

Analysis of Securitized Asset Liquidity

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1. Introduction

This research note extends our prior analysis² of corporate bond liquidity to the structured products markets. We analyze data from the TRACE³ system, which began collecting secondary market trading activity on structured products in 2011.

We explore two general categories of structured products: (1) real estate securities, including mortgage-backed securities in residential housing (MBS) and commercial building (CMBS), collateralized mortgage products (CMO) and to-be-announced forward mortgages (TBA); and (2) asset-backed securities (ABS) in credit cards, autos, student loans and other miscellaneous categories.

Consistent with others,⁴ we find that the new issue market for securitized assets decreased sharply after the financial crisis and has not yet rebounded to pre-crisis levels. Issuance is below 2007 levels in CMBS, CMOs and ABS. MBS issuance had recovered by 2012 but has declined over the last four years. By contrast, 2016 issuance in the corporate bond market was at a record high for the fifth consecutive year, exceeding \$1.5 trillion. Consistent with the new issue volume decline, the median age of securities being traded in non-agency CMO are more than ten years old. In student loans, the average security is over seven years old.

Over the last four years, secondary market trading volumes in CMOs and TBA are down from 14 to 27%. Overall ABS volumes are down 16%. Student loan and other miscellaneous ABS declines balance increases in automobiles and credit cards. By contrast, daily trading volume in the most active corporate bonds is up nearly 28%.

Despite the negative trends in issuance and trading volumes, market microstructure measures of liquidity do not show the same deterioration. Bid-ask spreads are down in every category except for autos. The price impact of trades has fallen in every security since 2012. The size of dealer networks has remained fairly stable, although interdealer trading has declined. Finally,

¹ Office of the Chief Economist, FINRA. The views expressed herein are the views of the authors and do not necessarily reflect the views of FINRA or the authors' colleagues on the FINRA staff.

² Bruce Mizrach, "Analysis of Corporate Bond Liquidity," FINRA Research Note, December 2015.

³ The Trade Reporting and Compliance Engine (TRACE) is the FINRA-developed vehicle that facilitates the mandatory reporting of over-the-counter secondary market transactions in eligible fixed income securities. All broker-dealers that are FINRA member firms have an obligation to report transactions in most fixed income securities to TRACE under an SEC-approved set of rules.

⁴ Cf., Segoviano et al, "Securitization: The Road Ahead," *IMF Staff Note*, January, 2015.

our analysis of common liquidity across markets shows that the liquidity for real estate products is only weakly linked to that of the corporate bond market, with the exception of CMBS. The negative correlation between real estate products and several categories of ABS shows that there is no single common liquidity driver among structured products. This makes it difficult to ascribe the liquidity challenges in these markets to a single cause such as stronger regulatory burdens.

The research note is organized as follows: Our path from here is to first describe the securitized assets and the data that FINRA is collecting in the TRACE system. We then look at new issuance and the vintage of securities in the secondary market to gain insight into the vibrancy of these markets, post-financial crisis. Next we evaluate standard microstructure measures of liquidity both currently and over the last five years to understand the potential implications of changing regulations or disclosures on the health of these markets. Our final section looks for common liquidity patterns across these markets to better understand whether certain common factors are influencing liquidity across multiple markets.

2. Securitized Assets and Reporting in TRACE

The assets we study in this research note are defined in FINRA Rule 6710. Securitized products are “securities collateralized by any type of financial asset.”

2.1 Brief description of securitized assets

The collateral for mortgage backed securities (MBS) is residential single and multi-family mortgages. The collateral for these assets is separated between residential mortgages (RMBS) and commercial mortgages (CMBS).⁵ TRACE category MBS includes single and multi-family pass-through securities where there is no credit enhancement through tranching. The most actively traded MBS security in 2016 was a Government National Mortgage Association (GNMA) 30-year mortgage pass through security with CUSIP 36179SLR6, issued in September 2016. This security is also held in the Federal Reserve’s System Open Market Account.⁶

There is an active forward market in MBS called the “To Be Announced” Market (TBA). Vickery and Wright (2013) note that the CUSIPs to be delivered at settlement are not identified at the trade date, only characteristics like issuer, maturity and coupon.

Federal agencies and private firms frequently create more complex financial products from mortgages called collateralized mortgage obligations (CMOs). These securities break up the cash flows from the mortgages into interest and principal and prioritize payment to certain tranches. The TRACE data in this category are from the residential mortgage market. Our sample includes agency CMOs created by government sponsored enterprises (GSEs) including the Federal National Mortgage Association (FNMA), the Federal Home Loan Mortgage Corporation (FHLMC), GNMA, the Small Business Administration (SBA) as well as privately issued, non-agency CMOs. Home equity loans are bundled into the CMO category in TRACE.

⁵ Note that certain multi-family loans are considered to be CMBS.

⁶ <https://markets.newyorkfed.org/soma/download/727/mbs?client=GUI>

The most actively traded agency CMO in 2016 was a Freddie Mac real estate mortgage investment conduit (REMIC) series 4590, with CUSIP 3137BQ7A9, that closed on June 30, 2016. The most active privately issued security was a Bear Stearns (now JP Morgan) structured mortgage product BSSP 2004-5.

Mortgage securities backed by commercial mortgage loans (CMBS), which are structured as CMOs, have been reported to TRACE since the third quarter of 2011.⁷ The most actively traded security in 2016 was the FREMF 2012-K23 Mortgage Trust, CUSIP 30290WAA3, a structured mortgage security created by Freddie Mac in December 2012.

Non-real estate asset-backed securities⁸ are constructed from automobile loans (ABS Auto), credit cards (ABS Card) and student loans (ABS Student). A large number of additional categories including aircraft, equipment and manufactured housing are grouped into the miscellaneous group (ABS Misc).

The most actively traded automobile security in 2016 was the Ford Credit Auto Owner Trust 2016-REV2, CUSIP 34531BAA0; for credit cards it was the American Express Credit Account Master Trust 2014-3, CUSIP 02582JGU8; for student loans, it was the Sallie Mae Student Loan Trust 2008-9, CUSIP 78445JAA5; and for the ABS Misc., it was the Green Tree Manufactured Housing Contract Senior/Subordinate Pass-Through Certificates 1998-7, CUSIP 393505N40.

We note in passing, before discussing this in greater detail in Section 3, that the most actively traded securities, in both non-agency CMOs and ABS student loans, are more than ten years old.

