname{Cov}(\Delta p(t_k), \Delta p(t_{k-1})}, \tag{9}$$

where $\Delta p(t_k)$ is defined as the change in the consecutive prices $p_{k,j}$ and $p_{k,j-1}$ on trading day t_k with $t_k \leq t_i$. We compute the Roll measure based on the available price changes within a time frame of 21 days (i.e., $\forall t_k$ with $i - k \leq 21$) and require at least two observations to determine the covariance. Since we interpret the Roll measure as a transaction cost metric, we bound the measure at zero, whenever the covariance turns out to be positive.

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Tables and Figures

	Total	ABS	CMO	MBS	TBA
Traded Products	3245	308	1082	1709	147
Trades	13326	508	2328	2681	7849
Traded Volume [mln USD]	214096	2742	9085	13376	189847

Table 1: This table presents aggregate data on the average daily number of traded products, number of trades and traded volume for the whole securitized product market as well as for the market segments of Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS), and To-be Announced securities (TBA) during the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	Total	ABS	CMO	MBS	TBA
Product Characteristics					
Amount Issued [mln USD]	304.06	508.83	88.00	405.97	
Time-to-Maturity [years]	21.20	18.31	22.72	20.76	28.31
Coupon [%]	4.82	3.86	4.72	5.05	
Trading Activity Variables					
Number of Trades	4.11	1.65	2.15	1.57	53.46
Trading Volume [mln USD]	65.98	8.92	8.39	7.83	1292.50
Number of Dealers	1.90	1.38	1.54	1.62	9.05
Trading Interval [days]	14.66	11.94	11.94	18.54	2.04
Liquidity Measures					
Round-Trip Costs [%]	0.66	0.39	0.98	0.48	0.05
Effective Bid-Ask Spread [%]	0.45	0.28	0.76	0.27	0.05
Amihud [% / mln]	46.18	9.42	76.26	32.56	0.53
Imputed Round-Trip Costs [%]	0.64	0.39	0.93	0.49	0.07
Price Dispersion [%]	0.59	0.35	0.80	0.63	0.10
Roll [%]	0.81	0.54	1.10	0.97	0.10

Table 2: This table shows the means of the product characteristics, trading activity variables, and liquidity measures for the whole securitized product market as well as for the market segments of Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS), and To-be Announced securities (TBA) for the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	Total	ABS	CMO	MBS	TBA
Product Characteristics					
Amount Issued [mln USD]	812.88	578.03	234.21	1026.17	
Time-to-Maturity [years]	8.24	13.08	6.17	8.07	3.00
Coupon [%]	1.76	2.24	2.06	1.35	
Trading Activity Variables					
Number of Trades	36.31	1.33	3.21	1.30	163.17
Trading Volume [mln USD]	857.54	24.22	32.33	33.70	3838.04
Number of Dealers	2.80	0.80	0.83	1.01	10.13
Trading Interval [days]	29.72	23.84	25.61	34.04	9.71
Liquidity Measures					
Round-Trip Costs [%]	0.87	0.71	1.02	0.65	0.15
Effective Bid-Ask Spread [%]	0.74	0.57	0.93	0.52	0.16
Amihud [% / mln]	135.72	61.15	169.20	114.18	10.10
Imputed Round-Trip Costs [%]	0.88	0.70	1.02	0.71	0.15
Price Dispersion [%]	0.77	0.55	0.81	0.82	0.16
Roll [%]	0.95	0.78	0.97	0.99	0.16

Table 3: This table shows the standard deviations of the product characteristics, trading activity variables, and liquidity measures for the whole securitized product market as well as for the market segments of Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS), and To-be Announced securities (TBA) for the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	amti	*mty*	*cpn*	*trd*	*vol*	*dlr*	*tint*	*rtc*	*ebas*	*ami*	*irtc*	*pdisp*	*roll*
amti	1.00												
mty	0.05	1.00											
cpn	−0.02	−0.04	1.00										
trd	0.03	0.04	0.01	1.00									
vol	0.10	0.07	−0.12	0.93	1.00								
dlr	0.12	0.03	0.04	0.67	0.68	1.00							
tint	−0.09	−0.02	−0.02	−0.04	−0.04	−0.12	1.00						
rtc	−0.08	0.11	0.09	−0.08	−0.09	−0.16	0.02	1.00					
ebas	−0.06	0.08	0.08	−0.05	−0.06	−0.14	−0.04	0.83	1.00				
ami	−0.01	0.03	0.14	−0.03	−0.04	−0.03	−0.05	0.40	0.40	1.00			
irtc	−0.07	0.09	0.08	−0.07	−0.08	−0.13	0.02	0.92	0.73	0.40	1.00		
pdisp	0.00	0.05	0.22	−0.10	−0.11	−0.14	−0.01	0.60	0.63	0.55	0.51	1.00	
roll	−0.01	0.04	0.20	−0.14	−0.15	−0.24	0.10	0.41	0.37	0.36	0.42	0.49	1.00

