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"Bid-Ask Spreads and the Pricing of Securitizations: 144a vs. Registered Securitizations"

by

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"Bid-Ask Spreads and the Pricing of Securitizations: 144a vs. Registered Securitizations"

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Abstract

Traditionally, various types of securitizations have traded in opaque markets. During May 2011 the Financial Industry Regulatory Authority (FINRA) began to *collect* transaction data from broker-dealers (without any public dissemination) as an initial step towards increasing transparency and enhancing its understanding of these markets. Five months later FINRA began to *publish* price indices reflecting valuations for various types of collateral at a daily level, potentially increasing somewhat the transparency (and possibly affecting spreads). Securitization markets are highly fragmented and require transaction matching methods to construct bid-ask spreads. We study the determinants of bid-ask spreads, such as the size of the underlying trade and the path by which trade execution and intermediation occur. We find that retail-sized transactions lead to relatively wide spreads because of the absence of competition, while institutionally-sized transactions often result in much tighter spreads. We perform statistical analysis of how spreads changed at the time of the change in market structure resulting from the public release of index data. One focus in our paper is the contrast between registered instruments that are freely tradable and Rule 144a instruments with much more limited disclosures that can only be purchased by sophisticated investors. We also undertake a graphical analysis that highlights the evolution of spreads over our entire sample. The more limited disclosure in Rule 144a markets generally and the greater restrictions on which investors can purchase these 144a instruments are particularly interesting and suggest ambiguous comparisons theoretically about the quality of registered vs. Rule 144a instruments, as well as the extent of adverse selection and spread magnitudes.

As part of our analysis we also study the structure of the intermediary network and how that influences the nature of bid-ask spreads. We use two alternative methodologies to measure dealer's relative positions in the interdealer network. Some dealers are relatively central in the network and trade with many other dealers, while many others are more peripheral. Some dealers may have a limited number of trading partners, but still are central to their local subnetwork. We propose a way to disentangle dealers' local and global importance and perform empirical analysis using the constructed measures. It is not clear a priori whether the central dealers receive relatively higher or lower spreads than peripheral dealers when trading with customers, but interestingly, the central dealers receive relatively lower spreads. This could reflect greater competition and reduced bargaining power of these dealers or lower trading costs on the transactions which they intermediate. These findings suggest a degree of specialization in the trading of different instruments and the need to look at competition in more subtle ways. Central dealers perform a valuable function by enhancing the linkages in the network and the integration of customer activity.

Keywords: Securitization; transparency; disclosure; sophisticated investors; Rule 144a

Introduction

Relatively little is known about the pricing of securitizations, because these have traded traditionally in opaque markets. The importance of the shadow banking system, in general, and securitization, in particular, has been recognized strongly in the aftermath of the financial crisis. In May 2011 the Financial Industry Regulatory Authority (FINRA) used its regulatory authority to begin to *collect* transaction data on securitizations from broker-dealers, which it regulates.[1] This was an initial step by FINRA to increase potentially the transparency of these markets, a measure also intended to enhance understanding of the markets.

A second step by FINRA occurred five months later (starting October 18, 2011) when it began to *disseminate,* in conjunction with IDC, daily price index data by collateral type. At that point FINRA also released index data back to the beginning of the data collection period that began five month earlier.[2] These informational releases potentially offered market participants more detailed information and transparency about valuations for various collateral types and indirectly, greater transparency about spreads and trading costs. Of course, this represents only a limited step towards full-blown transparency because it entails considerable aggregation across individual instruments in

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[1]FINRA's jurisdiction applies to broker-dealers, so under current FINRA rules all broker-dealers have been required to report trades undertaken by them, starting May 16, 2011. Our analysis is based upon these data (adjusting out identical interdealer trades between a pair of broker-dealers that are reported twice). The market design changed on October 18, 2011 with the public release of price index data by FINRA and IDC. The release of daily index valuation data represented a change in market structure and potentially increased the transparency of both valuations and spreads. We have transaction data through the end of February 2012, so our sample is of roughly comparable length between the pre-release interval (five months) and post-release interval (4.5 months). We examine both the pre-release and post-release settings and examine how spreads changed with the dissemination of the public index data. Our full dataset has been provided to us on a confidential basis to facilitate analysis of securitization markets under opacity by FINRA. We also use the interdealer transactions data to study the structure of the trading network among dealers and the impact of the network structure on spreads.

[2]We believe that the notion of disseminating the price index data had not been announced in advance.

a category and involves daily rather than transaction level disclosure.[3] These steps follow FINRA's efforts to increase the transparency of the corporate bond markets a decade ago, and parallel efforts by the Municipal Securities Rule-making Board (MSRB) to increase transparency in the municipal bond markets, for which it is the Self-Regulatory Organization (SRO). We offer a report of our analysis of these new data concerning pricing of securitizations.

In studying securitizations we focus upon the contrast between registered securitizations, which require detailed disclosures in the issuance process, and Rule 144a instruments, which exempt private resale of restricted securities to QIBs (Qualified Institutional Buyers) from these disclosure requirements. We focus our analysis upon ABS ("Asset-Backed Securities"), CDO/CBO/CLO ("Collateralized Debt (Bond/Loan) Obligations"), CMBS ("Commercial-Mortgage-Backed Securities") and CMO ("Collateralized Mortgage Obligations") instruments due to the mix of trading of Rule 144a instruments and benchmark these against corresponding public (registered) instruments in the ABS, CMBS and CMO cases.[4]

Preliminary to our statistical analysis we discuss the economics of Rule 144a. First, we emphasize that the use of Rule 144a is a choice by the issuer and that the nature of the choice is one in which the required disclosures are more limited than for registered securitizations. The 144a instruments experience a corresponding potential reduction in issuance cost and exemption from liability. These Rule 144a instruments are designed for sophisticated (i.e., relatively informed) investors and the purchase of Rule 144a instruments would reflect self-selection on the part of the buyers, including

[3]The interaction between the aggregation across instruments and the temporal aggregation further weakens the extent of transparency introduced.

[4]Since there are not 144a instruments in the TBA and MBS categories, we have not used these in our benchmark analysis. Similarly, we also have excluded agency CMOs from our analysis, as these do not arise for 144a instruments. We also have limited our treatment of CDOs ("Collateralized Debt Obligations") as these are largely 144a instruments.

recognition of the restrictions on re-trading for the 144a instruments. This suggests relatively less interest ex post in trading the 144a instruments since these are oriented to buy-and-hold investors, which can further heighten the spread from a liquidity perspective. Without registration, the Rule 144a instruments can only be resold to QIBs. Potentially, the 144a instruments are of higher quality as the issuer can sell to QIBs (without accessing the full potential market) those that it desires to sell without incurring the costs of registration, including potential liability. On the other hand, issuers of low quality instruments could find it more appealing to issue 144a instruments due to the limited required disclosure (as in models of signaling).[5]

One focus of our empirical analysis is on descriptive comparison in trading and spreads between the Rule 144a and registered instruments. This does not reflect an analysis of the endogenous choice of Rule 144a or registration. In particular, we note that the effect of adverse selection (information asymmetry) is ambiguous. Rule 144a instruments can have larger spreads than registered offerings due to the more limited initial publicly available information or can have smaller spreads, if either these instruments are of higher quality or if the Rule 144a buyers have greater informational sophistication. Indeed, empirically within some asset classes Rule 144a securitizations have higher spreads than registered securitizations, and within other asset classes Rule 144a securitizations have lower spreads than registered securitizations. These may reflect in part substantial differences in the composition of registered and 144a markets. To limit these distortions and composition effects, we examine only *non-agency* CMO trading (see footnote 4), the impact of the size of transactions (there are very few retailed-sized transactions in the 144a context) upon spreads (small transactions

[5]Whether the 144a instruments are higher quality than registered securitizations seems ambiguous theoretically. This would result from whether buyers or sellers determine the marginal behavior.

have especially large spreads) and then we exclude retail-sized transactions from our regression analyses.

Our preliminary findings suggest a number of interesting results about the nature of trading in securitization markets. Most fundamentally, trading is very fragmented and there is relatively little trading in most individual instruments, especially (but not only) for Rule 144a instruments. In fact, there are a large number of securitization issues, but many of these do not trade at all in our sample. Consequently, we do not use traditional time series techniques for estimating spreads, but instead use matching techniques to locate chains of transactions involving a buy from a customer and sell to a customer.[6] We note that some of the absolute spreads in the ABS, CDO/CBO/CLO, CMBS and CMO markets are surprisingly large, especially for CMOs and retail-sized matches. The average spread for a non-agency CMOs is 3.46% and the average spread for the Rule 144a high yield non-agency CMOs is 1.05%. The average spread for retail-sized matches in registered ABS instruments is 2.12% of the mid-quote for high-yield and 1.42% for investment grade issues. Table 5 reports estimated average bid-ask spreads for registered and Rule 144a securities for each market.

For all instruments except high-yield CMBS the 144a spreads are smaller than the spreads for registered instruments (both for smaller-sized and larger-sized matches), while for CMBS instruments the 144a spreads are larger than the spreads for registered instruments. This suggests that the overall comparison in the spreads between 144a and registered instruments reflects the

[6]We use an iterative algorithm to extract chains of related transactions. Each chain has a buy from customer and a sell to customer that enables us to compute total customer bid-ask spreads. We discuss details of the procedure we use in the Appendix on Data Cleaning. In some of the earlier versions of our draft we used three matching methods (and found that our results were relatively robust): LIFO method for matching as well as LIFO with matches restricted to being within two weeks and also a method which restricts matches to within the same trading day, which dramatically limits the transactions for which spreads can be computed. We do use a traditional time-series approach for understanding the spreads underlying the public index data, but the index does not suffer from extremely limited trading.

underlying composition of securitization instruments among subgroups. In interpreting the result it is important to recognize that there is considerable selection as to the use of 144a vs. registered status.

For ABS, CMBS and non-agency CMO instruments there is a volume discount with respect to the spread—larger volume matches lead to statistically significant lower spreads than for retail matches. The finding can be interpreted as due to greater competition or ability by sophisticated investors to negotiate pricing with more potential counterparties. That larger investors obtain better prices is reminiscent of one of the insights from the pricing of municipal bonds (Green, Hollifield, and Schürhoff (2007), and Harris and Piwowar (2006)) and corporate bonds (Bessembinder, Maxwell, and Venkataraman (2006), Edwards, Harris, and Piwowar (2007), and Goldstein, Hotchkiss, and Sirri (2007)). We find that as the number of dealers trading an instrument increases typically the smaller is the underlying spread, while the greater the need for intermediation of a particular roundtrip transaction the larger the spread, even when controlling for volume.

Additionally, our empirical results indicate that investment grade instruments tend to trade with smaller spreads. We also find evidence for a negative relationship between bid-ask spreads and dealer's ability to access and participate in the interdealer market. We use network analysis to measure dealers' participation and their relative importance on interdealer markets following two alternative methodologies. Under both methodologies we obtain evidence of negative relationship between dealers' importance and spreads in general for most types of securitizations we study.

The results concerning the connection between the structure of the intermediary network and how that influences the nature of bid-ask spreads is especially interesting. Of course, there are some intermediaries who are relatively central in the network and trade with many other dealers, while there are many others who are more tangential. Interestingly, in our sample period the central dealers receive relatively lower spreads. The finding is consistent with the equilibrium in a search-and-bargaining model of a decentralized interdealer market in which dealers differ in their search efficiency proxy for dealer centrality in Neklyudov (2012). Here, the more connected dealers charge lower spreads because their endogenous reservation values reflect their search efficiency and they intermediate trade flows among the less efficient dealers. Our empirical findings suggest a degree of specialization in the trading of different instruments and the need to look at competition in more subtle ways. Central dealers perform a valuable function by enhancing the linkages in the network and the integration of customer activity.

Description of The Sample

Our sample, pre-release of IDC index data, contains all trading activity ranging from May 16, 2011 to October 17, 2011 inclusive, in several classes of securitized products: Asset Backed Securities (ABS,) Collateralized Debt, Bond and Loan Obligations (CDO/CBO/CLO), Commerical Mortgage Backed Securities (CMBS), and non-agency Collaterlized Mortgage Obligations (CMO). Our post-release index sample when the daily price indices are publicly disseminated covers the period from October 18, 2011 to February 29, 2012. The overall sample combines the pre-release and post-release periods and spans from May 16, 2011 to February 29, 2012.

The trading data is a sequence of trading reports, each providing a trade identifier, an execution timestamp and settlement date, the side of the reporting party—either the buy side or sell side, the entered volume of the trade measured in dollars of original par balance, and the entered price measured in dollars per $100 par. The trading report also allows us to determine if the transaction is between a dealer and an outside customer, or if the transaction is between two dealers. We performed several rounds of cleaning before we obtained a workable sample of trades. The Appendix provides additional information on the database and our data-cleaning procedures.

Table 1 reports basic statistics on the number of instruments and how many of each category of instrument traded in our sample before and after the dissemination of the indexes. The top panel reports statistics on the ABS and CDO instruments, and the bottom panel reports statistics on the CMBS and CMO instruments. There are fewer registered ABS and CMBS securities than Rule 144a ABS and CMBS instruments in our sample, and there are more registered CMOs than Rule 144a CMOs in the sample.

For all types of instruments approximately the same number of instruments traded at least once during the five month long pre-release period as traded during the four and half month long post-release period. There are fewer trades both in the pre-release and post-release periods than that trade in either sample, indicating that there are a substantial number of instruments that only trade pre-release or post-release.

Both pre-release and post-release, a larger fraction of the population of the registered ABS has at least one trade in the sample than the Rule 144a ABS. Perhaps the higher frequency of trading in

registered instruments reflects that a larger number of traders can hold and trade registered instruments than can hold and trade Rule 144a instruments, as well as ex ante selection associated with the difficulty of trading the 144a instruments. Perhaps it also reflects that there are fewer disclosure requirements for Rule 144a instruments, so that potential investors have less public information about them and therefore, are reluctant to trade them due to adverse selection risk.

We also report the number of traded instruments by type. We use the collateral type to categorize the type of ABS instruments. There is some variation in the split of registered versus Rule 144a ABS in the sample, but for most types of ABS, registered ABS are more likely to trade than Rule 144a ABS. We split the CDO/CLO/CBO group into CDO instruments, CLO instruments and CBO instruments.

The second panel of Table 1 reports statistics for the CMBS and non-agency CMO instruments. For CMBS Rule 144a instruments are more common in the population than are registered instruments (this applies to both IO/PO and all other types). However, Rule 144a CMO instruments are less common in the population than are registered instruments. One interpretation is that the selection effects are different for CMO instruments compared to other types of instruments such as ABS and CMBS.

Table 1 also reports statistics for different classes of CMO instruments. We use the tranche type to categorize the CMO instruments. IO/PO stands for interest only and principal only tranches. PAC/TAC/NAS are tranches with planned or targeted prepayment schemes, and tranches that are protected from prepayments for a fixed period (NAS). PAC/TAC/NAS tranches tend to have better

controls for prepayment risk. SEQ/PT are sequential and pro-rata, parallel tranches. Sequential tranches make principal payments in sequential fashion, and parallel tranches make principal payments in a parallel fashion. Sequential and pro-rata, parallel tranches are the most common tranche types in the sample. SUP/Z tranches are support tranches and Z-tranches; such tranches have the most uncertainty about the timing and magnitude of payments. Other categories include all other tranches and as well as mezzanine and subordinate and missing type tranches. Other Senior are senior tranches of all other types. This category includes all senior and super-senior tranches.

Tables 2a through 3b report additional summary statistics for all types of ABS, CDO/CBO/CLO, CMBS, and non-agency CMO instruments. In Tables 2a and 3a, we report how many instruments are investment grade or high yield,[7] how many instruments have fixed- or floating-rate coupons; indicator variables for the instruments' vintage—with vintage defined as the number of years between the trade execution date and the instrument's issue date; the instruments' average coupon rates, and the instruments' average factors. For many of the instruments, the principal balance can be reduced through amortization or prepayment; the factor represents the fraction of the original principal outstanding. Table 2b and Table 3b report information on the average number of trades per day, the average number of dealers active in the instruments, the average number of interdealer trades, and the distribution of trade sizes. We categorize trade size into three groups: Retail-size being trades with original par value less than $100,000, Medium-size trades being trades with original par value between $100,000 and $1,000,000, and Institutional-size trades being trades with original par value greater than $1,000,000.