2.2 History of TRACE data collection for securitized assets

In July 2002, FINRA's Trade Reporting and Compliance Engine (TRACE) began to collect transaction data from the corporate bond market.⁹ By January 2006, TRACE was providing the public real time dissemination of non-block trades and delayed dissemination of block trades. Numerous studies,¹⁰ including Edwards, Harris and Piwowar (2007), have shown that increased transparency in the corporate bond market improved execution quality for retail-sized trades.

Over time and given the evidence, FINRA began to expand the number of instruments required to report to TRACE. In March 2010, FINRA began collecting debt issued by federal agencies including Fannie Mae, Freddie Mac and the Federal Home Loan Banks.¹¹ FINRA adopted a

⁷ Certain asset-backed securities including CMBS have slower reporting times and are designated ABSX in TRACE. FINRA has data starting from the second quarter of 2015. ABSX is defined in FINRA *Regulatory Notice 14-34* "SEC Approves Amendments to Disseminate Additional Asset-Backed Securities Transactions and to Reduce the Reporting Time for Such Transactions."

⁸ For the sake of brevity, we will use the terms ABS and asset-backed to mean specifically "non-real estate asset-backed securities" for the remainder of the research note.

⁹ "NASD Launches TRACE Bond Trade Data System," July 1, 2002.

¹⁰ A list of academic studies using TRACE is at: <http://www.finra.org/industry/trace/trace-independent-academic-studies>.

¹¹ "Major TRACE Expansion Will Further Enhance Debt Market Transparency," March 1, 2010. <http://www.finra.org/newsroom/2010/trace-reporting-government-agency-debt-primary-bond-market->

framework where it would first collect transactions for regulatory purposes and once it gained additional experience with the data and market, consider disseminating certain data elements associated with transactions to the public.

In May 2011, TRACE expanded to include securitized assets.¹² These included mortgage-backed, asset-backed and collateralized securities. These instruments were considered more complex, and reporting initially began on a next day basis.¹³ FINRA understood that direct retail participation in these markets was significantly less than in corporate bonds. Further, the number of large active participants was often small and well known to other market participants. As such, FINRA considered the market dynamics in each securitized asset market in order to assess the trade-off between the costs and benefits of transparency and adjusted the reporting regime to reflect these differences.

A summary of the data available¹⁴ in TRACE is in **Table 1**.

Table 1: Data Available in TRACE

Data Begins	Security	Brief Description
April-2015	CDO	Collateralized Debt Obligation
May-2011	MBS	Mortgage Backed Securities
May-2011	TBA	To Be Announced
July-2011	CMBS	Commercial Mortgage Backed Security
May-2011	Agency CMO	Agency Collateralized Mortgage Obligation
May-2011	Non-Agency CMO	Non Agency Collateralized Mortgage Obligation
May-2011	ABS Auto	Asset-Backed Securities in Automobiles
May-2011	ABS Card	Asset-Backed Securities in Credit Card Receivables
May-2011	ABS Student	Asset-Backed Securities in Student Loan
May-2011	ABS Misc	Asset-Backed Securities Miscellaneous
July-2002	Corp. Bond	Corporate Bond

By September 2015, TRACE reporting was harmonized around a reporting standard of “as soon as practicable but no more than 15 minutes.”¹⁵ CMOs are still subject to end-of-day reporting, though FINRA has recently proposed to shorten that to 60 minutes.¹⁶

3. New Issuances and Turnover

We begin our analysis by examining the supply of new securities coming into the market and the extent to which trading is occurring in new issues or older vintages. We also briefly document the number of securities trading in the secondary market.

[begin-march-1](#). This was the implementation of SR-FINRA-2009-010 approved by the SEC on September 28, 2009.

¹² See Securities Exchange Act Release No. 63223 (November 1, 2010), 75 FR 68654 (November 8, 2010) (Notice of Filing and Immediate Effectiveness of File No. SR-FINRA-2010-054 to Extend the Implementation Period for SR-FINRA-2009-065).

¹³ FINRA *Regulatory Notice 10-23*, April 2010.

¹⁴ Collateralized debt obligations (CDO) are structured products that package and tranche many different types of collateral. The sample of data is too short, and we have omitted CDOs from the analysis.

¹⁵ FINRA proposed a default standard of 15 minutes in SR-FINRA-2015-025 which was approved by the SEC on August 28, 2015.

¹⁶ SR-FINRA-2016-023 of June 27, 2016.

3.1 Supply of new securities

Our security reference data is from the Securities Industry and Financial Markets Association (SIFMA).¹⁷ SIFMA collects aggregate data on issuance in a wide range of capital markets including equities, corporate bonds and structured products. The categories are more broadly defined than in TRACE, so we report ABS in the aggregate and include all types of CMBS. For comparison purposes, we also report data on corporate bonds.

The MBS and CMO markets have the largest issuance amounts among structured products. CMO issuance in 2016 is down almost \$1.4 trillion from its 2005 peak, a decline of 86%. The biggest share of the decline is in the non-agency or “private label” segment of the market.¹⁸ The MBS market had fully recovered to pre-crisis levels by 2012, but has declined almost 25% in the last four years (2013-2016). CMBS is still down almost 60% since its 2007 peak, but it has shown steady growth over the last five years although it dropped significantly in 2016.

By 2014, ABS issuance had fully recovered to pre-crisis levels, with issuance of \$311 billion, up more than \$20 billion from the 2007 peak. Market activity regressed in 2015 and 2016, with issuance falling nearly \$100 billion.

Activity in the corporate bond market provides an interesting contrast. The market for new corporate issuance has seen steady growth each year since 2008, with a record issuance in 2016 of over \$1.5 trillion.