Table 4: This tables shows correlations between product characteristics, trading activity variables, and liquidity measures based on a panel data-set for the time period from May 16, 2011 to February 29, 2012, provided by the Financial Industry Regulatory Authority (FINRA), where pairwise complete observations were required for calculation. The liquidity proxies are the amount issued (*amti*), time-to-maturity (*mty*), coupon (*cpn*), number of trades (*trd*), traded volume (*trd*), number of dealers (*dlr*), trading interval (*tint*), round-trip costs (*rtc*), effective bid-ask spreads (*ebas*), Amihud measure (*ami*), imputed round-trip costs (*irtc*), price dispersion measure (*pdisp*) and Roll measure (*roll*).

	ABS		CMO		MBS	
	Retail	Inst.	Retail	Inst.	Retail	Inst.
Product Characteristics						
Amount Issued [mln USD]	470.93	513.03	6 36.11	144.03	480.26	375.23
Time-to-Maturity [years]	16.27	18.55	22.50	22.96	20.00	21.07
Coupon [%]	4.46	3.79	5.45	3.94	5.65	4.81
Trading Activity Variables						
Number of Trades	1.29	1.70	1.77	2.55	1.35	1.66
Trading Volume [mln USD]	0.05	9.95	0.03	17.31	0.04	11.02
Number of Dealers	1.30	1.38	1.51	1.57	1.65	1.60
Trading Interval [days]	9.72	12.21	9.03	15.44	15.80	19.82
Liquidity Measures						
Round-Trip Costs [%]	0.92	0.36	1.18	0.81	0.73	0.40
Effective Bid-Ask Spread [%]	0.66	0.26	0.89	0.63	0.39	0.23
Amihud [% / mln]	107.59	3.88	143.88	13.15	94.10	13.75
Imputed Round-Trip Costs [%]	0.93	0.36	1.12	0.76	0.74	0.41
Price Dispersion [%]	1.00	0.32	1.02	0.67	1.29	0.53
Roll [%]	1.26	0.50	1.40	0.88	1.61	0.85

Table 5: This table shows the product characteristics, trading activity variables, and liquidity measures for retail and institutional traded sub-segments in the market segments of Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO) and Mortgage-Backed Securities (MBS) during the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA). We define trades with an average daily trading volume of less than $100,000 to be retail trades, in accordance with the definition used by FINRA.

	ABS			CMO				
	SUB	MEZ	SR	SUB	MEZ	SR	SSR	SSSR
Product Characteristics								
Amount Issued [mln USD]	117.25	47.52	591.17	30.09	37.90	106.54	222.26	55.10
Time-to-Maturity [years]	18.39	15.49	19.10	23.08	23.07	22.97	25.53	26.30
Coupon [%]	4.20	3.95	3.68	2.91	1.84	4.46	4.04	3.63
Trading Activity Variables								
Number of Trades	1.58	1.73	1.63	2.40	2.03	2.40	2.39	2.23
Trading Volume [mln USD]	7.53	7.31	9.09	7.78	9.63	9.69	13.81	13.75
Number of Dealers	1.28	1.32	1.38	1.45	1.40	1.54	1.30	1.37
Trading Interval [days]	20.47	30.57	10.71	17.05	19.19	12.50	15.67	17.15
Liquidity Measures								
Round-Trip Costs [%]	0.64	1.15	0.30	1.23	1.13	1.29	1.07	1.39
Effective Bid-Ask Spread [%]	0.44	0.73	0.22	0.77	0.77	1.00	0.93	0.96
Amihud [% / mln]	3.15	17.61	9.26	11.75	6.68	91.44	41.17	27.76
Imputed Round-Trip Costs [%]	0.61	1.04	0.31	1.12	1.10	1.21	0.94	1.30
Price Dispersion [%]	0.45	0.57	0.31	0.54	0.65	1.00	0.76	0.68
Roll [%]	0.91	1.21	0.46	1.01	1.15	1.28	1.07	1.05