[7] We classified unrated instruments as high yield rather than investment grade throughout the paper.

Registered instruments and Rule 144a instruments tend to have similar bond characteristics for all the various categories.

It is apparent from the trading frequencies reported in Table 2b and Table 3b that the average ABS and CDO do not trade very frequently: on average the ABS instruments have 0.097 trades per day and CDO have 0.026 trades per day. On average, registered ABS instruments have 0.117 trades per day, and ABS Rule 144a instruments have 0.074 trades per day. The distribution of trades across instruments is quite skewed: There are a few instruments with many trades per day, but most of the instruments in our sample do not trade very often. The trading frequency for CMBS instruments is similar to ABS and slightly larger than the frequency for non-agency CMO instruments.

For the ABS and CDO instruments, retail-sized trades constitute the smallest fraction of trading activity in terms of number of trading records, while institutional-sized trades make up the bulk of the trades. Retail-sized trades make up a larger portion of the trade sizes in the registered instruments than in the Rule 144a instruments, while the retail-sized trades are a small fraction of the trade in the Rule 144a instruments.[8] Retail-sized trades constitute a much larger fraction of the trades in CMO instruments than in ABS instruments, and institutional-sized trades constitute a smaller fraction of the trades in CMO instruments than in ABS instruments.

On average, there are 6.03 dealers who traded in a particular ABS security, with even fewer dealers in other types of instruments. Typically there are more active dealers trading the registered instruments than trading the Rule 144a instruments.

[8] Only a tiny fraction of the trade in Rule 144a instruments is retail sized (less than $100,000 of original par volume). We would not expect substantial retail activity in these instruments, so the small matches may reflect in part order splitting by larger investors.

Figure 1 depicts the kernel density function of the distribution of the number of distinct trades by broker-dealers with either customers or with other broker-dealers (assuming that there are a positive number of distinct trades) in the entire sample, truncating the plot at the 95th percentile of the distribution. In the top left panel we plot this for ABS instruments (separate graphs for registered and Rule 144a instruments), in the bottom left panel we plot this for CMBS instruments, in the top right panel for CDO/CBO/CLO instruments, and in the bottom right panel we plot the same for non-agency CMO instruments. These plots and the 95th percentiles illustrate that there are not many trades in individual instruments, with especially limited trading in the Rule l44a instruments. Though we truncate from these plots those instruments with the largest number of trading records to improve the display of this density, we note that these truncated observations are potentially the most important because they correspond to the largest number of trading records and provide the most information for estimating spreads. At the same time, given the dispersed nature of the overall trading and the relatively small number of trades in individual instruments (including interdealer trades), for the most part we are unable to use structured time series methods to estimate spreads (except potentially for the most active instruments or indices). Consequently, we use a matching method to identify chains of related transactions and estimate spreads, using opposite trades with customers.

We include Figures 2a through 2d to illustrate the nature of trading activity in our sample. In the figures, we provide several examples of registered and Rule 144a securities that are highly traded in our sample. Each panel (two panels per page) depicts trading in a security. There are three subpanels within each panel—the upper subpanels show buy and sell transactions by volumes

during our sample period, the middle subpanels show the corresponding interdealer trades by volumes and the bottom subpanels show the corresponding transaction prices (ask, bid and interdealer) during our sample period.

The limited extent of trading highlighted by the figures illustrates some of the conceptual difficulty in estimating spreads and the importance of using matching methods, especially for less actively traded instruments. The figures illustrate the potential importance of interdealer transactions in reallocating inventory and exposure and matching buy and sell transactions to a degree at the aggregate or market level. For our formal analysis we use matching techniques to identify chains of related transactions. In some cases we may be able to match activity at a daily level (see right panel of Figure 2b, where the matching is especially striking in terms of volumes), but in other situations there will be insufficient matches at that level (and to utilize the data effectively and not excessively bias our results we need to formulate matches more broadly).[9] The bottom subpanels of the plots illustrate the positive nature of the bid-ask spread and that in some situations with relatively active instruments that the bid-ask spreads can nevertheless be quite substantial. We document and describe the nature of the spreads more explicitly and in more detail later in the draft. We also note that the interdealer trades do not always lie between the customer buy and sell trades.

In many situations dealers are potentially buying or selling from existing inventory, but the nature of our data does not provide direct information identifying the initial inventory. Of course, in some cases the matching may be relatively apparent—but in most situations we'll only have a limited set of matches at a daily level and therefore, will need to consider broader matching criteria. Indeed, in at least some situations (e.g., see Figure 2b, right panel) there are considerable imbalances in trading

[9] We discuss in detail the matching method we use in the Appendix called "Data Cleaning."

with customers (as reflected in the figure we see indications of clustered selling) and dealer reliance on trading from pre-existing inventory.

Table 4 reports the cumulative inventory changes for various categories of registered and Rule 144a instruments. For each category, we report the mean change in dealer inventories averaged over instruments, the mean change conditional on that change being positive, and the mean change conditional on that change being negative. We also report the number of instruments with positive inventory changes, the number with negative inventory changes, and the number with zero inventory changes. If the dealer purchases from outside customers were equal to the dealer sales to customers, then we would expect that a large fraction of the instruments had cumulative inventory changes close to zero. This is the case for many, but not all of the instruments. For example, the ABS registered SBA (Small Business Administration) category has 117 out of the 227 instruments with zero cumulative inventory trade, but that average negative inventory change is $58.9 million. The magnitude of the cumulative inventory changes implies that while many of the dealers do tend to have balanced trade with customers, there are some large imbalances.

In our analysis we use Moody's ratings for securities that have at least two opposite trades with customers. Moody's ratings were collected for all securities that satisfy our minimal-trading requirement: There are at least two opposite transactions with customers at most 2 weeks apart in our sample period from May 16, 2011 to February 29, 2012. Among ABS, CMBS, Rule 144a CDOs and non-agency CMOs there were 20,392 such securities. 15,216 of these securities have been rated by Moody's, for other securities the Moody's ratings were not available (539 securities were rated

"NR", others had missing Moody's rating). We used the proprietary list of CUSIPs provided by FINRA to locate Moody's ratings for these securities on the corporate website.

Figure 3 summarizes the distribution of the first rating observed within our sample period per security. We observe differences in rating levels for securities traded in our sample, with relatively frequent high-grade ratings in ABS and CMBS security types.

There were 3 registered ABS securities upgraded from high yield to investment grade during our sample period and 1 registered ABS security downgraded. Similar numbers for other instrument types are: 11 and 3 for Rule 144a ABS, 105 and 2 for Rule 144a CDOs, 1 and 46 for registered CMBS, 6 and 94 for Rule 144a CMBS, 16 and 102 for registered non-agency CMO, 7 and 24 for Rule 144a non-agency CMOs. These facts highlight that ratings upgrades and downgrades crossing the investment grade boundary are relatively infrequent during our sample period. Overall there were more downgrades than upgrades (149 upgrades and 272 downgrades crossing the investment grade boundary); however some security types were mostly upgraded during our sample, such as CDOs.

Figure 4 demonstrates the trading activity around the security upgrade/downgrade dates. In this figure we consider all rating changes that do not necessarily cross the investment grade boundary, such as from A3 to A1 or from Ba1 to B3 that occur within the investment grade or high yield region. For each such security we only consider transactions that were executed 45 days before a rating change and/or 31 days after. We observe 407 upgraded securities that have at least one trade within that period and 562 downgraded securities. Our main observation is that rating downgrades

are associated with increased trading activity with customers within 10 days after the rating change, however subsequently trading volumes tend to drop (right panel of Figure 4). We do not observe such effects for securities around the rating upgrade dates (left panel of Figure 4).

We use a multi-stage matching technique to disentangle trading activity in each instrument and organize related trades into chains of transactions. Each chain captures the movement of a particular block of volume from a customer to the interdealer network, within the interdealer network, and from the dealer network back to the customer sector. To perform sorting of this nature, we first match related interdealer and customer transactions that have the same volume moving from one party to another in a particular instrument. Second, we look for chains of transactions that may have different volume traded and thus involve volume splits as security moves from one party to another.[10] Each chain has one buy from customer and one sell to customer, as well as several rounds of intermediation between dealers (however large part of the resulting sample has just one round of dealer intermediation). We are able to disentangle 75% of the total absolute turnover in ABS market, 86% in the CDO/CBO/CLO market, 74% in CMBS market, and 80% in non-agency CMO market into complete chains that we use to compute total customer bid-ask spreads.[11] The rest of the turnover in these markets corresponds to: 1) imbalanced trades with no opposite customer transactions within a one-month horizon; 2) broken chains that do not link buy from a customer with a sell to customer based on the dealer mask (masks do not match).

Bid-Ask Spreads

For each chain of transactions having two opposite trades with customers, we compute two types of bid-ask spread measures: the total client bid-ask spread and the dealer-specific spread—both

[10] We provide additional details on the matching algorithm we use in the Data Cleaning Appendix.

[11] We use information on dealer masks to relate different trade reports with each other and construct chains of transactions.

measured per $100 of current value of the bond. Our matching algorithm allows us to disentangle trading activity in various instruments into chains of related transactions. Each chain can either be one-roundtrip in the form client-to-dealer and dealer-to-client, or it can involve several rounds of intermediation. For each such chain we compute the total client bid-ask spread by treating all intermediating dealers as a single aggregate dealer. At the same time for each link in a chain we compute a dealer-specific spread. The total client bid-ask spread for a chain is a weighted sum of dealer-specific spreads corresponding to that chain. Since the quotes observed in our dataset are clean prices per unit of current balance, we adjust the resulting spreads for accrued interest and factor prepayments. We present detailed discussion of these adjustments in the Appendix.

For each resulting spread observation we have information on how many rounds of intermediation happened in between the two customer transactions; on the average dealers' participation on the interdealer market throughout the sample; on the time gap between the two opposite trades with customers; and on original volumes traded and whether any splitting happened from one party to the other. Few of the resulting spread observations are extreme due to price data entry errors. We remove such observations from the final sample by winsorizing the 1% upper and lower tails of spread distributions within each of the four types of instruments (ABS, CDO, CMBS, and non-agency CMO), two placement types (registered and Rule 144a, except for CDO category) and credit rating quality (investment grade and high yield). This way we modify a total 2% of extreme observations, controlling for major categories and subtypes.

Table 5 reports mean client bid-ask spreads computed as a percentage of the average bid and ask prices for the ABS, CDO, CMBS and non-agency CMO categories, for registered and Rule 144a

instruments. Dealers may possess potential bargaining advantages with respect to retail-sized trading, thus retail-sized trades may face especially large spreads. For this reason we distinguish spreads among trades of different sizes and adjust for differences in the trade-size composition within different types of instruments. Trades with less than $100,000 of original par generally come from retail traders, so we define a retail-size spread to be the bid-ask spread resulting from two opposite trades both having volume less than $100,000. We refer to all other spread observations as non-retail since they result from paired trades of larger volumes.

Each column of the table reports statistics on the spreads for the four different types of instruments: ABS, CDO, CMBS, and non-agency CMO in the investment grade and high yield categories. The table reports the differences in the average spreads for retail-sized and non-retail-sized trades for the different categories, along with standard errors and the F-test for equality of the average spreads between retail and non-retail sized trades with p-values for the null-hypothesis that these averages are the same. The top panel of the table reports overall spreads across categories; the second panel reports the spreads for registered instruments; the third panel reports the spreads for the Rule 144a instruments; and the final panel reports F-tests for differences in spreads between registered and Rule 144a instruments.

Perhaps the most striking result reported in Table 5 is the difference in spreads between retail-size and other-size trades. For all categories, retail-size spreads are significantly larger than other-size transactions. In general we confirm the finding from other fixed-income markets that retail-size trades tend to have significantly higher spreads than institutional-size transactions.

We also compare spreads across instrument types. Overall spreads are largest for non-agency CMO instruments and overall spreads are smallest for CMBS instruments. Average spreads are higher for registered ABS than for Rule 144a ABS and average spreads are higher for registered non-agency CMO instruments than for Rule 144a non-agency CMO instruments. Average spreads are lower for registered CMBS instruments than for Rule 144a CMBS instruments. Perhaps the differences between the relative spreads for registered and Rule 144a instruments across instrument types reflect selection effects, or that the customers in Rule 144a instruments are more sophisticated than the customers are in Registered securities.

Table 6a reports the average bid-ask spread sorted by the size of the dealers' buys from customers and sells to customers for registered and Rule 144a ABS and CDO/CBO/CLO instruments, sorted by the credit rating of the underlying instruments. Table 6b reports the average bid-ask spread sorted by the size of the dealers' buys from customers and sells to customers for registered and Rule 144a CMBS and non-agency CMO instruments, sorted by the credit rating of the underlying instruments.

Each cell of the table reports the average spread, the standard error of that estimate, and the number of spread observations computed for different types of transactions, with each panel corresponding to a different instrument type: ABS or CMO instrument, registered or Rule 144a instrument, and investment grade or high yield instrument. Each row of Tables 6a and 6b reports the average spread for all pairs of transactions with dealers' buy from customer having different sizes: Retail—less than $100,000 in par value, Medium—between $100,000 and $1,000,000 in par value, and Large—greater than $1,000,000 in par value. Each column reports the average spread for all pairs of

transactions with different sizes of dealers' sales to customers. For example, the top left cell in each panel reports the average spread computed for a retail-sized dealer buy transaction matched to a retail-sized dealer sell transaction.

Across all categories on instruments, retail sized trades tend to have the largest average spreads, a finding consistent with spreads computed in most fixed income markets.

The number of observations of Retail Buys and Retail Sells show that most of the trade in 144a instruments is Large Buys and Large Sells. There are not many retail trades in Rule 144a instruments relative to the amount of retail trades in registered instruments. Comparing the average spreads between Investment Grade instruments and High Yield instruments, the average spreads are lower for Investment Grade instruments than for High Yield instruments.

The results in Tables 6a and 6b indicate that spreads are similar across the two sides of the market. Buying from retail investors tends to have similar average spreads relative to selling to retail investors.

Table 7a reports characteristics of spreads for non-retail sized trades in our sample by category of instruments computed over the entire sample,. We report the average, the standard deviation, the median, the 10^{th}, the 25^{th}, the 75^{th} and the 90^{th} percentiles of the spread distributions. The first panel of the Table is for ABS instruments, the second panel is for CDO instruments, the third panel is for CMBS, and the fourth panel is for non-agency CMO instruments. Across all categories and both for pre-release and post-release subsamples, the mean spread is higher than the median spread,

indicating that the spread distributions are skewed to the right—there are some large spreads in all categories. For all categories of instruments, the standard deviation of the spread distributions is larger than the mean, indicating a lot of dispersion in spreads. This is also evidence about spreads in the reported percentiles. The 10^{th} percentile of the spread distribution is zero or negative for all types of instruments, indicating that dealers sometimes can make losses on their transactions. There are broadly similar findings pre-release and post-release.

Median spreads are largest for non-agency CMO instruments, and smallest for ABS instruments both pre-release and post-release. We compare median spreads between publicly registered instruments and Rule 144a instruments. In the pre-release sample publicly registered ABS and non-agency CMOs instruments have higher median spreads than Rule 144a ABS and non-agency CMOs with the difference between registered and Rule 144a instruments much larger for non-agency CMO instruments. In the post-release sample, only non-agency publicly registered CMO instruments have higher median spreads than Rule 144a median spreads. Across all types of instruments, high yield instruments have higher median spreads than investment grade instruments.

Table 7b reports the mean, median and standard deviations of the spreads in the pre-release and post-release samples, as well test statistics for the null hypothesis that average and median spreads are the same in the pre-release and post-release samples. We reject the null hypothesis in all cases, finding that across most categories instruments that the median and average spreads increased in the post-sample period relative to the pre-sample period.

In order to visualize the realized spreads, Figure 5 provides time-series plot of the realized spreads in our sample. The instruments are sorted by instrument type, and by rating (investment grade and high yield). The blue triangles correspond to spreads in Rule 144a instruments and the orange circles correspond to spreads in registered instruments. The plots are consistent with the quantiles reported Table 7a: Registered instruments tend to have more dispersion in realized spreads than the Rule 144a instruments in all categories. The plots also show the positive skewness in the realized spreads and that for all categories of instruments, dealers do sometimes make losses.