Table 2: Issuance (in billions)

Year	MBS	ABS	CMO	CMBS	Corp. Bonds
2002	\$1,447	\$216	\$1,019	\$52	\$636
2003	\$2,131	\$228	\$1,291	\$82	\$773
2004	\$1,015	\$223	\$1,295	\$98	\$775
2005	\$983	\$284	\$1,623	\$172	\$750
2006	\$923	\$266	\$1,594	\$211	\$1,058
2007	\$1,189	\$290	\$1,065	\$238	\$1,136
2008	\$1,170	\$267	\$250	\$17	\$711
2009	\$1,734	\$166	\$361	\$5	\$940
2010	\$1,420	\$106	\$567	\$14	\$1,053
2011	\$1,240	\$127	\$427	\$31	\$1,021
2012	\$1,757	\$232	\$353	\$45	\$1,367
2013	\$1,643	\$262	\$361	\$87	\$1,377
2014	\$980	\$312	\$285	\$99	\$1,450
2015	\$1,323	\$256	\$288	\$100	\$1,493
2016	\$1,557	\$208	\$230	\$77	\$1,510

¹⁷ The data can be found at: <http://www.sifma.org/research/statistics.aspx>.

¹⁸ See Goodman (2016) for the slow progress on the efforts by the U.S. Treasury to revive the private label market.

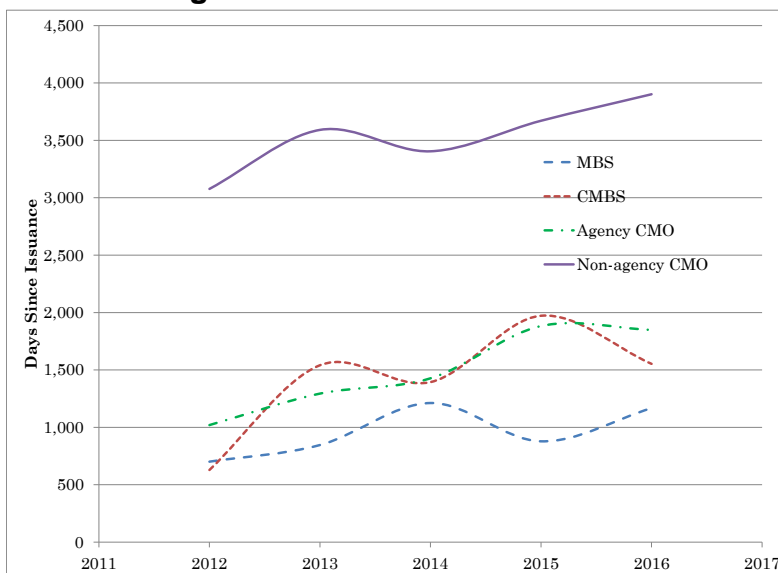
3.2 Trading days since issuance

Given the general decline in new issuances of securitized assets, we may expect an increase in the typical age of securities traded as well. We calculate the median age, in days since issuance, of all the securities trading in the quarter. This analysis of “vintage” is useful to determine whether dealers are focusing on only the subset of recently issued securities. Given significant differences in the issuance activities in different types of securitized assets described above, this “vintage” analysis will provide evidence as to the market conditions for these securities.

We break our analysis into two groups: real estate securities and asset-backed securities, with corporate bonds included as a reference point for comparison.

In the real estate related securities segment in **Figure 1**, the MBS market has the most stable vintage, ranging from 700 to 1,200 days. CMBS, along with agency and non-agency CMOs, have seen an uptrend since 2012. As reported in Table 2, new issues of non-agency CMOs have been almost non-existent post crisis;¹⁹ however, the secondary market is continuing to trade the securities issued pre-crisis. As a consequence, the vintage is steadily increasing, rising from nearly 3,100 calendar days (approximately six years) in 2012 to over 3,900 days (over ten and one-half years) in 2016.

Figure 1: Real Estate Securities



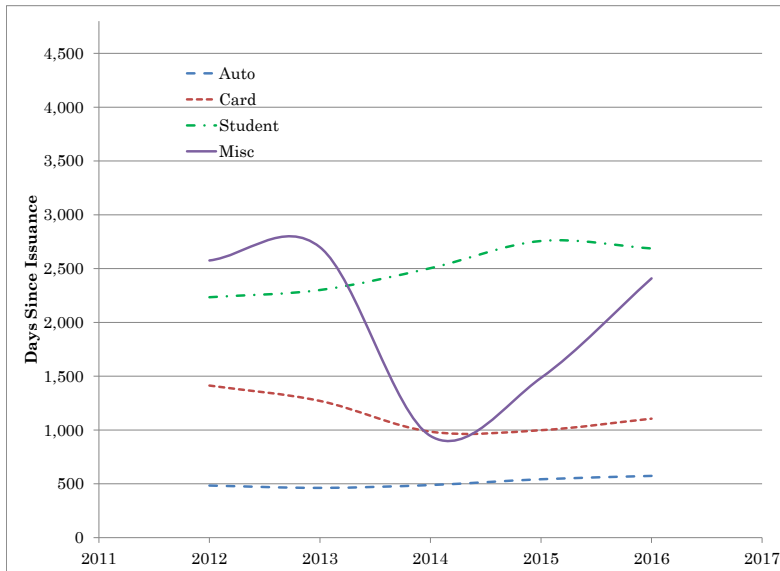
Agency CMOs and CMBS are less than half as old as the non-agency CMOs, with vintages of 1,553 and 1,849 days in 2016. We display the same vintage analysis for the ABS market²⁰ in Figure 2. Securitizations backed by credit cards are trending down, falling from over 1,400 days

¹⁹ Goodman (2015) shows that private label MBS fell from \$1.2 trillion at its 2005 peak, to under \$50 billion in 2015.

²⁰ We will frequently refer to the securitization structure based on the underlying collateral. Our observations about trading volume the auto market, for example, do not reflect the number of loans being made, simply the trading activity of the securitized products.

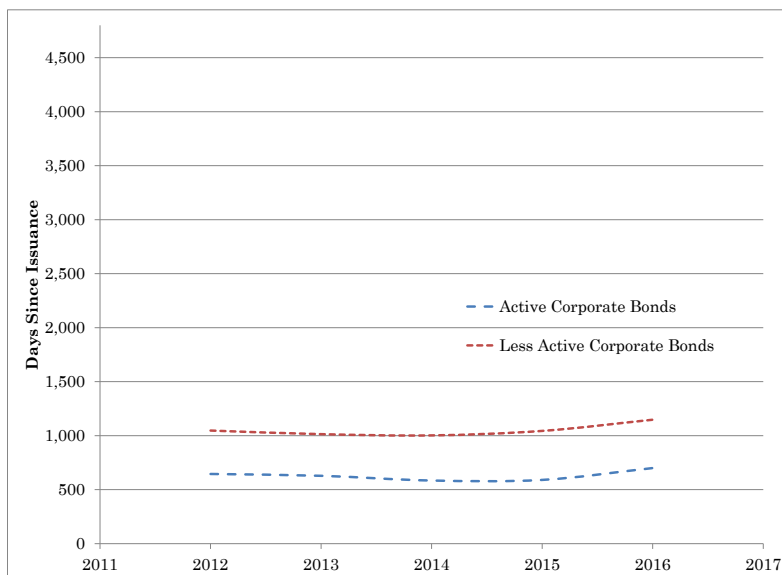
in 2012 to 1,100 days in 2016. Miscellaneous securities are down slightly from 2012 but up since 2014. Student loans have continued to rise to 2,687 days from an already high base of 2,234 days in 2012. Autos display a slight uptrend, rising from 484 days in 2012 to 578 days in 2016. The average days since issuance for traded auto loan securities is the lowest of all of the securitized assets and is even lower than corporate bonds.