Table 6: This table shows the product characteristics, trading activity variables, and liquidity measures for the tranche type sub-segments (super-super senior (SSSR), super senior (SSR), senior (SR), mezzanine (MEZ) and sub-ordinated (SUB)) in the market segments of Asset-Backed Securities (ABS) and Collateralized Mortgage Obligations (CMO) during the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	Others	FN	FH	GN
Product Characteristics				
Amount Issued [mln USD]	119.67	93.37	89.89	42.01
Time-to-Maturity [years]	23.49	20.10	20.09	25.81
Coupon [%]	4.16	5.20	5.18	4.71
Trading Activity Variables				
Number of Trades	2.35	1.95	2.02	2.14
Trading Volume [mln USD]	10.68	10.77	7.22	4.83
Number of Dealers	1.47	1.55	1.57	1.58
Trading Interval [days]	13.62	12.15	11.51	10.03
Liquidity Measures				
Round-Trip Costs [%]	1.23	0.73	0.75	0.98
Effective Bid-Ask Spread [%]	0.95	0.57	0.59	0.76
Amihud [% / mln]	73.03	78.38	84.83	72.27
Imputed Round-Trip Costs [%]	1.14	0.73	0.74	0.95
Price Dispersion [%]	0.91	0.73	0.75	0.73
Roll [%]	1.22	1.05	1.03	0.99

Table 7: This table shows the product characteristics, trading activity variables, and liquidity measures for the issuing authority sub-segments which is one of the three Federal Government Sponsored Enterprises (GSEs), i.e. the Federal Home Loan Mortgage Corporation (FH), the Federal National Mortgage Association (FN), and the Government National Mortgage Association (GN) or by other institutions (Others) in the market segment of Collateralized Mortgage Obligations (CMO) during the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	AAA	AA	A	BBB	BB	B	CCC/C	NR
Product Characteristics								
Amount Issued [mln USD]	410.47	488.33	399.86	232.31	135.24	106.64	130.85	557.98
Time-to-Maturity [years]	7.17	11.85	17.81	19.51	17.73	17.86	22.32	19.79
Coupon [%]	1.73	2.36	3.80	4.49	4.48	5.02	3.30	4.13
Trading Activity Variables								
Number of Trades	1.47	1.53	1.65	1.72	1.83	1.93	1.69	1.67
Trading Volume [mln USD]	6.70	11.57	8.12	8.52	9.14	10.53	15.98	8.92
Number of Dealers	1.30	1.30	1.39	1.37	1.46	1.44	1.29	1.39
Trading Interval [days]	9.10	16.86	15.95	15.47	19.03	17.74	25.51	11.23
Liquidity Measures								
Round-Trip Costs [%]	0.14	0.31	0.42	0.68	0.65	0.81	1.17	0.36
Effective Bid-Ask Spread [%]	0.12	0.22	0.32	0.50	0.42	0.55	0.73	0.27
Amihud [% / mln]	4.66	2.05	6.91	31.39	6.88	8.46	7.90	9.32
Imputed Round-Trip Costs [%]	0.15	0.31	0.43	0.69	0.65	0.81	1.08	0.37
Price Dispersion [%]	0.17	0.33	0.40	0.56	0.46	0.55	0.57	0.34
Roll [%]	0.27	0.56	0.63	0.94	1.03	0.89	1.23	0.51

Table 8: This table shows the product characteristics, trading activity variables, and liquidity measures for the credit rating grades (AAA, AA, A, BBB, BB, B, CCC/C, NR) in the market segment of Asset-Backed Securities (ABS) during the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).