Only sophisticated investors can hold Rule 144a instruments, while both sophisticated and unsophisticated investors can hold registered instruments. Rule 144a instruments have a smaller pool of potential owners and so the market may be more limited. Our finding that many types of Rule 144a instruments have smaller spreads than registered instruments may reflect that sophisticated investors face lower transactions costs than unsophisticated investors. Registered non-agency CMO instruments have significantly higher average and median spreads that Rule 144a non-agency CMO instruments. Perhaps the lower spread for Rule 144a instruments relative to registered instruments in these categories reflects that more sophisticated investors are trading the Rule 144a non-agency CMOs than the registered non-agency CMOs and more sophisticated investors have higher bargaining power with the dealers than unsophisticated investors.

In order to study the importance of the underlying collateral to the spreads, Table 8a reports non-retail spreads for different types of ABS collateral, and for CDOs. We report the average spreads for overall trade, for registered and Rule 144a instruments, and by rating (investment grade and high yield). Overall and across all collateral types, registered ABS instruments have higher average

spreads than Rule 144a instruments. For the investment grade ABS instruments, registered ABS instruments of all collateral types have higher average spreads than Rule 144a instruments. For High Yield instruments, overall registered ABS have a higher average spreads than overall Rule 144a ABS, but the ordering is mixed across collateral types: SBA and Student loan backed registered instruments have higher spreads than the Rule 144a instruments, while all other collateral types having the opposite ranking.

The bottom panel of Tables 8a reports F-statistics for the null hypothesis that investment grade and high yield instruments have similar spreads across different collateral types. For the majority of collateral types, the difference between average spreads is statistically significant, with high yield instruments having higher average spreads than investment grade instruments in all categories except Other ABS category.

Table 8b reports non-retail spreads for CMBS and non-agency CMO categories for different types of underlying tranches. The table has a similar structure to Table 8a, with both CMBS instruments and the non-agency instruments sorted by tranche type. Overall, Rule 144a CMBS have higher average spreads than registered CMBS. Registered non-agency CMO instruments have higher average spreads than Rule 144a non-agency CMO instruments. For all tranche categories of non-agency CMO instruments except support and Z tranches (SUP/Z), registered CMO instruments have higher average spreads than Rule 144a instruments, although there are few Rule 144a SUP/Z instruments. In all categories, high yield instruments have higher average spreads than Investment Grade instruments.

Goldstein, Hotchkiss and Sirri (2007) provide estimates of spreads on BBB-rated corporate bonds after the introduction of the TRACE system in 2002. They compute a round-trip spread measure similar in spirit to our measures. Table 6 in their paper reports average spreads for different trade sizes. We can compare our estimated average spreads pre-release and post-release to the spreads reported by Goldstein, Hotchkiss and Sirri (2007). They report the mean spread in Panel A in Table 6 for different transactions sizes computed using a LIFO method[12] with transactions size measured in the number of $100 face value bonds. The mean spread reported in their Table 6 ranges from $2.37 per $100 of face value for transactions of less than or equal to 10 bonds, to $1.96 per $100 of face for transactions between 21 and 50 bonds, to $0.56 per $100 of face for institutional-size transactions over 1,000 bonds. From Table 5, in our study, our estimates of the retail and non-retail sized spreads both pre-release and post-release are approximately the same order of magnitude as those in the post-transparency corporate bond sample for all categories, except for non-agency CMOs. In our sample, non-agency CMO instruments have larger spreads than in the post transparency sample.

We also compare the non-retail spreads reported in Tables 7a through 8d with the spreads for corporate bonds reported by Goldstein, Hotchkiss, and Sirri (2007) in their Table 6. For ABS instruments, the spreads for registered instruments reported in our Table 8 tend to be smaller than the spreads in the corporate bond market for institutional-sized trades, with an exception being ABS backed by Manufacturing. The spreads for Rule 144a instruments in Table 8 tend to be larger than institutional sized trades reported for the corporate bond market; instead the spreads for Rule 144a

[12] Goldstein, Hotchkiss and Sirri (2007) compute spreads matching the trade by dealer while we compute the spread aggregating over all dealers. Our spread measures are computed as a percentage of average trade prices, while their approach is dollars per unit of par. Both calculations should produce similar sized spreads as a first approximation, since the corporate bonds should have been trading close to the order of their par values.

instruments are similar to spreads for trade sizes of 51-100 bonds in the corporate bond market. We find similar results both pre-release and post-release.

We use a regression methodology to study the relationship between characteristics of the instruments, and the structure of the market trading relationship and the bid-ask spreads. In order to study the dealership structure, we employ network analysis to study properties of interdealer trading relationships. Our sample of interdealer trades allows us to determine links between different dealers and estimate relative participation measures for different market players. We employ two alternative methodologies to perform network analysis and construct variables that capture overall as well as relative importance of a particular dealer to the interdealer market across different types of instruments. We study how customer bid-ask spreads are related to these dealers' importance measures.

Dealer Networks

The interdealer markets we observe exhibit interdependence across different products we study in the two samples. For example, in the pre-release sample of trade records from May 16, 2011 to October 17, 2011 we observe 580 active dealers, of which 573 dealers participated at least once in interdealer trading--315 in ABS, 186 in CDO/CBO/CLO, 228 in CMBS, and 469 in CMO--implying that many dealers participate in several markets. On average each dealer participated in 40 interdealer trades in ABS market, 12 interdealer trades in CDO/CBO/CLO, 43 interdealer trades in CMBS, and 101 interdealer trades in non-agency CMO, either as a seller or a buyer. Over the sample, an average dealer transacted $112 million of original balance on interdealer market in ABS, $43 million in CDO/CBO/CLO, $361 million in CMBS, and $277 million in CMO. Similar

interdealer activity is observed in the post-release sample. In the post-release sample from October 18, 2011 to February 29, 2012 we observe 542 active dealers, of whom 532 dealers participated at least once in interdealer trading (275 in ABS, 164 in CDO/CBO/CLO, 247 in CMBS, and 449 in CMO. There were 441 dealers active in both samples, which suggests that some dealers trade only in one of the two sample periods. On average each dealer participated in 39 interdealer trades in ABS market, 11 interdealer trades in CDO/CBO/CLO, 45 interdealer trades in CMBS, and 85 interdealer trades in non-agency CMO, either as a seller or a buyer. Over the sample, an average dealer transacted $185 million of original balance on interdealer market in ABS, $126 million in CDO/CBO/CLO, $283 million in CMBS, and $259 million in CMO. Figure 6 shows the break-up of total volume transacted on interdealer market by the four major product types and the two samples.

Dealers are heterogeneous both in terms of their trading with customers and interdealer market participation. Figure 7 demonstrates heterogeneity of dealers in terms of total volume traded with customers. Small number of top dealers account for a significantly large fraction of customer volume across all markets we study. An interesting observation is that Rule 144a markets exhibit smaller degree of dealer heterogeneity than markets for registered securities. There is a noticeable dispersion and skewness in interdealer market participation by different dealers. A median dealer participated in 9.5 interdealer transactions in the pre-release sample (10 transactions in the post-release sample) and transacted in total $3 million ($5 million, respectively), while the 75th percentile of interdealer trade participation by a dealer is 69 transactions in the pre-release sample (57 transactions in the post-release) and $71 million of original balance traded ($102 million, respectively). There is also evidence that some links between different pairs of dealers are stronger

than others, and some dealers have higher levels of importance to the functioning of the interdealer market and act as the key providers of interdealer liquidity.

Figure 8 summarizes the topology of the grand interdealer market for all products—its strongest links. In this figure we include links between two dealers when more than 50 trade reports were observed in the overall sample and more than $10 million of current balance in total was transacted during the sample period. Links with more than $100 million transacted are shown as solid lines.

The four broad markets we analyze are significantly interconnected. Individual dealers often participate in different markets at the same time. Some interdealer markets are generally more active than others in terms of number of interdealer trade records with the non-agency CMO market particularly active. For these reasons we measure dealers' activity in different instruments separately, then following Li and Schürhoff (2012) and Milbourn (2003), we perform normalizations of the resulting measures to preserve information on dealers' ranks in the network. For the purpose of our empirical analysis we follow two alternative methodologies. Under the first methodology we construct a single aggregate proxy for dealer-specific importance on interdealer market by performing principal component analysis and use that proxy in the fixed-effects regression. Under the second methodology for each dealer and each submarket we measure coreness and degree centrality, and use the relationship between the two variables to describe dealers' relative position in the network and resulting bargaining power. We describe both methodologies in greater detail below.

We measure the relationship between dealers by their interdealer trade. Under our first empirical methodology we compute the following centrality measures for each dealer:

- **Degree centrality** is defined as the number of closest neighboring dealers around a particular dealer in the network;
- **Eigenvector centrality** is computed using eigenvalues of the adjacency matrix (matrix describing links between dealers in the network), for each particular dealer it emphasizes connections with relatively more important dealers of the network;
- **Betweenness centrality** is equal to the total number of shortest trading paths from every single dealer to any potential counterparty that passes through this particular dealer.[13]
- **Closeness measure** is defined as the inverse of the total distance from each particular dealer to any other dealer in the network based on observed trading relationships.

Estimated centrality measures for dealers differ in their nature: Degree centrality is a local property taking into account only the closest subnetwork of dealer's neighbors, while eigenvector centrality or betweenness centrality account for its global structure, and across different markets (e.g. some dealers are relatively more active in registered ABS than Rule 144a non-agency CMO). Li and Schürhoff (2012) explored all of these alternative centrality measures in the context of municipal bond trading and demonstrated existence of a significant common component in these measures. We obtain similar results in our sample.[14]

We divide all interdealer trades between May 16, 2011 and February 29, 2012 for the overall sample into seven buckets based on the four types of instruments (ABS, CDO/CBO/CLO, CMBS,

[13] The betweenness centrality measure is a widely used tool in the literature on social networks. Reference on betweenness: Freeman, Linton, "A Set of Measures of Centrality Based upon Betweenness", 1977, Sociometry 40, 35–41.

[14] However it is worth noting that our sample length is much shorter and we are more exposed to the finite-sample noise in our centrality estimates.

and non-agency CMO) and two placement types—Registered and Rule 144a. Within each bucket we compute the total volume transacted by all pairs of dealers, differentiated from each other by their dealer masks.[15] We estimate[16] the following four centrality measures: 1) degree centrality (unweighted and weighted by volume transacted), 2) eigenvector centrality (unweighted and weighted by volume transacted), 3) betweenness centrality measure, and 4) the closeness measure.

All of the measures are estimated for each dealer, and the first two of these measures allow us to differently weight the links between dealers based on total volume traded over the particular sample period. We differentiate between buys from and sells to a particular dealer in the interdealer network and use directed networks in our estimation. We apply the empirical cdf transformation to each of the six centrality measures obtained, and then extract the first principal component separately from weighted and unweighted versions of these measures. For each of the eight buckets and each of the two samples we have two versions of the dealers' importance – unweighted and weighted by total volume transacted within each market and sample. We perform principal component analysis separately for these two versions to aggregate across different markets, separately for the pre-release and post-release samples. In our empirical analysis we use the measure weighted by total volume transacted, with the correlation between the weighted and unweighted versions at 0.98. We linearly normalize the resulting variable to a zero-to-one scale. Dealers that did not participate in interdealer trades are assigned zero centrality value.

[15] Dealer masks may not identify separate dealers perfectly in case when a single dealer has several trading desks having different dealer masks for reporting purposes.
[16] We use the STATA routine developed by Hirotaka Miura at the Economic Research Department, Federal Reserve Bank of San Francisco.

In our analysis of total client bid-ask spreads we use the average dealer centrality variable, which is the average aggregate centrality measure of all dealers that intermediated in a particular round-trip chain of matched transactions (each chain has a buy from customer and a sell to customer).

Overall we find evidence for negative relationship between dealers' interdealer activity measured by aggregate centrality and total client bid-ask spreads. Figures 11a and 11b present scatter plots of spreads against dealers' centrality for non-retail size matches in registered and Rule 144a instruments. Dealers who participate more actively in the interdealer market have lower inventory risk and may require lower compensation for their services. But these dealers may be generally more visible to other market participants and have a certain degree of market power – in this case we expect these dealers to charge higher compensation through customers' bid-ask spreads. We use average dealers' centrality in our regression analysis to check the validity of these conjectures when we control for other factors and characteristics as well.

Under the second methodology for each dealer we compute the following two measures:

- **Coreness measure** is defined using the k-core subnetwork. The k-core subnetwork is the one involving a subset of dealers and their trading relationships such that every dealer in this subnetwork has at least k immediate trading partners. There are many subnetworks a particular dealer participates in characterized by different values of k. The dealer's coreness is defined as the largest value of k such that a k-core subnetwork having a particular dealer exists.
- **Coreness-Degree Residual** is defined as the difference between dealer's degree centrality (described earlier in this section) and dealer's coreness measure. The C-D Residual intends

to measure relative importance of a dealer in the subnetwork of his most active trading partners, and can be used as a proxy for dealer's local bargaining power. Note that by definition C-D Residual is always non-negative, because any dealer's degree cannot be smaller than that dealer's coreness.

Graphical illustrations of four different scenarios for dealer's coreness and C-D residual are presented in Figure 9. The figure shows subnetworks constructed using the ABS registered market within the overall network presented in Figure 8, with a relaxed restriction on what constitutes a strong link – we do not require the volume transacted between two parties to be above $10 million in total for the purpose of analyzing more links. The dealer with 23 immediate trading partners has the largest degree centrality in the network. The second order neighborhood of that dealer is shown in the top left panel of Figure 9. That dealer's coreness is 4, meaning that the largest subnetwork that this dealer participates in has at least 4 immediate trading partners.

It is worth noting that in ABS registered sample of strong interdealer links the maximum coreness is 4 and there are a few dealers with coreness of 4. We can think of all these dealers corresponding to the 4-core subnetwork as the set of most important and frequent counterparties for the dealer with 23 immediate partners. This dealer has links to other subnetworks as well and performs the role of a "bridge" across different parts of the interdealer market. There is also another dealer with degree 4, which is the same as its coreness – the weakest node in the 4-core subnetwork. The C-D residual captures this relative difference in dealer's local positions.

A single centrality measure cannot capture these relative differences in dealers' positions. Two dealers may have similar numbers of trading partners, however differences in their coreness may result in different bargaining power between the dealers. A dealer with coreness similar to the degree centrality will be the least connected dealer in the main k-core he belongs to. On the other hand a dealer with coreness much smaller than degree will have the strongest outside options in the k-core he belongs to. We perform empirical analysis based on these two measures of dealers' standing in the network and for some of our markets we find their effects having different directions on bid-ask spreads. Figures 12a and 12b maps the average dealer bid-ask spreads against dealers' coreness and degree centrality.

Regression Analysis

Table 9 provides descriptions of the right-hand-side variables used in the regression analysis under the two network analysis methodologies we use. The left-hand-side variable in the regressions is observations of the matched bid-ask spread, with one observation per matched trade in the sample.

Let the columns of matrix X be all the independent variables in the regressions We include fixed effects for each of the six different collateral types of ABS issues, for CDO, CBO, and CLO issues, CMBS IO/PO and CMBS P/I, and six different types of CMO tranches separately (17 categories in total). Denote each category by $k \in \{1, \dots, 17\}$. We estimate:

$$E\left[y_{(k,j)it} | X_{it}, t\right] = \alpha_{(k,j)} + (X_{it})^T \beta_{(k,j)}.$$

Here, we allow the regression constant and the marginal effects measured by β to differ across categories k and placement types (registered versus Rule 144a, except for CDO/CBO/CLO). Denote placement type by $j \in \{0,1\}$, with $j = 0$ for registered instruments and $j = 1$ for Rule 144a instruments.

We estimate the equation:

$$y_{it} = \sum_{j=0}^{1}\sum_{k=1}^{6}\mathbf{1}_{\{i\in k,R144a=j\}} \times (X_{it})^T\beta_{ABS}^{j} + \sum_{k=7}^{9}\mathbf{1}_{\{i\in k\}} \times (X_{it})^T\beta_{CDO/CBO/CLO} + \sum_{j=0}^{1}\sum_{k=10}^{11}\mathbf{1}_{\{i\in k,R144a=j\}} \times (X_{it})^T\beta_{CMBS}^{j} + \sum_{j=0}^{1}\sum_{k=12}^{17}\mathbf{1}_{\{i\in k,R144a=j\}} \times (X_{it})^T\beta_{CMO}^{j} + \sum_{j=0}^{1}\sum_{k=1}^{15}\mathbf{1}_{\{i\in k,R144a=j\}}\alpha_k + \varepsilon_{it}$$

We perform Wald tests of linear restrictions on the slope coefficients: We test separately element-by-element equality of marginal effects vectors $\beta_k^{Reg.}$ and $\beta_k^{Rule144a}$ for ABS, CMBS, and non-agency CMO instruments.