Figure 2: ABS Securities



We again include corporate bonds in this section in **Figure 3** as a benchmark. Corporate bond vintages are more stable than real estate securities with the median age steadily below two years for the active bonds.

Fig 3: Corporate Bonds



In our previous analysis, we broke the secondary market trading in corporate securities into two segments, the most active 1,000 securities and the remaining less active group. Both segments have maintained a steady median vintage. The vintage among the high activity bonds is consistently below two years, while the less active segment is steady at around three years.

3.3 Number of instruments traded

Since the CUSIP ID for securities in some structured markets like TBA is recycled, we used the number of distinct FINRA security identifiers to measure range of securities trading in the secondary market in **Table 3**. MBS has the deepest security composition with more than 50,000 distinct securities traded in 2016. This is well above any other market we consider, with second place going to corporate bonds, where 26,000 distinct securities traded.

Table 3: Number of Distinct FINRA IDs Traded

Security	Number of Securities	Growth 2012-16
MBS	53,614	0%
TBA	767	-14%
CMBS	931	122%
Agency CMO	11,946	-14%
Non-Agency CMO	7,984	-23%
ABS Auto	974	63%
ABS Card	189	-1%
ABS Student	397	-5%
ABS Misc	1,352	-22%
Corp. Bonds	26,212	24%

ABS autos, cards and student loans have less than 1,000 securities trading in the secondary market. The only securitized asset with more than 1,000 distinct issues is the miscellaneous category.

TBA data reflects the institutional nature of the market. Only 767 securities account for the \$200 billion in daily trading volume in 2016.²¹

4. Measures of Liquidity

As shown in the above descriptive statistics, the market for securitized assets has generally floundered since the crash with the exception of pass-through MBS. New issuances are down, and the average age of the traded securities is rising, especially for real estate ABS. Given this, it is rational to believe that the liquidity of these securities may also have changed recently. Both

²¹ Vickery and Wright (2013) note that the structure of the TBA market allows trading to be concentrated in a small number of representative securities.

industry participants and global financial regulators are eager to ensure sufficient liquidity in these markets.²²

There are a number of standard measures of liquidity that have been analyzed in the academic and practitioner literature. We have chosen to focus on four of those measures. The first is trading activity as measured by dollar volume, number of trades and average trade size. The second is transaction costs, which we measure from the bid-ask spread and from market impact. The third measure is interdealer activity. We believe this is particularly relevant for an over-the-counter market because dealers play an important role in price discovery. We capture dealer intermediation by looking at the number of counterparties in dealer networks, the share of activity held by the top ten dealers, and by the share of dealer-to-dealer trading volume. In our analysis, we report measurements for 2016, and then the growth rate between 2012 and 2016.

4.1 Trading activity

We report in **Table 4** the average daily dollar trading volume across the securitized markets for 2016 and the growth rate for 2012 to 2016.

The TBA market, at nearly \$200 billion per day, is by far the most active market in the group with almost ten times the trading activity of any other category. A distant second is the less active category of corporate bonds, followed by MBS and the active corporate bonds, with each between \$18 and \$20 billion per day. CMOs total more than \$6 billion, nearly equally split between agency and non-agency instruments.

ABS across all categories is much less active. The miscellaneous group, which includes securities as disparate as lottery tickets and manufactured housing, is still below \$1 billion per day. The other ABS categories are smaller with around \$0.50 billion daily in autos and credit cards. The smallest group is student loans with only \$0.18 billion.

Table 4: Average Daily Volume (in billions)

Security	\$Volume	Growth 2012-16
MBS	\$19.69	8%
TBA	\$199.67	-27%
CMBS	\$0.30	112%
Agency CMO	\$3.31	-16%
Non-Agency CMO	\$2.82	-14%
ABS Auto	\$0.56	90%
ABS Card	\$0.41	66%
ABS Student	\$0.18	-34%
ABS Misc	\$0.78	-47%
Corp Bond Active	\$18.24	28%
Corp Bond Less	\$20.33	66%

²² On July 11, 2016, the BIS lowered the risk weighting on standardized securitized assets from 15% to 10%.

Real estate security trading has generally declined since 2012. Agency and non-agency CMOs are down by 15% on average, and TBA by 27%. MBS show a small 8% gain over the four years. The exception to the trend is CMBS. These are up by 112%, but this represents only \$0.30 billion in trading volume per day.

ABS trading is down by 16% overall. ABS auto and cards are up by 90% and 66%, balancing a 34% decline in student loan trading and a 47% decline in the largest category, miscellaneous.

These data suggest that the securitization markets have not fully recovered from the financial crisis. Corporate bond issuance and trading reached record levels²³ in 2015, but the securitization markets have shown a different trend.

Table 5: Average Daily Number of Trades

Security	Trades	Growth 2012-16
MBS	3,011	-5%
TBA	7,226	-8%
CMBS	79	137%
Agency CMO	1,081	-41%
Non-Agency CMO	580	-39%
ABS Auto	140	67%
ABS Card	79	82%
ABS Student	27	-21%
ABS Misc	130	-12%
Corp Bond Active	14,267	12%
Corp Bond Less	41,568	49%

If we look at the number of trades in **Table 5**, we see a story similar to that in trading volume in Table 4. The only security that has a different sign for trades is MBS, where the daily number of trades is down -5%.