	rtc	$ebas$	ami	$irtc$	$pdisp$	$roll$
$Intercept$	1.093^{***}	0.842^{***}	-1.181^{***}	0.996^{***}	0.247^{***}	0.692^{***}
	(15.400)	(13.540)	(−5.254)	(8.264)	(3.912)	(5.948)
trd	0.041^{***}	0.081^{***}	0.154^{***}	-0.019^{***}	0.046^{***}	0.001
	(8.969)	(7.578)	(9.366)	(−4.665)	(7.806)	(0.119)
vol	-0.139^{***}	-0.134^{***}	-1.172^{***}	-0.147^{***}	-0.094^{***}	-0.133^{***}
	(−12.514)	(−15.305)	(−48.824)	(−15.244)	(−16.005)	(−11.291)
dlr	-0.125^{***}	-0.175^{***}	0.304^{***}	0.052^{***}	0.096^{***}	-0.023^{*}
	(−8.073)	(−9.969)	(18.228)	(3.996)	(11.279)	(−1.929)
$tint$	-0.015^{***}	-0.037^{***}	-0.060^{***}	0.028^{***}	-0.018^{***}	0.000
	(−4.709)	(−3.801)	(−3.487)	(3.251)	(−3.841)	(0.070)
cpn	0.082^{***}	0.070^{***}	0.250^{***}	0.108^{***}	0.073^{***}	0.106^{***}
	(7.065)	(7.594)	(6.121)	(9.601)	(7.806)	(6.680)
mty	0.001	−0.001	0.009^{**}	0.001	−0.001	−0.001
	(1.304)	(−0.495)	(2.396)	(0.313)	(−0.568)	(−0.577)
$amti$	-0.108^{***}	-0.082^{***}	-0.112^{***}	-0.135^{***}	-0.083^{***}	-0.049^{***}
	(−13.496)	(−9.813)	(−5.346)	(−10.787)	(−16.663)	(−2.955)
Obs.	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000
R^2	0.404	0.354	0.826	0.380	0.414	0.236

Table 9: This table reports the results of regressing the round-trip cost (rtc), effective bid-ask spread ($ebas$), Amihud measure (ami), imputed round-trip costs ($irtc$), price dispersion measure ($pdisp$) and Roll measure ($roll$) on (i) trading activity variables, i.e., number of trades (trd), trading volume (vol), number of dealers (dlr), trading interval ($tint$), and (ii) product characteristics, i.e., coupon (cpn), time-to-maturity (mty), amount issued ($amti$) using the Fama and MacBeth (1973) procedure on weekly averages of all variables. We control for retail trading, tranche seniority (SSSR, SSR, SR, MEZ and SUB), registered products and credit ratings. Values in parentheses are t-statistics based on hetereoscetasticity and autocorrelated consistent standard errors using Newey and West (1987). We denote the statistical significance at a 1%, 5%, and 10% level with ***, ** and *, respectively. The sample is based on data provided by the Financial Industry Regulatory Authority (FINRA) for the period from May 16, 2011 to February 29, 2012.

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.627***	1.321***	0.655***	0.880***	0.973***	0.474***
	(9.622)	(22.655)	(12.175)	(13.326)	(16.146)	(7.527)
ebas	0.566***					0.316***
	(26.702)					(15.780)
ami		0.209***				0.034***
		(31.993)				(6.783)
irtc			0.464***			0.332***
			(37.407)			(20.515)
pdisp				0.720***		0.141***
				(15.304)		(2.792)
roll					0.156***	0.038***
					(13.071)	(6.040)
trd	−0.003	0.010**	0.049***	0.009*	0.042***	0.010**
	(−0.599)	(2.541)	(9.065)	(1.727)	(9.381)	(2.257)
vol	−0.064***	0.106***	−0.071***	−0.071***	−0.118***	0.011
	(−6.821)	(7.901)	(−6.367)	(−5.510)	(−9.678)	(0.982)
dlr	−0.025***	−0.186***	−0.148***	−0.191***	−0.122***	−0.105***
	(−2.751)	(−12.617)	(−10.470)	(−14.480)	(−8.389)	(−11.626)
tint	−0.003	−0.006***	−0.028***	−0.007***	−0.016***	−0.015***
	(−1.599)	(−4.727)	(−4.729)	(−4.287)	(−5.260)	(−4.773)
cpn	0.042***	0.033***	0.030***	0.032***	0.065***	0.005
	(3.566)	(2.778)	(3.119)	(3.618)	(6.084)	(0.496)
mty	0.002**	−0.001	0.001*	0.002**	0.002*	0.001
	(2.553)	(−0.987)	(1.985)	(2.715)	(1.737)	(0.965)
amti	−0.060***	−0.083***	−0.047***	−0.047***	−0.099***	−0.018**
	(−8.041)	(−10.889)	(−6.710)	(−6.299)	(−14.467)	(−2.384)
Obs.	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000
R^2	0.622	0.528	0.625	0.603	0.430	0.744