We also perform analysis of overall categories without differentiating between registered and Rule 144a security types. We pool together registered and Rule 144a instruments and obtain overall marginal effects of the aforementioned factors. The estimation equation is:

$$y_{it} = \sum_{k=1}^{6}\mathbf{1}_{\{i\in k\}} \times (X_{it})^T\beta_{ABS} + \sum_{k=7}^{9}\mathbf{1}_{\{i\in k\}} \times (X_{it})^T\beta_{CDO/CBO/CLO} + \sum_{k=10}^{11}\mathbf{1}_{\{i\in k\}} \times (X_{it})^T\beta_{CMBS} + \sum_{k=12}^{17}\mathbf{1}_{\{i\in k\}} \times (X_{it})^T\beta_{CMO} + \sum_{j=0}^{1}\sum_{k=1}^{17}\mathbf{1}_{\{i\in k,R144a=j\}}\alpha_k + \varepsilon_{it}$$

We keep separate fixed effects for Rule 144a and registered securities among the types of instruments, except CDO/CBO/CLO. We perform Wald tests on the overall categories specification for the overall sample.

Tables 10a and 10b report the results from regressions of the total client spreads on characteristics of the instruments. The total client spreads are computed using the complete customer-to-customer chains of matched transactions. Tables 10a reports results for ABS and CDO instruments, and Tables 10b report results for CMBS and non-agency CMO instruments for the overall sample. In each group of columns, we report the point estimates of the coefficients with standard errors in parentheses below. All regressions include fixed effects that are reported in the lower part of the tables. We report the estimates for the overall category, estimates for registered instruments within the category, estimates for the Rule 144a instruments within the category, F-tests for the null hypothesis that the slope coefficients are equal between registered and Rule 144a categories, and the estimates of fixed effects for each subcategory.

The point estimates on the two vintage dummies (4-6 Year Vintage dummy and >6 Year Vintage dummy) are positive for all types of instruments except CDOs. The estimates imply that older maturity instruments tend to have higher spreads, reflecting their lack of trade, and also the possibility that there is more asymmetric information about these securities. Across all categories of instruments, the point estimate on the Investment Grade dummy is negative and economically significant: High yield instruments tend to have higher spreads than investment grade securities. The point estimate of the coefficient on Security-Specific Match Volume is negative for most categories of instruments. A negative coefficient on Security Specific Volume indicates that

instruments with larger trades tend to have small spreads, consistent with more active instruments having lower transactions costs. This is indeed the case for all security types except for Rule 144a CMBS. Deviation of Particular Match is a measure of the size of the matched transaction relative to the average transaction size in that security. The point estimates are negative across all types of instruments except for the CDO/CBO/CLO category. A negative coefficient on Deviation of Particular Match indicates that when the matched trade is larger than typical for that instrument, the match will have a lower spread.

In typical equity markets, larger trades tend to have larger spreads, with the typical explanation that larger trades carry information so that dealers face higher adverse selection costs on larger trades. In many bond markets, smaller trades have larger spreads; with the typical explanation being that smaller trades tend to proxy for less sophisticated customers so that dealers have greater bargaining power in smaller trades and so are able to earn higher spreads on smaller trades. The securitized markets we analyze tend to resemble bond markets with respect to volume effects, with stronger effects for registered instruments and weaker effects for Rule 144a instruments. Our finding does not depend on retail-sized trades, since those trades are removed from the regression analysis.

We find mixed evidence on the effect of floating coupon dummy across different categories. For Rule 144a CDO instruments floating coupon instruments tend to have lower spreads. We observe similar pattern in Rule 144a CMBS and non-agency CMOs. In registered CMBS and non-agency CMOs, floating coupon instruments tend to have higher spreads. For many categories the estimates are not statistically significant. With an exception of Rule 144a ABS instruments, generally the

point estimates on Investment Grade and Floating Coupon together imply that securities with riskier cash flows tend to have higher spreads.

The point estimates on Gap in Execution Time are mixed: it is negative for CDO/CBO/CLO category, CMBS and Rule 144a ABS in the overall sample, and not significant for other types of instruments. One interpretation of a negative coefficient on Gap in Execution Time is that the dealers offer a price concession to close out a trade when the holding period is long. One interpretation of a positive coefficient on Gap in Execution Time is that the dealers in such instruments earn a higher rate-of-return the longer that the instrument is in the dealers' inventory.

The coefficients on Number of Dealers is negative for registered ABS and CMBS, and for both types of non-agency CMOs, indicating that more dealers involved in intermediating the trade lead to lower spreads. The result is consistent with a competition effect—more competition between dealers is related to lower spreads. The coefficient on Proportion of Interdealer Trades is positive for ABS and non-agency CMO instruments: The more trades that go between dealers as instruments move to the final customers, the larger is the spread. When there are more dealers involved in the trade spreads are higher, perhaps reflecting higher costs of finding an ultimate buyer for the dealers' inventory. The point estimate on Number of Rounds is positive across all types of instruments: the more times a bond passes through different dealers, the higher the average bid-ask spread.

The point estimate on Dealer Importance Dummy in Tables 10a and 10b is negative for all categories with the exception of CDOs and registered non-agency CMOs where the positive point estimate is neither statistically nor economically significant. A negative coefficient on Dealer

Importance Dummy implies that the average spread is lower if the inventory passes through a dealer who is more active in the inter-dealer network, while a positive coefficient implies that the spread is higher if the inventory passes through a more connected dealer.

Tables 11a and 11b report the results from regressions of the dealer spreads on characteristics of the instruments in which we use dealer's coreness and degree centrality to measure the dealer's importance in the network. Tables 11a reports results for ABS and CDO instruments, and Table 11b report results for CMBS and non-agency CMO instruments for the overall sample. All other control variables except the number of rounds in the deal are the same as in the total client spread regressions reported in Tables 10a and 10b. The point estimate of Dealer's Coreness in Tables 12a and 12b is negative for ABS and CMBS and is positive for CDOs and non-agency CMOs. The negative point estimates could reflect greater competition and reduced bargaining power of these dealers or lower trading costs on the transactions they intermediate. These findings suggest a degree of specialization in the trading of different instruments and the need to look at competition in more subtle ways. Central dealers perform a valuable function by enhancing the linkages in the network and the integration of customer activity.

The point estimate of Dealer's Degree Residual is negative for ABS, CDOs, registered CMBS and Rule 144a non-agency CMOs. Holding the size of the interdealer k-core subnetwork constant, the higher relative position of a dealer in that subnetwork captured by positive Degree Residual results in lower dealer spreads on average. This result is the opposite from the generally positive relationship between dealer's centrality and bid-ask spreads found in the literature (Li and Schürhoff (2012)). Perhaps the securitization markets we study involve more sophisticated dealers

and have more complex structure of interdealer networks. This also highlights the importance of the decomposition of single centrality measure into the coreness and degree residual. For ABS both point estimates on Dealer's Coreness and Dealer's Degree Residual are negative, while for CDO and CBO/CLO the empirical evidence is mixed, which suggests a direction for further study.

Publication of Price Index Data

An important event within our sample period is the public release of price index data on a daily basis by FINRA and IDC starting in mid-October 2011 for various types of securitizations. This has the potential to lead to substantial informational changes in the market. We examined whether these indices provide market participants information about pricing and spreads, and whether that information becomes common knowledge to all market participants, including dealers. We anticipated that this could affect spreads after the initial public release of the indices (five months of such data were initially released in mid-October) and then the indices were updated on a daily basis (even without a full-blown roll-out of post-trade transaction level price reporting). Analysis of this data after its public release and comparison to an environment in which the indices were not anticipated to be released (such as prior to the initial release of index data) would allow analysis of the impact of a form of price transparency. To control for other considerations that alter the spreads, we examine both registered and 144a instruments, as this is one issue of our focus and because for categories except for the CDO/CBO/CLOs, there is more weight and trading in registered rather than 144a instruments and because the investors in 144a instruments are potentially more sophisticated than those in registered instruments.

The publication of these data began on October 18, 2011. Initially the data was published back to the start of the data collection interval and then updated daily with a one-day lag. In examining the price index data we are struck by the substantial negative first-order serial correlation in the price index—both pre- and post-release (see Figure 13). Using standard market microstructure interpretations this highlights the extent of noise in the data, which suggests the difficulty confronting market participants in extracting valuation information from the data. Conceptually, the nature of improvement in transparency at the level of individual instruments from the release of index data may have been modest, both because of the portfolio composition and the daily nature of the index. The negative serial correlation in the index points to the potential construction of spreads using time series approaches (e.g., see the Roll (1984) estimator of bid-ask spreads using the negative serial correlation in transaction prices) and is suggestive of relatively wide spreads implicit in the index data (and the underlying securitizations). Given the limited set of observations, we focus our analyses of spreads at the securitization level in our matching analyses, but time series perspectives are potentially useful as we try to understand the public index data. In other contexts (such as the equity markets) cash index returns or differences often reflect substantial positive serial correlation due to staleness in components of the pricing and strong positive cross-sectional correlation among the assets. In the current context the index construction only reflects the assets that have traded recently, so there is not an obvious rationale that would lead to underlying positive serial correlation. Indeed, this aspect of the index construction suggests an additional source of noise not present in the standard equity index, as the composition of the index here is changing because it reflects only assets that have traded recently.

The newly disseminated price index data provides us an opportunity to study the impact on spreads for registered and 144a instruments. Table 7b reports information on the spreads before and after the public dissemination of price indices, specifically whether the spreads increased or decreased from the pre- to the post-release samples for both registered and Rule 144a instruments. The conventional view is that the spread should decrease after transparency enhancing events. We find such decrease in spreads in the registered non-agency CMO category with the mean spreads post-release being statistically significantly smaller than the pre-release sample. However we observe the reverse pattern in registered CMBS instruments and mixed results in other categories, that are not statistically significant.

The interpretation of the increase in spreads that we document above is not straightforward for a second reason. In particular, our graphical evidence suggests that there is a lot of variability in the spreads and not a sharp change in regime at the point at which the price index disclosure begins (see especially Figure 10, which documents the weekly moving averages of the total client bid-ask spread, and less directly, Figure 5, which offers scatter plots of the spreads). In fact, the graphical evidence suggests the plausibility of identifying changes in spread levels at a variety of alternative dates—undercutting the strength of the evidence with respect to the actual regime change.

Concluding Comments

This is a preliminary report on our analyses of spreads and trading concerning Rule 144a as well as registered securitizations. While our report highlights the comparison between spreads on Rule 144a and registered securitizations, it is important to understand the microeconomic aspects of the trading

process, especially in light of the dramatic disclosure differences between registered and Rule 144a offerings.

Rule 144a securitizations have less disclosure requirements than registered securitizations, so investors are likely to have less information about 144a securitizations early in the instrument's life. But 144a securitizations could (but need not) represent higher quality assets, as 144a securitizations only are held by sophisticated investors who may have access to additional sources of information. Consequently, it is ambiguous whether there is more informational asymmetry and wider bid-ask spreads in 144a securitizations as compared to registered securitizations. More specifically, analyzing how spreads change around the initial issue date and after the security has become seasoned suggests the possibility of distinguishing these if we had more information on the original issuance and trading history.

The dataset contains trades between dealers and outside customers and trades between two dealers. Our sorting techniques allow us to look in more detail how the total client bid-ask spread gets split among different parties involved in a deal. Our analysis offers some perspectives along these lines.

We have started to look in more detail at the trading "network" and construct centrality measures to understand the importance of individual dealers for interdealer trading of specific securities and are starting to understand how the overall spread between customers and dealers and allocation of the spread among dealers relates to the complexity required in trading and the importance of particular dealers to the trading of specific instruments.

In studying the impact of the release of the price index data, the spreads on the registered instruments rose, but this potentially also reflected other changes in trading conditions. To indirectly adjust for such differences, we also examined the spreads for the Rule 144a sample, which rose to an even greater degree.

While the initial market context involved *collection* of data (starting May 16, 2011) to allow us to study basic characteristics of trading and spreads (e.g., starting May 16, 2011) for securitization, this did not change the underlying transparency. However, the change in market structure with the disclosure of the daily price index potentially enhances somewhat the transparency of the markets, which is a potentially helpful event with respect to our empirical design. Because of the aggregation involved in a daily price index, the impact on transparency is likely to be more modest than for a full blown roll-out, as would arise with transaction-level price reporting.

References

Hendrik Bessembinder and William Maxwell, 2008, "Markets: Transparency and the Corporate Bond Market," *Journal of Economic Perspectives*, American Economic Association, vol. 22(2), pages 217-234, Spring.

Hendrik Bessembinder, William Maxwell, and Kumar Venkataraman, 2006, "Market transparency, liquidity externalities, and institutional trading costs in corporate bonds," *Journal of Financial Economics*, Elsevier, vol. 82(2), 251-288.

Amy K. Edwards, Lawrence E. Harris, and Michael S. Piwowar, 2007, "Corporate Bond Market Transaction Costs and Transparency," *Journal of Finance*, American Finance Association, vol. 62(3), 1421-1451, 06.

Linton Freeman, "A Set of Measures of Centrality Based upon Betweenness," 1977, *Sociometry* 40, 35–41.

Michael Goldstein, Edith Hotchkiss, and Erik Sirri, 2007, "Transparency and Liquidity: A Controlled Experiment on Corporate Bonds," *Review of Financial Studies* 20, 235–273.

Richard C. Green, Burton Hollifield and Norman Schürhoff, 2007, "Financial Intermediation and the Costs of Trading in an Opaque Market," *The Review of Financial Studies*, vol. 20, no. 2, pp. 275-314.

Lawrence E. Harris and Michael S. Piwowar, 2006, "Secondary Trading Costs in the Municipal Bond Market," *Journal of Finance*, American Finance Association, vol. 61(3), pages 1361-1397, 06.

Michael Lehner, "The Estimation of Causal Effects by Difference-in-Difference Methods", 2010, *Foundations and Trends in Econometrics*, vol. 4, No. 3, 165-224.

Dan Li and Norman Schürhoff, 2012, "Dealer Networks," working paper, Federal Reserve Board and University of Lausanne.

Todd Milbourn, 2003, "CEO Reputation and Stock-Based Compensation," *Journal of Financial Economics* 68, 233-262.

Artem Neklyudov, 2012, "Bid-Ask Spreads and the Over-the-Counter Interdealer Markets: Core and Peripheral Dealers," working paper, Tepper School of Business, Carnegie-Mellon University.

Richard Roll, 1984, "A Simple Implicit Measure of Effective Bid-Ask Spread in an Efficient Market," *Journal of Finance* 39, 1127–1139.

APPENDIX: Data Cleaning

For the purpose of this study we have trading activity data ranging from May 16, 2011 to February 29, 2012 in several classes of securitized products: ABS, CDO/CBO/CLO, CMBS, CMO, MBS and TBA, as well as the database with issue characteristics for all issues subject to FINRA reporting requirement.[17] On October 18, 2011 FINRA and IDC began to disseminate the price index data, and to extend our analysis we study both the overall sample as well as separate data from the period prior to that date (referred to as pre-release sample) and the period beginning on that date (referred to as post-release sample). We limit our attention to ABS, CMBS and non-agency CMO securitizations because these classes have both registered as well as Rule 144a placed instruments in our sample. We also present our results for CDO, CBO and CLO Rule 144a instruments separately to allow for comparisons across asset classes. In our analysis we use Moody's ratings for securities that have at least two opposite trades with customers. For other securities we were able to utilize the investment grade data for these instruments provided by FINRA. Moody's ratings were collected for all securities that satisfy our minimal-trading requirement: There are at least two opposite transactions with customers at most 2 weeks apart in our sample period from May 16, 2011 to February 29, 2012. We used the proprietary list of CUSIPs provided by FINRA to locate Moody's ratings for these securities on the corporate website.