As we show in **Table 6**, trade size has generally increased in securities where trading volume is up and decreased where trading volume is down. This includes MBS, ABS Auto, and both sets of corporate bonds on the up side and TBA, ABS Student and ABS Misc on the down side. Two outliers are CMBS, where trading volume is up over 100% but the average trade size is down 10%, and ABS Card where volume is up 66% but trade size is down 9%.

The largest average trade size is in the TBA market at more than \$27 million. The smallest average trade size, the \$3.06 million in non-agency CMO, is still more than six times the less active corporate bond trading size.

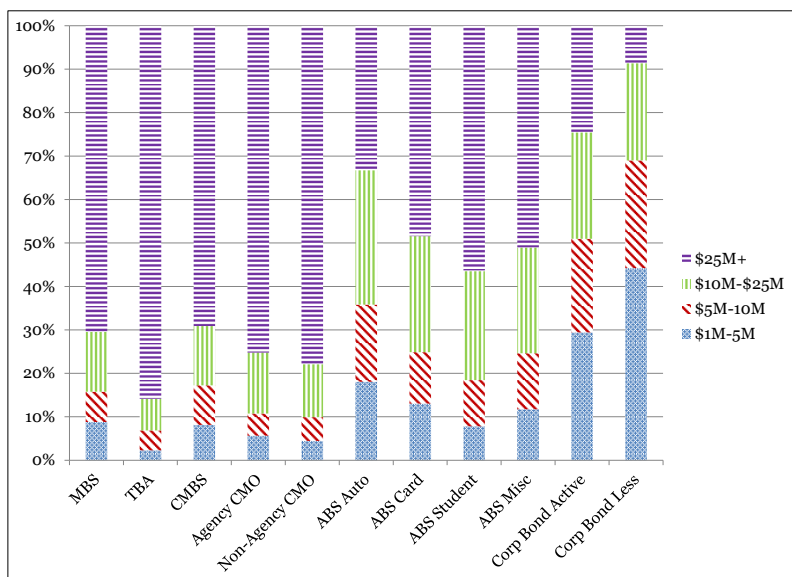
²³ See Bruce Mizrach, "Analysis of Corporate Bond Liquidity," (2015).

Table 6: Average Trade Size (in millions)

Security	Avg. Trade Size	Growth 2012-16
MBS	\$6.54	14%
TBA	\$27.63	-20%
CMBS	\$3.76	-10%
Agency CMO	\$3.06	42%
Non-Agency CMO	\$4.85	41%
ABS Auto	\$3.98	14%
ABS Card	\$5.28	-9%
ABS Student	\$6.87	-17%
ABS Misc	\$5.98	-39%
Corp Bond Active	\$1.28	14%
Corp Bond Less	\$0.49	12%

In Figure 4, we break down the market share of trades for 2016 in four block trade size categories, \$1 to \$5 million, \$5 to \$10 million, \$10 to \$25 million, and over \$25 million. We also report the market share change between 2012 and 2016.²⁴

Fig 4: Block Trade Sizes



²⁴ The current dissemination price caps for public reporting of the data are: agency debt securities – \$5M, asset-backed securities – \$10M, TBA– \$25M, investment grade corporate bonds —\$5M, high yield corporate bonds – \$1M. See FINRA Regulatory Notice 12-39 and FINRA Regulatory Notice 14-34.

Real estate securities have the largest percentage of trades over \$25 million, averaging nearly 75% across MBS, TBA, CMBS and CMOs. Growth in the largest trade sizes for these asset classes (not depicted) is up a few percentage points between 2012 and 2016, except for TBA which is down 3%.

ABS markets have an average of 46% of trading volume in the largest category. ABS Auto is the outlier, with just 32%. The share of \$25mn blocks is stable in autos and student loans, rising in credit cards, and falling in the miscellaneous category.

As a comparison, corporate bond activity is more concentrated in smaller and mid-size trades. More than 50% of overall corporate bond trading is in trades of less than \$10 million.

4.2 Transactions costs

In addition to market activity, liquidity can be evaluated by examining transactions costs. The two largest cost components of trading are bid-ask spreads and market impact, both immediately after the trade as well as over the longer run.

4.2.1 Bid-ask spreads

The bid-ask spread, which is generally paid by liquidity demanders, represents a reasonable first order measure of the cost of trading. The secondary market for trading securitized assets is conducted bilaterally or “over-the-counter”, and as such no pre-trade transparency exists. In the absence of quotes, market microstructure researchers typically infer bid-ask spreads from transactions. As in our previous study of corporate bond liquidity, we employ a common approach presented in Thompson and Waller (1988). It was originally applied to the futures markets, and it has been shown to accurately approximate the quoted spreads.²⁵ We report 2016 median bid-ask spreads in **Table 7**.

Table 7: Bid-Ask Spreads

Security	Bid-Ask Spreads	Growth 2012-2016
MBS	\$0.25	-37%
TBA	\$0.04	-20%
CMBS	\$0.16	-49%
Agency CMO	\$0.63	-24%
Non-Agency CMO	\$0.58	-23%
ABS Auto	\$0.04	1%
ABS Card	\$0.04	10%
ABS Student	\$0.15	-40%
ABS Misc	\$0.13	-60%
Corp Bond Active	\$0.34	-14%
Corp Bond Less	\$0.35	-28%

²⁵ See e.g., Mizrach and Neely (2008) who study the U.S. Treasury market. The spread estimate is the average absolute value of all the non-zero price changes.

The tightest spreads appear to be in ABS Auto, ABS Credit Cards and TBA, each close to \$0.04. These are all institutional markets with 32% to 86% of trades above \$25 million. The tight spreads in TBA may reflect the interchangeability of the pools that make up TBA securities. Each pool has similar characteristics and expected return.²⁶ The widest spreads reported are in non-agency CMO at \$0.58.

Bid-ask spreads for securitized assets have narrowed almost across the board, even in markets where trading volume has declined.²⁷ The only increases are in the ABS card and auto markets. The latter increase may reflect the rise in default rates in the subprime segment of this market.²⁸

4.2.2 Market impact

When a trade is executed, it may exhaust available liquidity and move market prices away from their current values. We study in **Table 8** both the immediate and long-run effects of a trade on price in 2016 as another way to assess the state of liquidity in these markets.²⁹

The immediate impact of a trade should reflect the cost of crossing the bid-ask spread.³⁰ Not surprisingly, ABS Autos, ABS Card and TBA, which have the smallest bid-ask spreads, also have the smallest immediate impact associated with trading, each \$0.04 or less.