Table 10: This table reports the results of regressing the round-trip costs (*rtc*) on (i) liquidity measures, i.e., effective bid-ask spread (*ebas*), Amihud measure (*ami*), imputed round-trip costs (*irtc*), price dispersion measure (*pdisp*), Roll measure (*roll*), (ii) trading activity variables, i.e., number of trades (*trd*), trading volume (*vol*), number of dealers (*dlr*), trading interval (*tint*), and (iii) product characteristics, i.e., coupon (*cpn*), time-to-maturity (*mty*), amount issued (*amti*) using the Fama and MacBeth (1973) procedure on weekly averages of all variables. We control for retail trading, tranche seniority (SSSR, SSR, SR, MEZ and SUB), registered products and credit ratings. Values in parentheses are *t*-statistics based on hetereoscetasticity and autocorrelated consistent standard errors using Newey and West (1987). We denote the statistical significance at a 1%, 5%, and 10% level with ***, ** and *, respectively. The sample is based on data provided by the Financial Industry Regulatory Authority (FINRA) for the period from May 16, 2011 to February 29, 2012.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intercept	−0.458*	−0.474**	−0.454*	0.009	−0.508**	−0.468**	−0.532**	−0.202	−0.435**	−0.522***	−0.689***
	(−1.878)	(−2.074)	(−1.932)	(0.049)	(−2.256)	(−2.079)	(−2.514)	(−1.102)	(−2.267)	(−3.925)	(−5.235)
rtc		0.408***						0.032			−0.008
		(8.489)						(0.558)			(−0.140)
ebas			0.278***					−0.011			0.008
			(8.616)					(−0.351)			(0.296)
ami				0.153***				0.103***			0.050**
				(10.711)				(7.155)			(2.648)
irtc					0.381***			0.235***			0.162***
					(10.227)			(7.956)			(5.985)
pdisp						0.410***		−0.126***			−0.287***
						(7.067)		(−2.771)			(−4.923)
roll							0.300***	0.161***			0.078***
							(7.718)	(4.169)			(3.437)
trd									0.035***		0.003
									(3.049)		(0.343)
vol									−0.193***		0.057*
									(−10.183)		(1.991)
dlr									0.072***		0.022
									(5.284)		(1.304)
tint									0.032***		0.020***
									(6.399)		(3.627)
cpn										0.894***	0.871***
										(32.234)	(34.838)
mty										−0.023***	−0.024***
										(−5.343)	(−5.340)
amti										−0.248***	−0.228***
										(−12.943)	(−13.713)
Obs.	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000	2436.000
R^2	0.335	0.376	0.354	0.357	0.374	0.343	0.351	0.397	0.351	0.500	0.542

Table 11: This table reports the results of regressing the yield spread (i.e., the yield of securitized product above the duration matched swap rate) on (i) liquidity measures, i.e., round-trip cost (*rtc*), effective bid-ask spread (*ebas*), Amihud measure (*ami*), imputed round-trip costs (*irtc*), price dispersion measure (*pdisp*), Roll measure (*roll*), (ii) trading activity variables, i.e., number of trades (*trd*), trading volume (*vol*), number of dealers (*dlr*), trading interval (*tint*), and (iii) product characteristics, i.e., coupon (*cpn*), time-to-maturity (*mty*), amount issued (*amti*) using the Fama and MacBeth (1973) procedure on weekly averages of all variables. We control for retail trading, tranche seniority (SSSR, SSR, SR, MEZ and SUB), registered products and credit ratings. Values in parentheses are t-statistics based on hetereoscetasticity and autocorrelated consistent standard errors using Newey and West (1987). We denote the statistical significance at a 1%, 5%, and 10% level with ***, ** and *, respectively. The sample is based on data provided by the Financial Industry Regulatory Authority (FINRA) for the period from May 16, 2011 to February 29, 2012.