We perform several rounds of cleaning before we obtain a workable sample of trades: 1) Adjust for trade corrections and removed cancelled trades; 2) address double-reporting issue for interdealer trades – both dealers were typically reporting the same trade from opposite sides; 3) match trading reports with issue-specific characteristics from the database provided by FINRA; 4) clean the data

[17] Among others the characteristics included: maturity date, coupons with update dates, type of coupon (fixed or floating), factors with update dates, type of placement (registered or Rule 144a), description of the issue.

from the issues with insufficient trading activity to perform our analysis; 5) compute bid-ask spreads using an iterative cascading matching technique discussed below; 6) adjust resulting spreads for coupon and factor payments; 7) perform cleaning for outliers. Below we discuss each of these rounds of data cleaning in greater detail.

For some trade records, traders entered incorrect trade information or canceled previous transactions. Traders corrected the records by entering additional reports marked as "Corrected Trades", "Trade Cancels" or "Cancels", and "Historical Reversals" (if correction was reported not on the say trading day). In the first round of cleaning we remove all trade records that were subsequently corrected to keep only the effective transaction records, we remove all records that were cancelled and do not count them in our subsequent analyses, and we disregard all corrections when no initial trade record is reliably identified by entered volume, entered price, trade execution date and counterparty masks.

According to the FINRA reporting rule, each interdealer trade must be reported by both sides to the transaction, effectively leading to double reporting in our sample, with a few exceptions. Customer transactions and so-called "locked-in trades"[18] are always reported once. In order to cope with the double-reporting problem we implement an iterative pair-matching procedure. We look at pairs of identical transactions reported from different sides by the same counterparties. The counterparties often reported slightly different trade execution timestamps, so that we have to be careful distinguishing the second report for a particular transaction from other trading activity unrelated to it. The pair-matching procedure consists of one hundred iterative rounds of search for very similar entries in terms of entered volume, price, execution timestamps, settlement date, counterparty

[18] Locked-in trades are defined in the layouts for trading data files provided by FINRA.

masks. In each round we flag trade reports that are sufficiently similar to constitute candidates for a double-entry of the same trade. Anytime we find several alternative candidate trades, we pick the ones closest in time according to the reported execution timestamp. Anytime we cannot identify a match based on the above criteria, we assume there was no second report for the trade. For 84.77% of all trade reports we were able to identify unique matching reports, which were subsequently removed from the sample.[19] The result of this cleaning constitutes our working sample of transactions.

We match each transaction report to the issue-specific characteristics and description from the database provided by FINRA. The database for ABS, CDO/CBO/CLO, CMBS and non-agency CMO products consists of eleven time-stamped files corresponding to May 15, May 31, June 30, July 31, August 31, September 31, October 31, November 30, December 31, January 31, 2012, and February 29, 2012. Using these files we are able to reconstruct the time-series of coupon rates and prepayment factors, as well as product collateral or underlying pool types, maturity, original balance, type of placement (registered or Rule 144a), type of coupon (fixed or floating). In the few cases when the instrument-specific characteristics (such as the product category or the type of placement) are different in different files for the same issue identifier – we take the data from the latest files available for this issue, having in mind potential data entry issues. In the very rare cases when instruments with the same CUSIP code have different symbol IDs we treat those as different instruments.

It is worth noting that most of securitizations in our sample traded very thinly during either of the two sample periods (pre-release and post-release). For example, only 2,807 out of 12,663 ABS

[19] These numbers apply to ABS, CDO, CMBS, and non-agency CMO only.

issues, 1,219 out of 7,471 CDO/CBO/CLO issues, 2,967 out of 13,720 CMBS issues, and 13,396 out of 78,698 non-agency CMO issues did have at least two opposite trades with customers at most two weeks apart in time. Table 1 presents more detailed information. We could compute client spreads for these instruments only.

Then we perform several steps of matching seemingly related transaction into chains. We use the complete trading sample from May 16, 2011 to February 29, 2012 to look for chains, and then tag each chain we find with the relevant pre-release or post-release sample tag. The implementation of our matching technique consists of three rounds.

In the first round we match related interdealer and customer transactions that have the same volume and each pair in a chain is no further than one month apart. For example, when we see among other trading activity three transactions in the same instrument of $1 million original balance that form a potential chain: Customer to dealer A, dealer A to dealer B, dealer B to customer, we perform two checks: 1) For each link of the potential chain there are no other alternative candidates resulting in a different branch of a chain that are closer in time based on the execution timestamp; 2) each link in the chain is no further than 1 month apart based on execution timestamp. If both conditions are satisfied, we take this chain out of the dataset and proceed with search for other chains iteratively. Different links of a single chain can be tangled in other trading activity in a given instrument, so in order to find candidates and establish links we sort our dataset by execution timestamp within each separate instrument and look for each trade record we look for candidate matches 15 record forward and 15 records backward. Note that we do not impose any timing sequence within a chain – buy from customers can follow as well as precede the sell to customer, and all seemingly related

interdealer trades may happen at any point in time that satisfies the one-month maximum link span. We find most of our chains with a step size smaller than 15, so this step size limit does not constrain our results in a noticeable way. In order to search for all chains with no splits of volume we perform the aforementioned algorithm iteratively 100 times, which completely exhausts all candidate links that fall in the non-split category. The result of the first round is a set of chains of various lengths: C-D-C (1 link), C-D-D-C (2 links), etc., with the same volume moving through the chain. We find 10,871 non-split chains in ABS (1.2 links on average, 5 links maximum), 1,959 chains in CDO/CBO/CLO (1.08 links on average, 6 links maximum), 11,298 chains in CMBS (1.15 links on average, 9 links maximum), and 30,179 chains in non-agency CMO (1.32 links on average, 7 links maximum).

In the second round we allow transaction volume to split when moving through a chain. For example, when we see among other trading activity three transactions in the same instrument forming a potential chain but having different trade volumes: $1 million customer to dealer A, $2 million dealer A to dealer B, $0.5 million dealer B to customer, we perform the same two checks as in the first round for the candidate links and in case these checks are satisfied we split the chain in three pieces: 1) $0.5 million customer to dealer A; 2) $1.5 million dealer A to dealer B; 3) $0.5 million customer to dealer A, $0.5 million dealer A to dealer B, $0.5 million dealer B to customer. The last piece corresponds to a valid two-links chain we take out from the sample, while the first two pieces are returned back for further iterations of search-for-chains. This splitting is designed to treat the trading patterns when different chains branch into sub-chains or merge together and potentially have common links. Similarly to the first round we search for candidate links 15 records forward and backward each in a sorted trade sample, and perform 100 rounds. This way we find

8,719 additional chains in ABS (1.51 links on average, 9 links maximum), 794 chains in CDO/CBO/CLO (1.43 links on average, 10 links maximum), 10,111 chains in CMBS (1.38 links on average, 15 links maximum), and 41,135 chains in non-agency CMO (1.9 links on average, 9 links maximum).

In the second round the 15 step size constraint binds for instruments with heavy trading activity and many trade records happening within a trading day. The second round ensures that we link most of the related interdealer links to trades with customers when they are less than 15 trade records away from each other. After the second round we drop all interdealer trades that have not yet been used to form a chain with any client transactions and perform LIFO matching of the opposite client transactions. This constitutes our third and final round of matching process. We keep track of all interdealer links established in prior rounds that were attached to these transactions. This way we find 3,396 additional chains in ABS (1.86 links on average, 11 links maximum), 406 chains in CDO/CBO/CLO (1.72 links on average, 7 links maximum), 4,621 chains in CMBS (1.8 links on average, 19 links maximum), and 13,192 chains in non-agency CMO (2.3 links on average, 10 links maximum).

After the three rounds we have a sample of chains both involving splits of volume and non-split chains. We have in total 23,036 chains in ABS (1.41 links on average, 11 links maximum), 3,198 chains in CDO/CBO/CLO (1.25 links on average, 10 links maximum), 26,124 chains in CMBS (1.35 links on average, 19 links maximum), and 84,788 chains in non-agency CMO (1.76 links on average, 10 links maximum). On average we find relatively longer chains in non-agency CMO

market. In our regression analysis we refer to the number of links in a chain as number of rounds in the deal.

The complete chains we find constitute 75% of the total absolute turnover in the ABS market, 86% in the CDO/CBO/CLO market, 74% in the CMBS market, and 80% in the non-agency CMO market. We also include broken chains in which dealer codes do not match.

Approximately 54.64% of chains we find using our matching process occur in the pre-release sample (between May 16, 2011 and October 17, 2011).

Within each chain of related transaction we adjust prices for coupon and factor payments that happened between the settlement time of a particular trade and the settlement time of the logical beginning of the chain (a buy from customer, not necessary the first trade to happen within a chain by execution time). For each chain of transactions having two opposite trades with customers, we compute two types of bid-ask spread measures: total client bid-ask spread and dealer-specific spread – both measured per $100 of current value (capital committed). The quotes observed in our dataset are clean prices per unit of current balance, thus we adjust our bid-ask spread measures for accrued interest and factor prepayments. We use the following approach to perform these adjustments:

Firstly, the direct way to compute bid-ask spread having two quotes on the opposite sides of an intermediating trade and the full information on factor and coupon payments in between is the following. Here we consider the case when settlement date effective for the ask quote occurs after the settlement date effective for the bid quote, however the formulas generalize to allow for

opposite cases (below T stands for number of calendar days in between and c is the annual dollar coupon amount per $100 of original balance):

$$Spread = 100 \times \frac{(P_{ask} \times factor_{ask} - P_{bid} \times factor_{bid} + adj)}{\left((P_{ask} \times factor_{ask} + P_{bid} \times factor_{bid} + adj)/_2\right)}, \qquad where:$$

$$adj = c \times \frac{T}{360} \times factor_{bid} + factor\ prepayment$$

We use the following fair-pricing condition to simplify the above formula:

$$\frac{factor\ prepayment}{P_{ask}} = factor_{bid} - factor_{ask}$$

Assuming the above condition holds, the bid-ask spread calculation simplifies to:

$$Spread = 100 \times \frac{\left(P_{ask} - P_{bid} + c \times \frac{T}{365}\right)}{\left(P_{ask} + P_{bid} + c \times \frac{T}{365}\right)/_2}$$

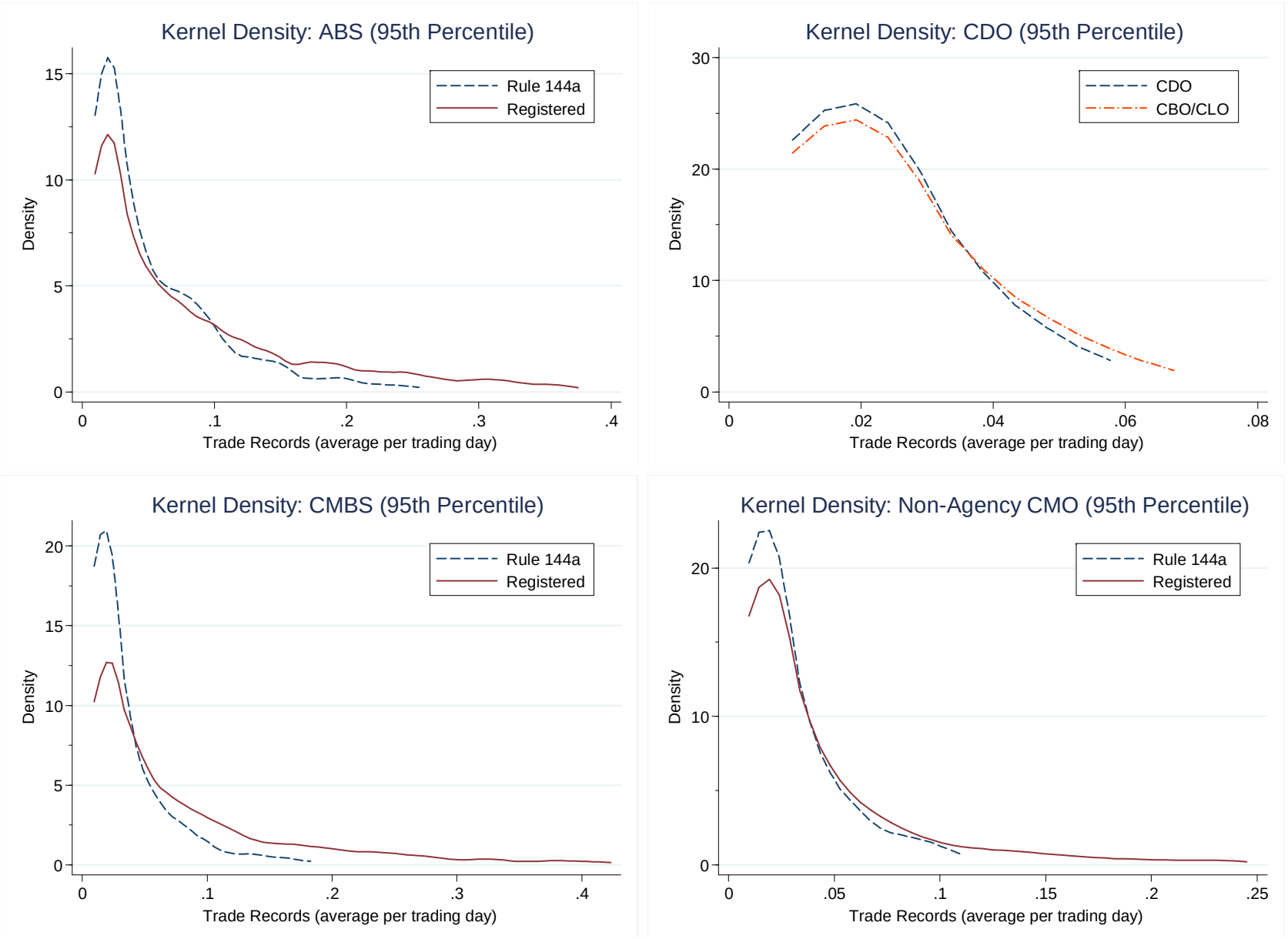
We performed both the direct spread computation and the simplified computation and did not find significant difference in terms of spread distributions. This can be explained by the fair-pricing condition outlined being a relatively good approximation for those matches that involve factor payments in between the two settlement dates. All results that follow correspond to the simplified approach.

The obtained spread observations contain outliers. In order to address this issue we winsorize 1% off each tail of the distribution of total client spreads within each subtype of instrument based on its overall type (ABS, CDO/CBO/CLO, CMBS, non-agency CMO) and collateral sub-type, its placement type -- registered or Rule 144a, and its investment rating. The distribution characteristics of resulting total client bid-ask spreads are presented in Table 7a for the overall sample from May

16, 2011 to February 29, 2012. We compare non-retail client spread distributions for pre-release and post-release samples and present results in Table 7b.