The longer term impact reflects the resilience of the market and any private information conveyed by trading activity. Long term impacts in the structured products market are on average 21% larger than immediate impacts. TBA has the smallest long term price impact while non-agency CMO is the largest. Corporate bonds have higher impacts than every structured product except for non-agency CMOs.

²⁶ See SEC, The Department of Treasury and OFHEO joint Staff Report at <https://www.sec.gov/news/studies/mortgagebacked.htm>.

²⁷ This is consistent with the BIS (2016) analysis of the growing electronic trading across all fixed income markets.

²⁸ The *Wall Street Journal*, July 12, 2016, cited a report by credit-ratings company DBRS Inc., noting that “[e]ighteen percent of auto-loan principal dollars securitized by subprime lenders in 2015 aren’t likely to be repaid.” If so, “that would mark a sharp rise from 14.4% in 2014 and 12.8% in 2012.” <http://www.wsj.com/articles/subprime-auto-loan-loss-expectations-rise-1468341801>

²⁹ The short-run impact is the average price change in response to a buyer or seller initiated trade. The longer run impact is the change after five trades or the end of the trading day, whichever comes first.

³⁰ The immediate price impact has a 71% correlation with the bid-ask spread in Table 10. The correlation between immediate price impact and long term price impact is 99%.

Table 8: Market Impact

Security	Immediate	Ch. 2012-16	Long Term	Ch. 2012-16
MBS	\$0.04	-\$0.01	\$0.06	-\$0.01
TBA	\$0.02	\$0.00	\$0.02	\$0.00
CMBS	\$0.07	-\$0.03	\$0.08	-\$0.03
Agency CMO	\$0.08	-\$0.02	\$0.10	-\$0.02
Non-Agency CMO	\$0.19	-\$0.04	\$0.22	-\$0.03
ABS Auto	\$0.01	-\$0.01	\$0.02	\$0.00
ABS Card	\$0.01	-\$0.01	\$0.02	\$0.00
ABS Student	\$0.07	-\$0.04	\$0.09	-\$0.05
ABS Misc	\$0.05	-\$0.04	\$0.09	-\$0.12
Corp Bond Active	\$0.19	-\$0.01	\$0.20	-\$0.02
Corp Bond Less	\$0.17	-\$0.07	\$0.20	-\$0.05

4.3 Dealer intermediation

The third aspect of liquidity that we examine is the role of dealers in the secondary market. We examine the size of dealer networks, the share of market activity held by the largest dealers, and the share of dealer-to-dealer trading volume.

4.3.1 The number of counterparties

Another measure of the ability to transact is the number of counterparties with which a dealer typically trades. We report 2016 averages for each market in **Table 9**. The second column is the change in the average between 2012 and 2016. The fourth column reports the market share of trading volume of the top ten dealers in the market.

Table 9: Number of Counterparties

Security	Avg.	Ch. 2012-16	Share of Top 10	Ch. 2012-16
MBS	9.06	-0.26	67%	6%
TBA	16.51	1.32	81%	5%
CMBS	3.89	0.89	72%	-3%
Agency CMO	7.98	-0.33	62%	7%
Non-Agency CMO	5.49	-1.46	67%	-4%
ABS Auto	3.26	-0.42	83%	0%
ABS Card	2.98	-0.03	84%	1%
ABS Student	2.62	-0.76	84%	6%
ABS Misc	3.49	-0.24	74%	-5%
Corp Bond Active	18.73	0.64	69%	4%
Corp Bond Less	24.39	1.91	56%	3%

Among structured products, TBA has the largest interdealer networks, with an average of more than 16 counterparties per market participant. Agency CMO and MBS have eight and nine, respectively. Non-agency CMO is less connected, with an average of 5.49. CMBS trails the rest of the real estate securities with only 3.89 counterparties per dealer. These networks have been fairly stable between 2012 and 2016. There are two exceptions: CMBS is up by nearly one counterparty, while non-agency CMOs are down by 1.5. Networks have not fallen in the same proportion as interdealer trading in **Table 10**. While dealers make far fewer inter-dealer trades, they continue to trade with approximately the same number of counterparties.

The corporate bond market is much more interconnected, with nearly 19 counterparties per dealer in the active bonds and 24 in the less active. Electronic trading has helped to increase these networks.³¹

Not surprisingly, the number of counterparties and the market share of the ten largest dealers have a strong negative correlation of 57%. The more counterparties you have in the market, the easier it is to find a better quote.

The top ten dealers in the less active corporate bonds markets have the smallest market share in Table 11, 56%. From there, market shares ranges from 62% in Agency CMO to 94% in ABS Card and Student.

4.3.2 Interdealer trading

We measure the proportion of buy side and sell side activity in 2016 by breaking trades and volume into inter-dealer and dealer to customer transactions in **Table 10**. TBA has the most interdealer share with a volume share of 39% and trades share of 57%. Non-agency CMO, ABS Auto, and ABS Misc. have volume shares of 10% or less.

Interdealer volume shares are declining in TBA, Agency CMO, ABS Auto and ABS Card, with the largest decline, 10%, in TBA. MBS has had the strongest increase in volume shares, 6%.

Table 10: Interdealer Shares

Security	Volume %	Ch. 2012-16	Trade %	Ch. 2012-16
MBS	24%	6%	33%	0%
TBA	39%	-10%	57%	-11%
CMBS	11%	-9%	19%	-9%
Agency CMO	22%	-4%	26%	-1%
Non-Agency CMO	7%	1%	18%	-2%
ABS Auto	8%	-2%	13%	2%
ABS Card	12%	-3%	17%	0%
ABS Student	15%	2%	18%	-5%
ABS Misc	6%	1%	13%	-1%
Corp Bond Active	25%	7%	42%	3%
Corp Bond Less	29%	11%	44%	5%

³¹ See the 2015 survey by Greenwich Associates, "Corporate Bond Trading Market Structure Update: Overview and Insights."

The effect of a smaller interdealer share on the buy side can be difficult to judge. On one hand, interdealer activity helps to balance inventories, a point emphasized by Schultz (2016). However, fewer intermediate interdealer transactions, Harris (2015) shows, may reduce the cost to the investor.