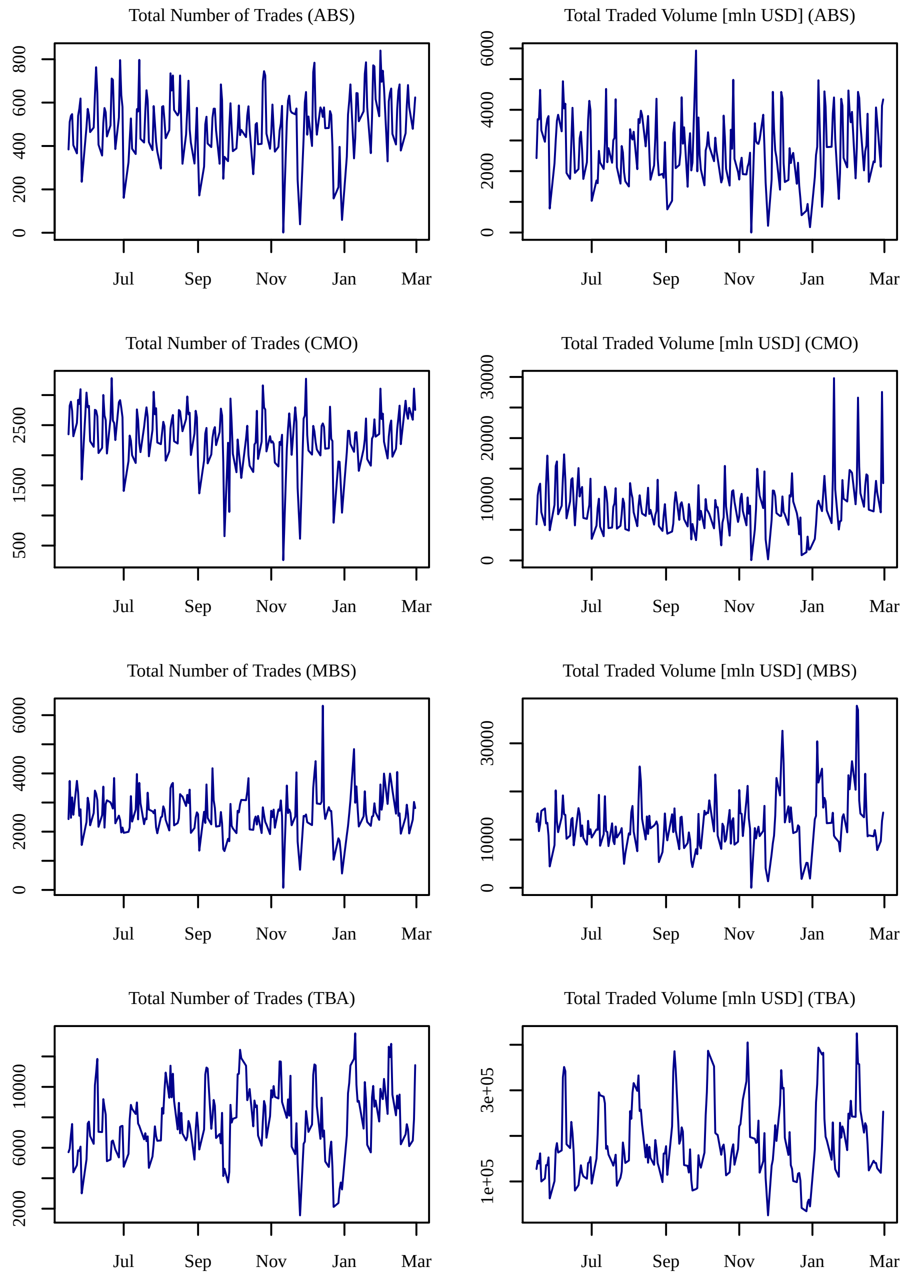

Figure 1: This figure shows the total daily number of trades (on the left-hand side panels) and traded volume (on the right-hand side panels) for the market segments of Asset-Backed Securities (ABS), Collateralized Mortgage Obligations (CMO), Mortgage-Backed Securities (MBS), and To-be Announced Securities (TBA) in the time period from May 16, 2011 to February 29, 2012, based on data provided by the Financial Industry Regulatory Authority (FINRA).