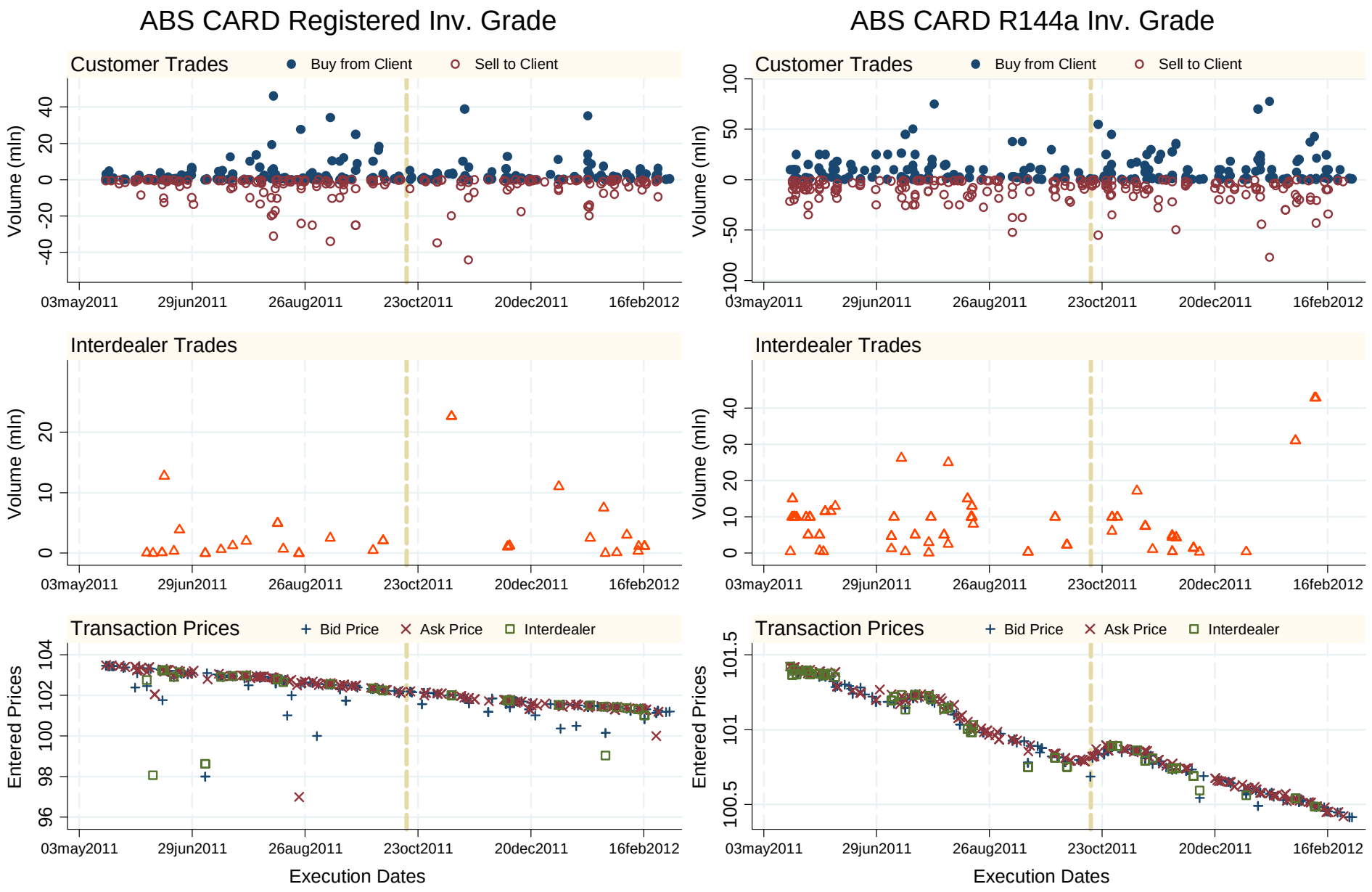
In our analysis we use information on trade sizes measured in dollars of original par underlying pairs of trades we use to construct each spread observation. We use three buckets for trade sizes: Retail trades (R), amounting to less than $100,000 original par, medium trades (M) between $100,000 and $1,000,000 original par, and institutional trades (I) amounting to more than $1,000,000 original par. Tables 2b and 3b report proportions of trade reports falling within each bucket. In our analysis we focus on non-retail chains when both original buy from customer and sell to customer volumes were greater than $100,000 original par (when a chain of transactions involves a split, we take into consideration the volume before splitting).

Figure 1: Distribution of Number of Trading Records per Day



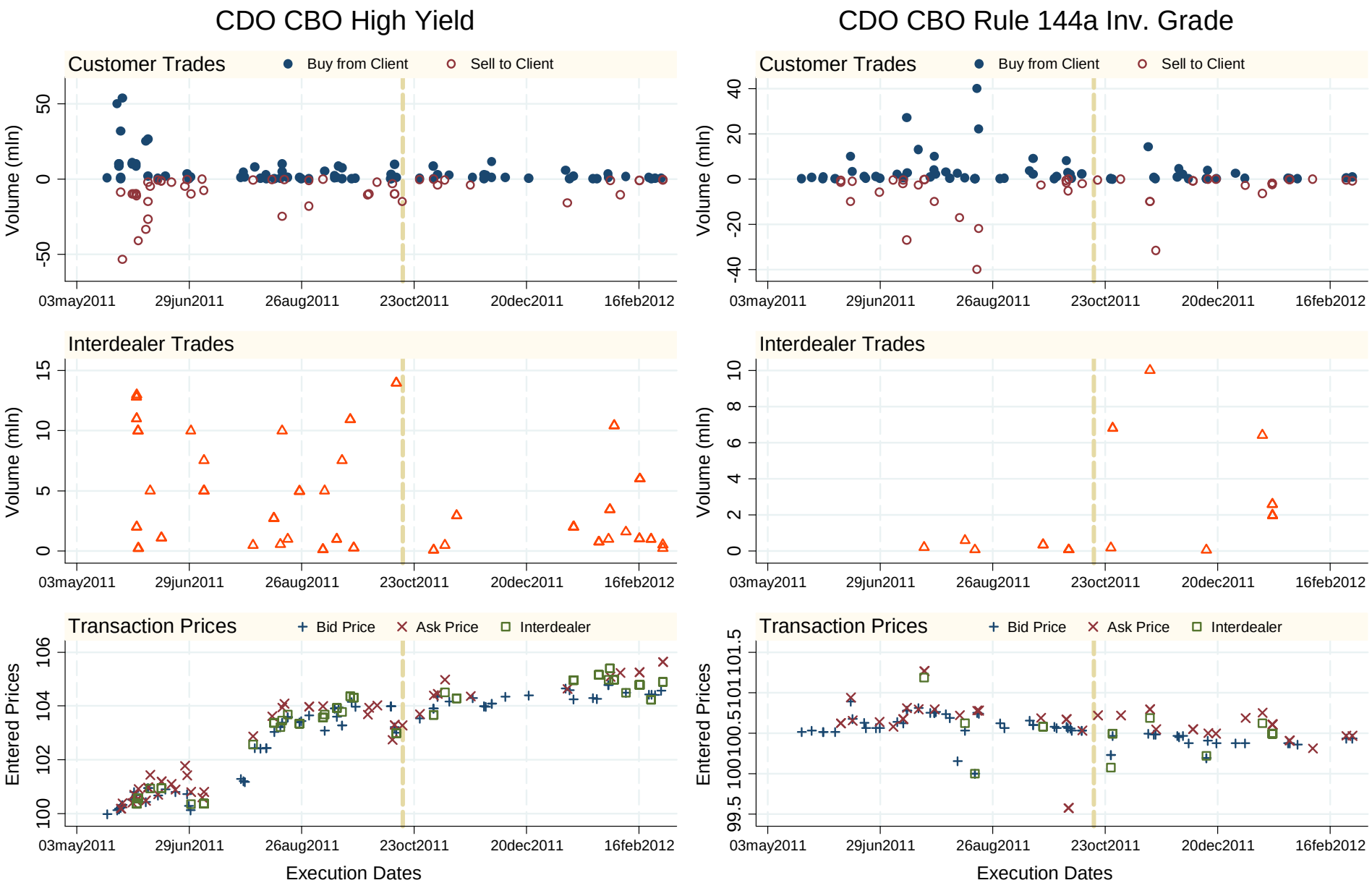
Legend: Number of trade records includes both trades with customers and interdealer trades after appropriate records cleaning (discussed in the Data section). The graphs show estimated distributions of the lower 95th percentile within each group of securities. The distribution is estimated using epanechnikov kernel density with 1/100 bandwidth. The sample period is from May 16, 2011 to February 29, 2012.

Figure 2a: Trading Patterns of Frequently Traded ABS Securities



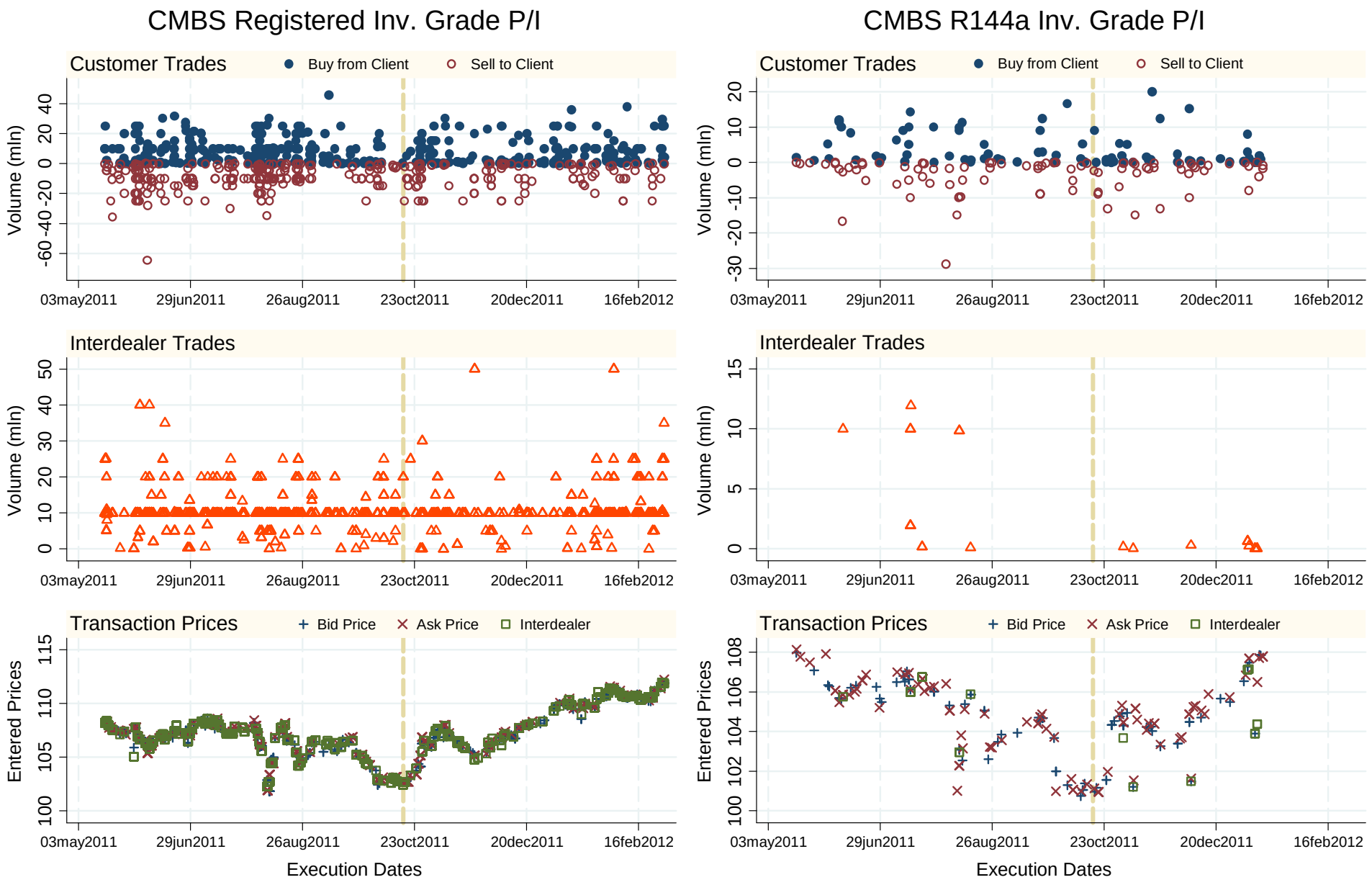
Legend: Total number of reports includes both customer and interdealer trades. Buys from customers are shown as having positive volumes traded and sells to customers are shown as having negative volume. Bold vertical line corresponds to the Index release date (October 17, 2011).

Figure 2b: Trading Patterns of Frequently Traded CDO Securities



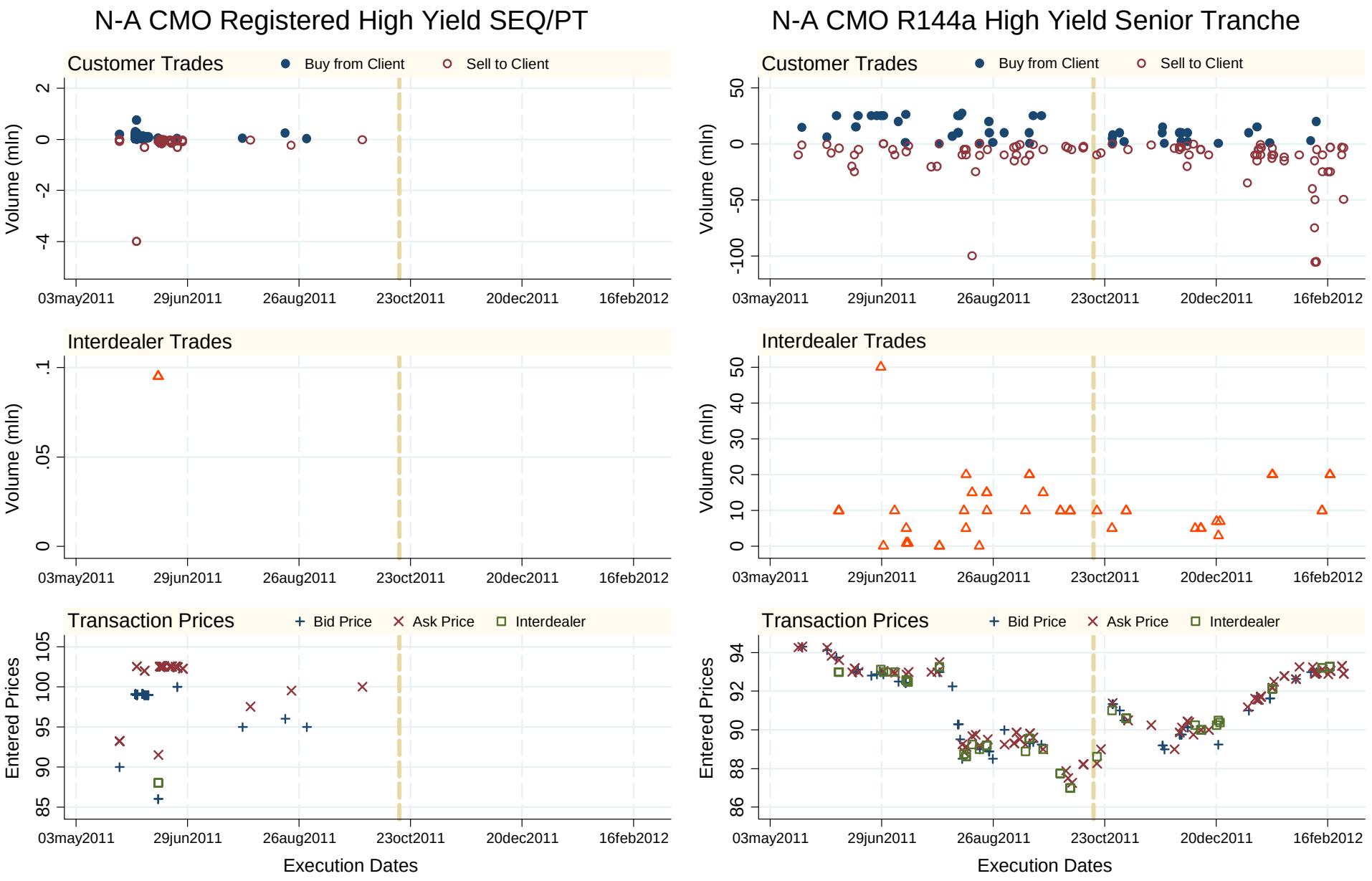
Legend: Total number of reports includes both customer and interdealer trades. Buys from customers are shown as having positive volumes traded and sells to customers are shown as having negative volume. Gray vertical line corresponds to the Index release date (October 17, 2011).