4.4 Summary

Real estate securities trading volume in 2016, apart from TBA, is up 2% since 2012. Including TBA, it is down 24.5%. Asset-backed securities trading volume has fallen 15.6% since 2012. Across all structured products, average trade sizes and block volumes have been very stable over the last four years.

Compared to four years ago, bid-ask spreads are down 31% on average in real estate securities and down 22% in ABS. Short-run and long-run market impacts have, on average, fallen \$0.02 in real estate securities. For ABS, average short run impacts are down \$0.02 and long run impacts down \$0.04.

The number of counterparties is essentially unchanged since 2012 across the products. The ten largest counterparties have gained 2.35% of market share in real estate securities and 0.50% in ABS.

Market liquidity seems adequate at the moment, but it appears less healthy than other markets. Active corporate bond trading volume is up 22% over the same time period, and the less active bonds are up 66%. Trade sizes in both categories are up over 10% between 2012 and 2016.

We next turn to the study of common market factors that may have boosted liquidity across all fixed income markets.

5. Commonality in Liquidity

Academic research, starting with Pastor and Stambaugh (2003) and Acharya and Pedersen (2005), has shown that liquidity risk effects expected returns. A related question is the common variation in liquidity across securities in these markets. Research has found this “commonality in liquidity” in U.S. equities (Chordia, Roll and Subrahmanyam, 2000), global equity markets (Karolyi, Lee and van Dijk, 2012), and in Real Estate Investment Trusts (Hoesly, Kadilliz and Rekax, 2015).

Commonality helps us to better understand how liquidity changes in one market may spill over into another. In turn, commonality helps identify the extent to which asset specific characteristics drive liquidity for that asset. This type of analysis may provide regulators a framework for assessing whether liquidity concerns in one market are likely indicative of a broader market issue and whether efforts to affect liquidity in a single market are likely to succeed and where spillover effects to other markets are likely.

We explore commonality in liquidity among securitized assets in the liquidity measures discussed in Section 4. This analysis may help uncover whether a common factor such as

increased capital requirements for dealers might be impacting liquidity across the board. It may also help detect unexpected linkages in markets that we typically think of as being distinct. We find several interesting results that warrant further investigation but are outside the scope of this research note.

We start by reporting correlation matrices among the liquidity measures at the quarterly frequency.

Table 11 is the correlation across trading volume at the quarterly frequency during the period 2012 to 2016.

Some of the linkages are quite straightforward. TBA is a forward market for MBS, so we find a strong and positive correlation of 58% among trading volume in the two markets. This carries over to agency CMOs, which are also at 58%, but not with non-agency CMOs, which have only a 4% correlation. CMBS has a surprisingly strong negative correlation, -59%, which we would like to explore in greater detail in future research.

TBA is negatively correlated with ABS Auto and Card, but it has a strong 64% positive correlation with ABS Student.

Table 11: Correlation in Quarterly Trading Volume

Security	CMO					ABS				Corporate Bonds	
	MBS	TBA	CMBS	Agency	Non-Agency	Auto	Card	Student	Misc	Active	Less Active
MBS	1.00	0.58	-0.35	0.44	-0.35	0.25	0.28	0.06	-0.65	0.09	-0.10
TBA	0.58	1.00	-0.59	0.58	0.04	-0.35	-0.32	0.64	-0.03	-0.29	-0.61
CMBS	-0.35	-0.59	1.00	-0.65	-0.02	0.47	0.37	-0.38	0.15	0.50	0.67
Agency CMO	0.44	0.58	-0.65	1.00	0.29	-0.33	-0.20	0.43	0.03	-0.17	-0.45
Non-Agency CMO	-0.35	0.04	-0.02	0.29	1.00	-0.22	-0.26	0.28	0.71	0.05	-0.05
ABS Auto	0.25	-0.35	0.47	-0.33	-0.22	1.00	0.76	-0.31	-0.28	0.58	0.69
ABS Card	0.28	-0.32	0.37	-0.20	-0.26	0.76	1.00	-0.33	-0.24	0.39	0.45
ABS Student	0.06	0.64	-0.38	0.43	0.28	-0.31	-0.33	1.00	0.42	-0.34	-0.42
ABS Misc	-0.65	-0.03	0.15	0.03	0.71	-0.28	-0.24	0.42	1.00	-0.10	-0.10
Corp Active	0.09	-0.29	0.50	-0.17	0.05	0.58	0.39	-0.34	-0.10	1.00	0.86
Corp Less	-0.10	-0.61	0.67	-0.45	-0.05	0.69	0.45	-0.42	-0.10	0.86	1.00

Corporate bonds are also negatively correlated with TBA, -29% for active bonds and -64% for the less active. The structured product most strongly correlated to the corporate bond market is ABS auto with a 58% correlation with the active bonds and 68% with the less active.

Our next liquidity matrix in **Table 12** is for bid-ask spreads. CMBS bid-ask spreads are positively correlated with TBA bid-ask spreads. If volume declines in CMBS are associated with volume increases in TBA, as we found in Table 11, and volume increases generally drive spreads lower, this lack of commonality in spreads also calls for further exploration.

Table 12: Correlation in Bid-Ask Spreads

Security	CMO					ABS				Corporate Bonds	
	MBS	TBA	CMBS	Agency	Non-Agency	Auto	Card	Student	Misc	Active	Less Active
MBS	1.00	0.80	0.38	0.72	0.71	0.36	0.57	0.75	0.65	0.30	0.52
TBA	0.80	1.00	0.25	0.69	0.73	0.15	0.62	0.67	0.58	0.18	0.33
CMBS	0.38	0.25	1.00	0.45	0.46	0.18	-0.18	0.53	0.65	0.61	0.73
Agency CMO	0.72	0.69	0.45	1.00	0.82	0.32	0.40	0.57	0.76	0.32	0.51
Non-Agency CMO	0.71	0.73	0.46	0.82	1.00	0.17	0.41	0.62	0.68	0.16	0.40
ABS Auto	0.36	0.15	0.18	0.32	0.17	1.00	0.55	0.12	0.00	0.10	0.10
ABS Card	0.57	0.62	-0.18	0.40	0.41	0.55	1.00	0.21	0.01	-0.25	-0.18
ABS Student	0.75	0.67	0.53	0.57	0.62	0.12	0.21	1.00	0.75	0.40	0.69
ABS Misc	0.65	0.58	0.65	0.76	0.68	0.00	0.01	0.75	1.00	0.54	0.80
Corp Active	0.30	0.18	0.61	0.32	0.16	0.10	-0.25	0.40	0.54	1.00	0.89
Corp Less	0.52	0.33	0.73	0.51	0.40	0.10	-0.18	0.69	0.80	0.89	1.00

We next turn to market impacts. For this section, we will discuss only the short run price impacts. Results are reported in **Table 13**.