Figure 2c: Trading Patterns of Frequently Traded CMBS Securities



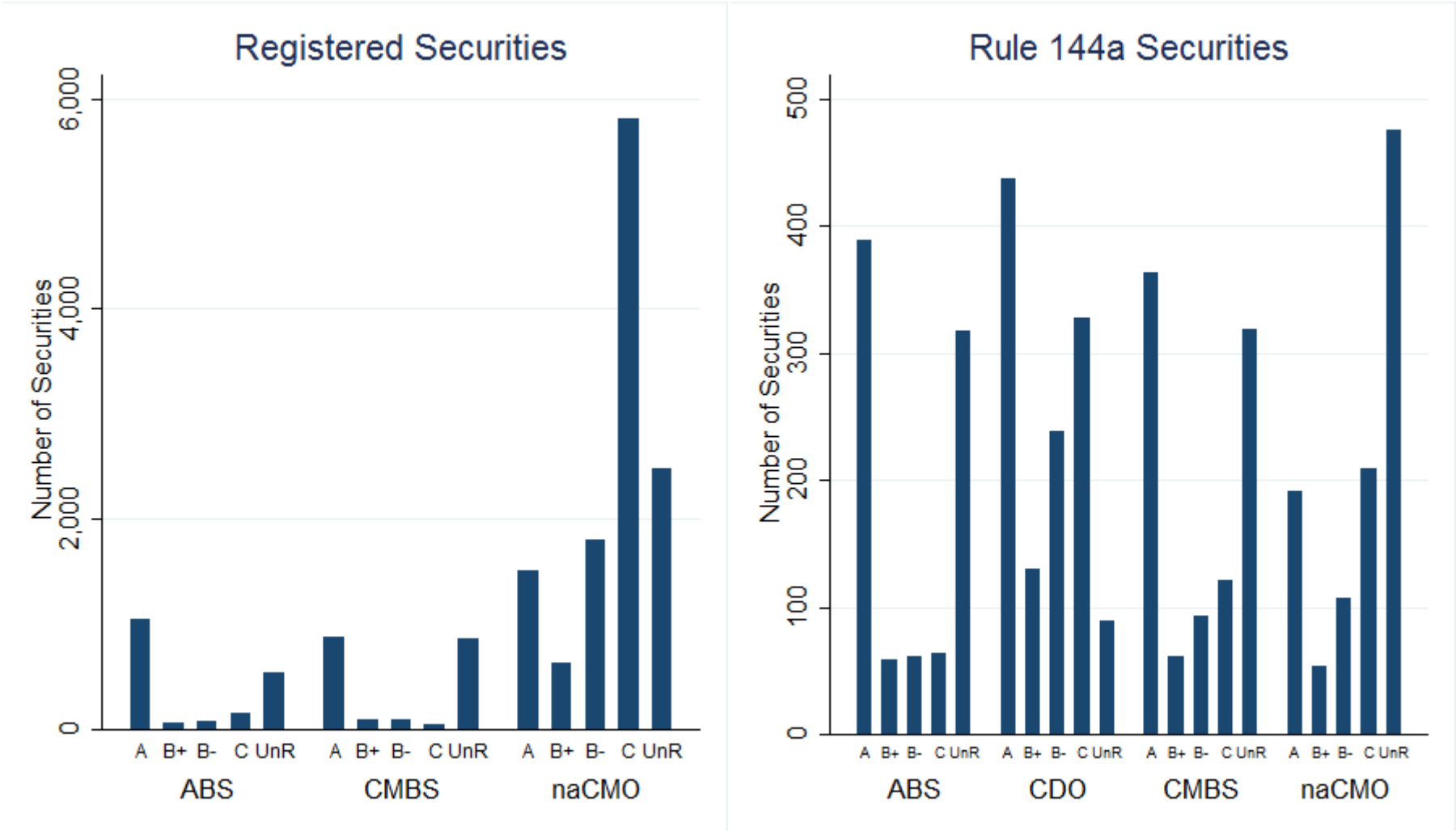
Legend: Total number of reports includes both customer and interdealer trades. Buys from customers are shown as having positive volumes traded and sells to customers are shown as having negative volume. Bold vertical line corresponds to the Index release date (October 17, 2011).

Figure 2d: Trading Patterns of Frequently Traded Non-Agency CMO Securities



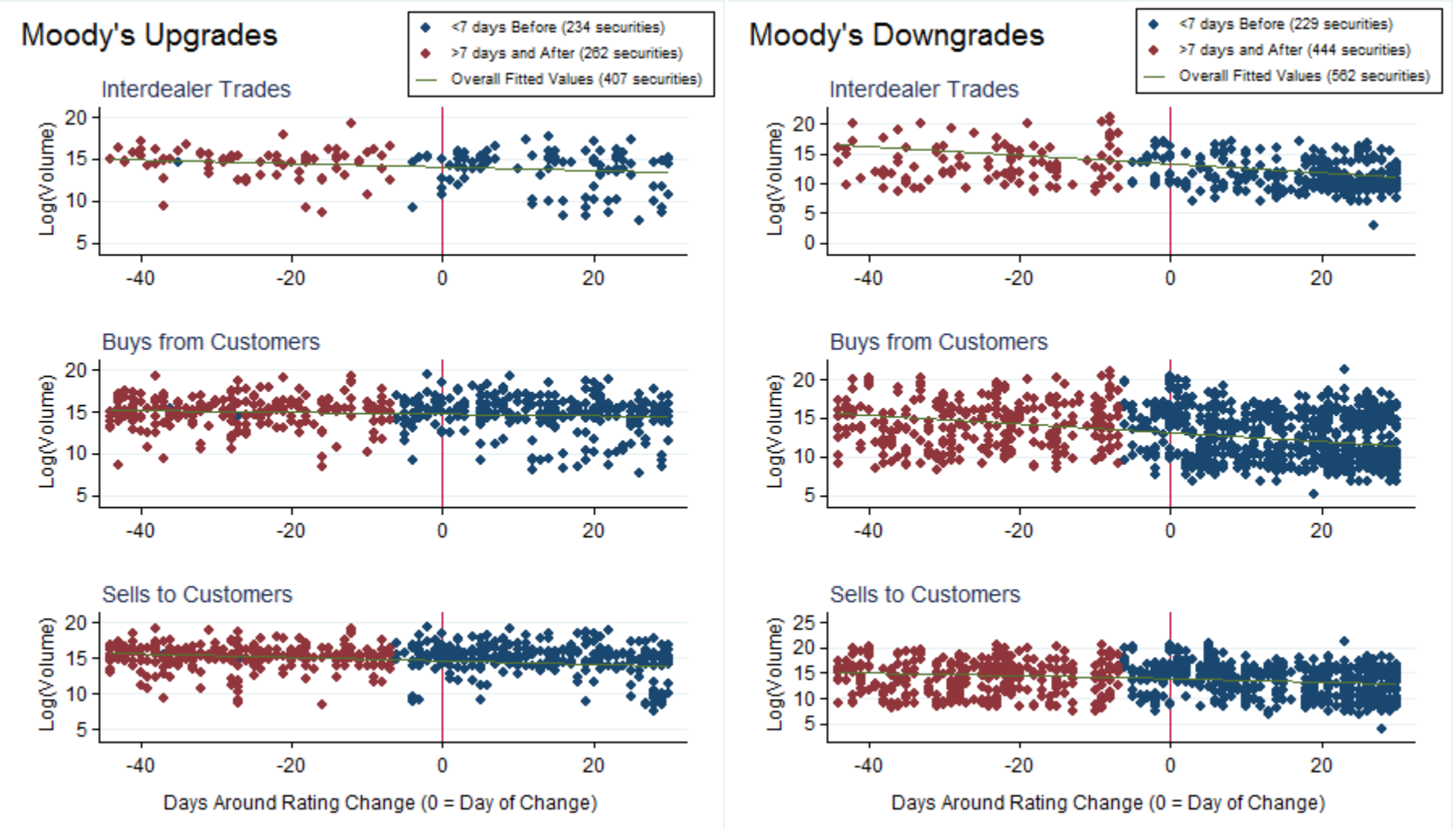
Legend: Total number of reports includes both customer and interdealer trades. Buys from customers are shown as having positive volumes traded and sells to customers are shown as having negative volume. Bold vertical line corresponds to the Index release date (October 17, 2011).

Figure 3: Distribution of Moody's Ratings in the Sample



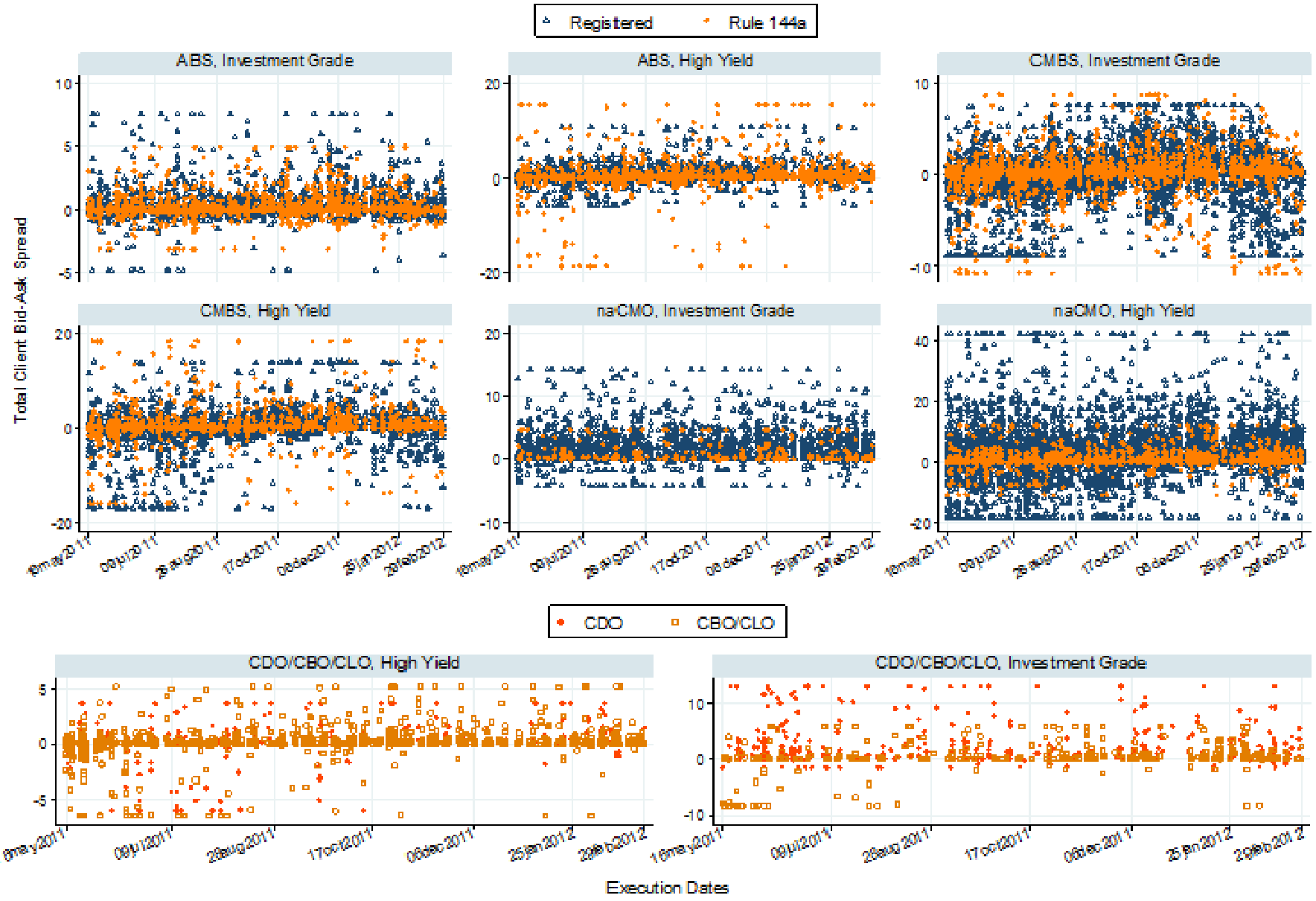
Legend: The bars show the distribution of the first Moody's rating effective in the sample period from May 16, 2011 to February 29, 2012. A category includes Aaa, Aa1, Aa2, Aa3, A1, A2, A3. B+ category includes Baa1, Baa2, and Baa3. B- category includes Ba1, Ba2, Ba3, B1, B2, B3. C category includes Caa1, Caa2, Caa3, Ca, C. UnR category includes securities rated NR, securities for which rating is withdrawn, or securities not found on Moody's website.

Figure 4: Trading Activity around Rating Change Dates



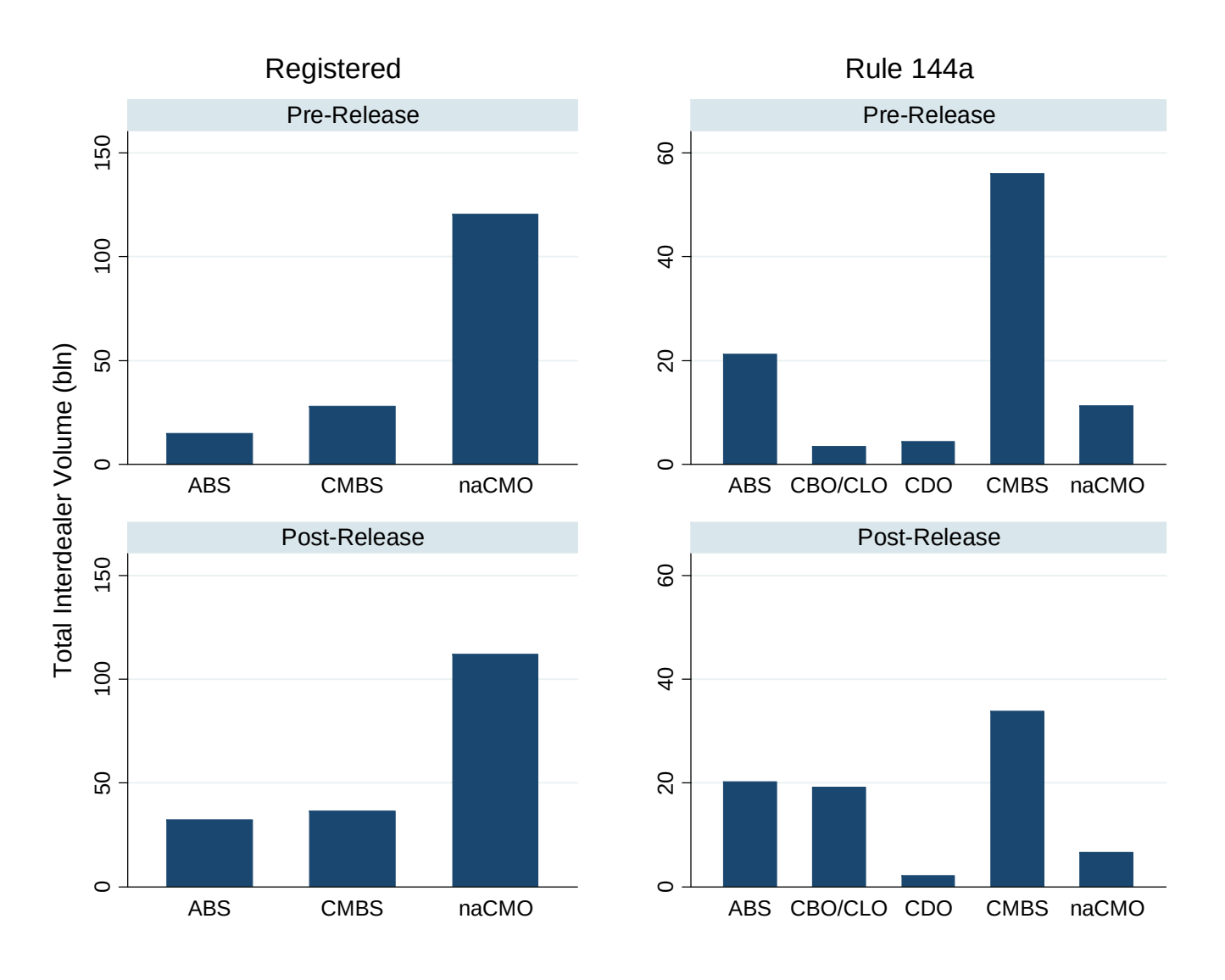
Legend: We look at securities that had a Moody's upgrade and/or downgrade. For each such security we look at transactions that were executed 45 days before rating change and/or 31 days after. 7 days before rating change onward transactions are marked as "affected", they are shown as blue dots on the right part of each graph. All prior transactions are market as "before activity" (for a period of equal comparable length of 38 days, red dots). The line fits pooled sample of "before" and "after" transactions along time. An upward sloping line means volume tends to increase after the event. A downward-sloping line means volume tends to decrease.