Buyers and sellers will generally cross the bid-ask spread, and a reasonable approximation to market impact is the half-spread (from the implied bid-ask midpoint). We should expect to see a common pattern in correlation between the spreads in Table 12 and price impact in Table 13,

We do find much in common in the two correlation matrices, but there are some exceptions that warrant further study. For example, the correlation between bid-ask spreads in ABS Misc and TBA is 58%, but there is only a 2% correlation in their market impact. Similarly ABS Card which has a -18% correlation in bid-ask spreads with less active corporates but a 25% correlation in market impact.

Table 13: Correlation in Market Impacts

Security	CMO					ABS				Corporate Bonds	
	MBS	TBA	CMBS	Agency	Non-Agency	Auto	Card	Student	Misc	Active	Less Active
MBS	1.00	0.59	0.55	0.26	0.09	0.53	0.38	0.54	0.21	0.01	0.21
TBA	0.59	1.00	0.36	0.36	0.05	0.49	0.57	0.41	0.02	-0.16	0.01
CMBS	0.55	0.36	1.00	0.55	0.43	0.35	0.35	0.53	0.70	0.40	0.74
Agency CMO	0.26	0.36	0.55	1.00	0.43	0.45	0.50	0.46	0.48	0.20	0.51
Non-Agency CMO	0.09	0.05	0.43	0.43	1.00	0.15	0.03	0.35	0.82	0.13	0.59
ABS Auto	0.53	0.49	0.35	0.45	0.15	1.00	0.76	0.29	0.25	0.04	0.33
ABS Card	0.38	0.57	0.35	0.50	0.03	0.76	1.00	0.33	0.26	0.10	0.25
ABS Student	0.54	0.41	0.53	0.46	0.35	0.29	0.33	1.00	0.44	-0.04	0.30
ABS Misc	0.21	0.02	0.70	0.48	0.82	0.25	0.26	0.44	1.00	0.45	0.86
Corp Active	0.01	-0.16	0.40	0.20	0.13	0.04	0.10	-0.04	0.45	1.00	0.77
Corp Less	0.21	0.01	0.74	0.51	0.59	0.33	0.25	0.30	0.86	0.77	1.00

While our statistical analysis³² has identified some interesting patterns, we also conduct a formal analysis for common factors in these liquidity measures as explained in the Appendix.

³² The standard errors around the correlations are $\sqrt{(1 - R^2)/18}$, reflecting the 20 quarters of data and two estimated parameters. Each of these results is highly significant.

6. Conclusion

In this research note, we provide an initial analysis of the market conditions and liquidity in the securitized product market using data FINRA collects through TRACE. We have identified several markets, both in real estate and asset-backed securities, with significant reductions in market activities as measured by issuance, trading volume and the aging of the securities traded. Issuance in non-agency CMOs, for example, has been stagnant for nearly a decade. The typical security trading in the secondary market is more than 10 years old. Volumes for non-agency CMO, agency CMO, and TBA are down 14%, 16% and 27%, respectively. CMBS presents a different picture with trading volumes that have doubled.

Asset-backed securities are mixed. Credit cards and autos have trading volume increases of more than 65% over the last four years. Student loans and misc. are down on average more than 40%.

At the microstructure level, markets appear quite healthy. The largest block trading shares are up in six of 11 segments. Bid-ask spreads have fallen in every segment except automobiles and credit cards. Long-term price impacts are \$0.20 or lower in every market except non-agency CMOs.

Dealer participation in these markets has been a concern because of both new regulations and a declining number of banks. The number of counterparties in the securitization market has remained fairly stable except for private label CMOs.

We will continue to monitor these markets as part of FINRA's ongoing mission of investor protection.

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Appendix: Factor Analysis

Our analysis in Section 5 showed that many of the liquidity measures across instruments are highly correlated. This raises the possibility that a small number of common factors may explain the correlation patterns we saw in Tables 12 to 14. There is a great deal of academic literature on the topic as factor analysis has been used to understand questions ranging from business cycle variation³³ to high frequency asset returns.³⁴

Our approach in this section is to take volume correlation as an illustration. Results for the other pairs of liquidity measures are quite similar.

We construct factors that are weighted averages of all the liquidity measures. These weighted averages are called principal components, and they synthesize a large amount of market information into a relatively small number of variables. I first compute the eigenvalues for the volume data. There are three that are larger than one.

Decomposing the variance, the first four factors account for 85% of the variation as shown in **Table 1A**.

Table 1A: Factor Analysis of Trading Volume

Statistic	1	2	3	4	5	6	7	8	9	10	11
Eigenvalues	4.44	2.57	1.52	0.79	0.65	0.34	0.27	0.21	0.12	0.08	0.02
PC % of Var.	40.36%	63.75%	77.52%	84.72%	90.66%	93.77%	96.20%	98.07%	99.13%	99.82%	100.00%

We hope to find that the same common factors that drive trading volume also drive bid-ask spreads. We then regress the bid-ask spreads for the 11 instruments on the principal components of the volume factors. We report in **Table 2A** this regression.

Table 2A: Bid-Ask Spreads Using Volume Principal Components

Security	Adj. R ²
MBS	47.60%
TBA	31.02%
CMBS	49.42%
Agency CMO	75.31%
Non-Agency CMO	58.30%
ABS Auto	-9.84%
ABS Card	5.85%
ABS Student	61.93%
ABS Misc	79.81%
Corp Bond Active	42.02%
Corp Bond Less	63.61%

The analysis of the principal components reveals several strong common factors across liquidity measures. Nearly 80% of the variation in ABS Misc. is described by the volume principal

³³ See e.g., Stock and Watson (2010).

³⁴ See e.g., Ait-Sahalia and Xiu (2015).

components. Agency CMO is above 75%, and less active corporate bonds, ABS Student and non-agency CMO are all above 50%.

The remaining real estate securities are close to 50%, except for TBA. ABS Card and ABS Student are not well explained by these factors.