Figure 5: Scatter Plots of Total Client Bid-Ask Spreads (Non-Retail Matches)



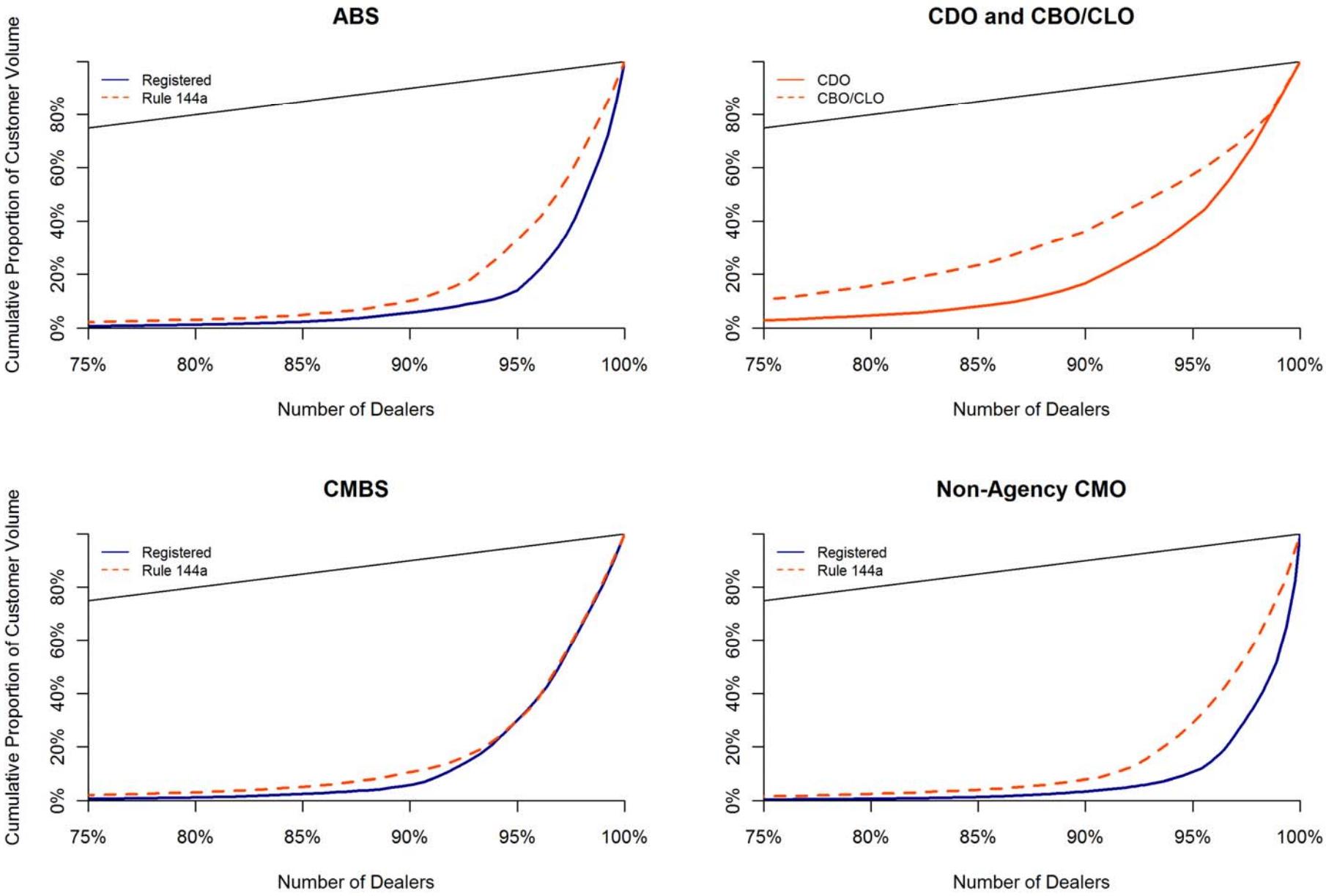
Legend: Larger size spreads are total client bid-ask spreads resulting from a chain with both buy from customer and sell to customer having volume greater than $100,000 of original balance.

Figure 6: Total Volume of Interdealer Trades by Security Types



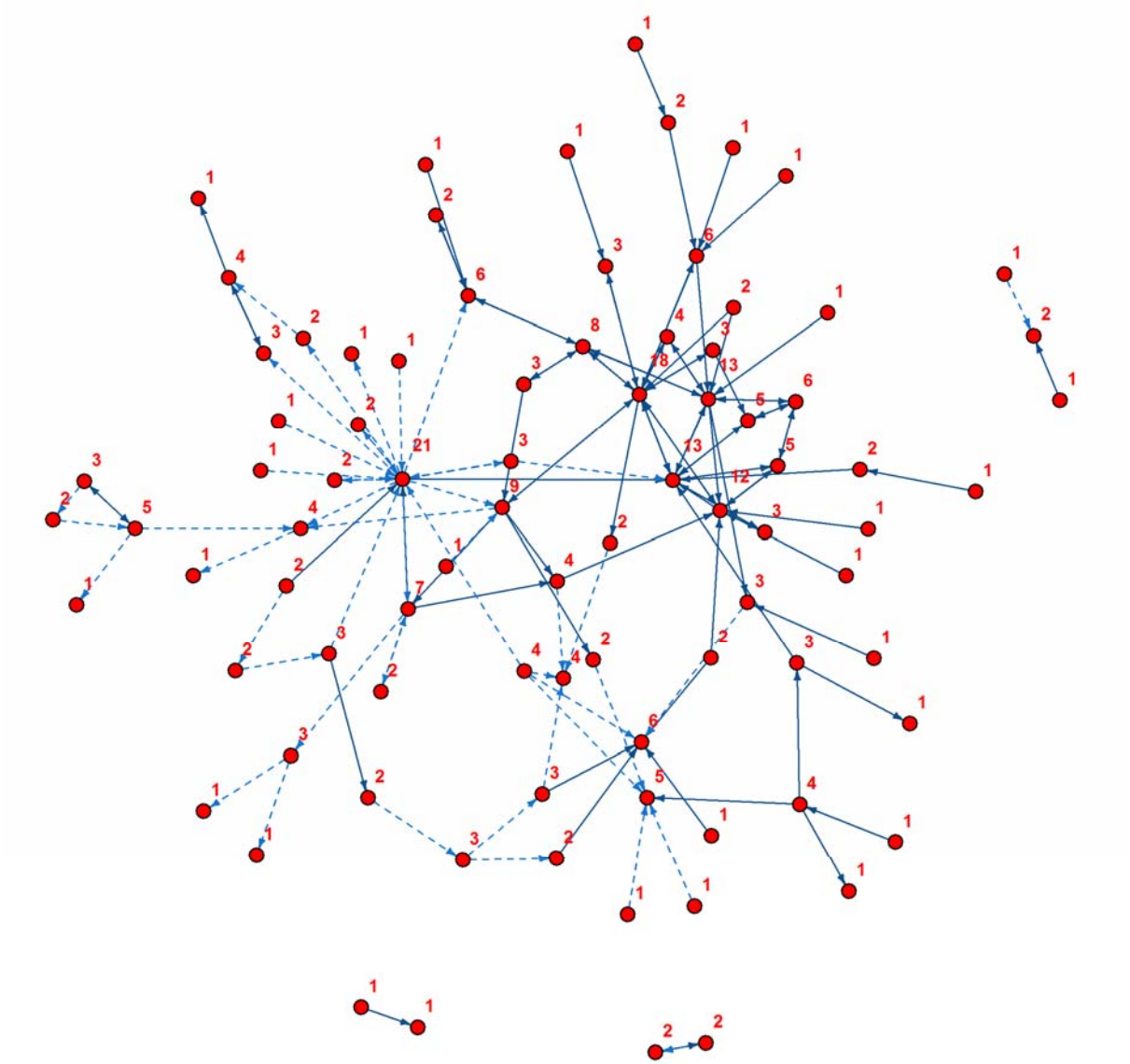
Legend: The total volume transacted on interdealer market by 580 active dealers in the pre-release subsample, 542 active dealers in the post-release subsample (441 dealers participated in both subsamples) shown by product types and type of security placement (Registered and Rule 144a). The Pre-Release Sample is from May 16, 2011 to October 17, 2011, and the Post-Release Sample is from October 18, 2011 to February 29, 2012.

Figure 7: Dealers' Shares in Original Balance with Customers (Lorenz Curves by Market)



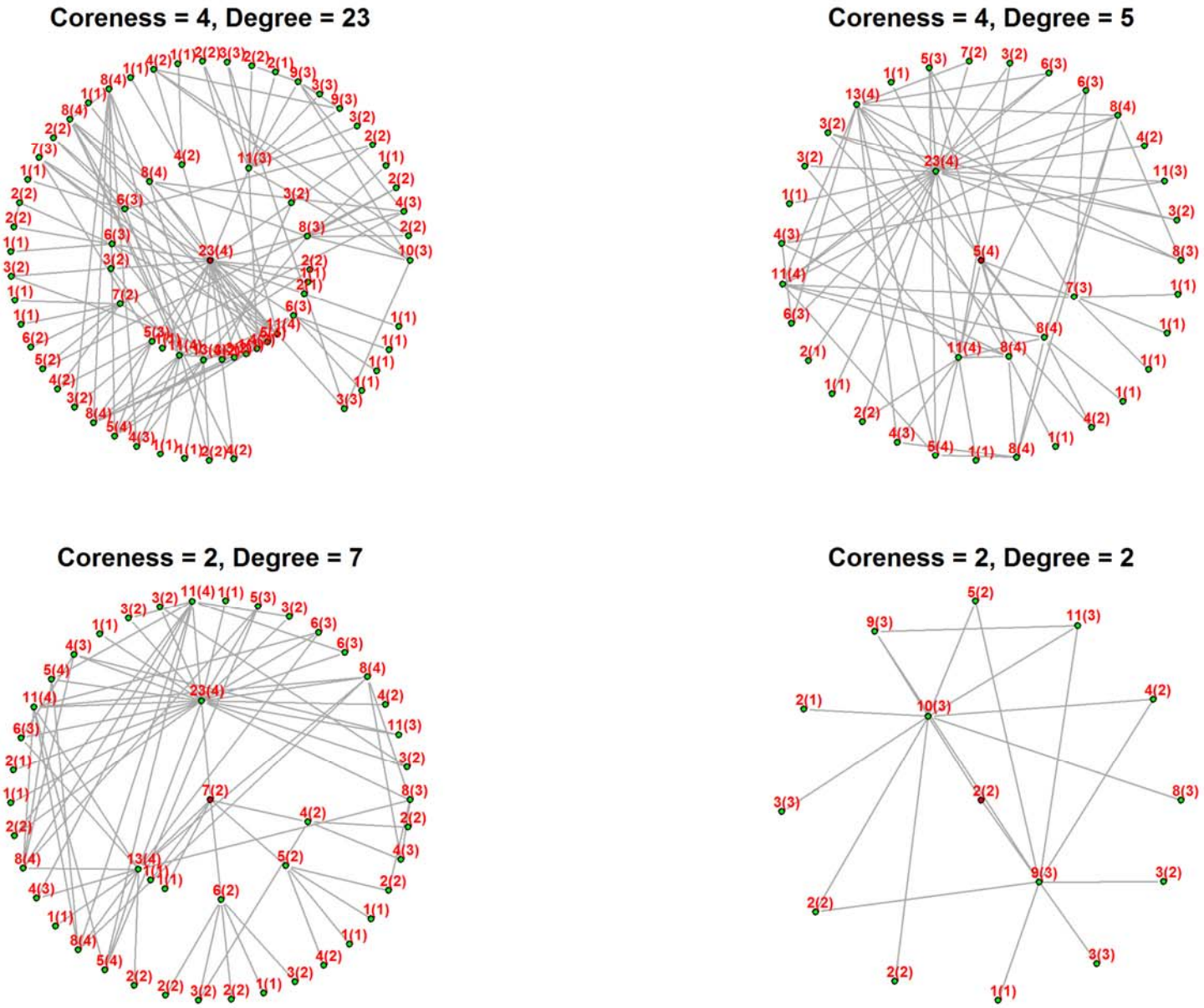
Legend: The 25% of dealers with largest volumes of original balance traded with customers are shown for each market. Numbers of Dealers in brackets correspond to dash Lorenz curves. All customer trades in instruments with at least two opposite trades at most two weeks apart in the sample period from October 17, 2011 to February 29, 2012 are used to construct Lorenz curves.

Figure 8: The Most Active Links of the Interdealer Network



Legend: Each node represents a dealer; each arrow represents the direction of order flow from one dealer to the other. Dealers are labeled by the number of trading partners (both buy and sell directed orders) in the sample from May 16, 2011 to February 29, 2012. Only trading relationships (links) with at least 50 trade reports and at least $10 million of original balance transacted are shown in the graph; links with more than $100 million transacted are shown as solid lines.

Figure 9: Examples of Dealers Coreness and Degree Centrality

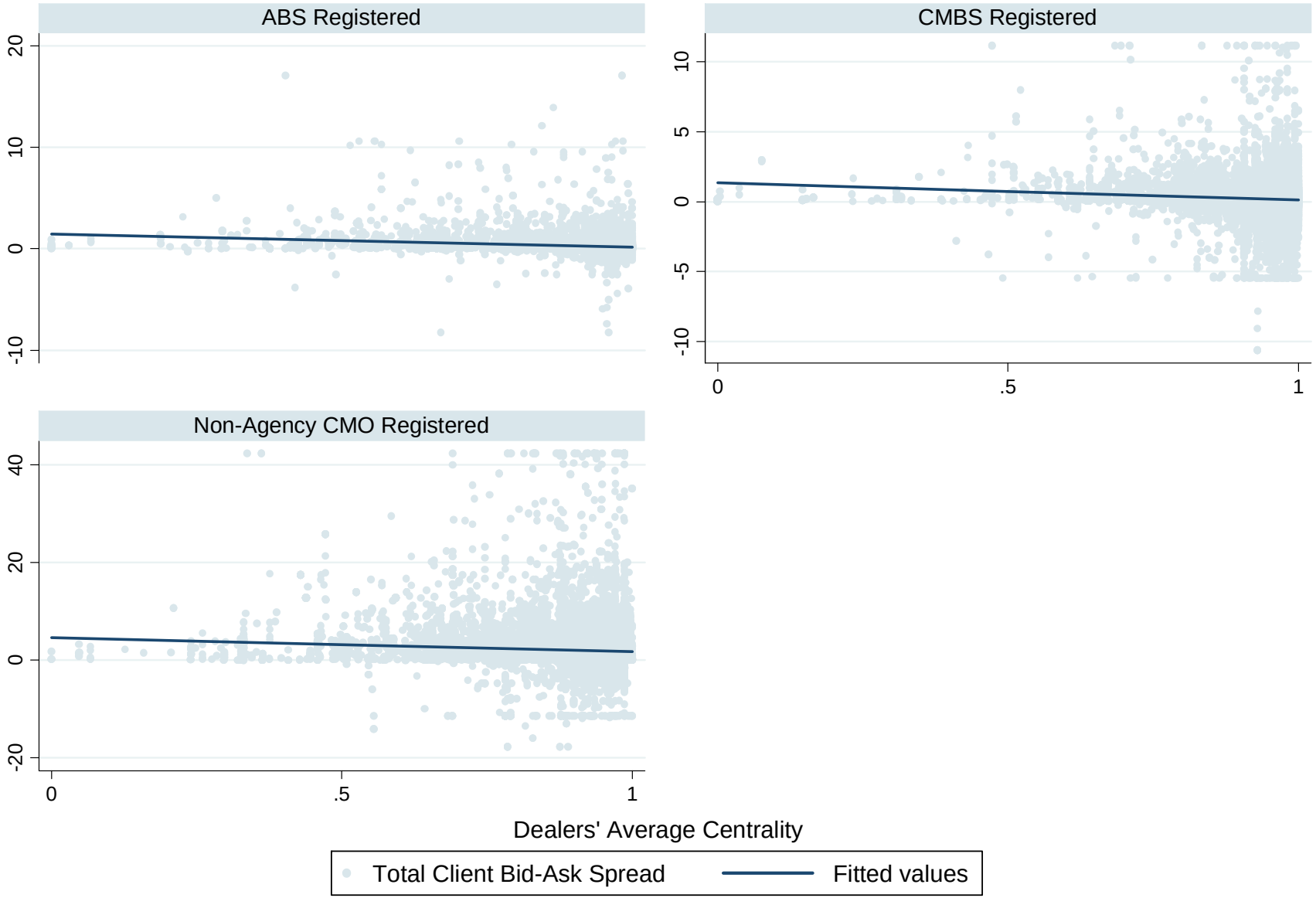


Legend: Degree centrality (undirected) shown for each dealer and coreness shown in brackets. The local neighborhoods up to the second degree (neighbors of neighbors) are presented for 4 combinations of degree and coreness of dealer in the middle (root). These neighborhoods correspond to the graph of interdealer market in Figure 6 with restriction on the volume of original balance transacted removed (each link restricted only to at least 50 transactions).

Figure 10: Weekly Moving Averages of Total Client Bid-Ask Spreads (Non-Retail Matches)

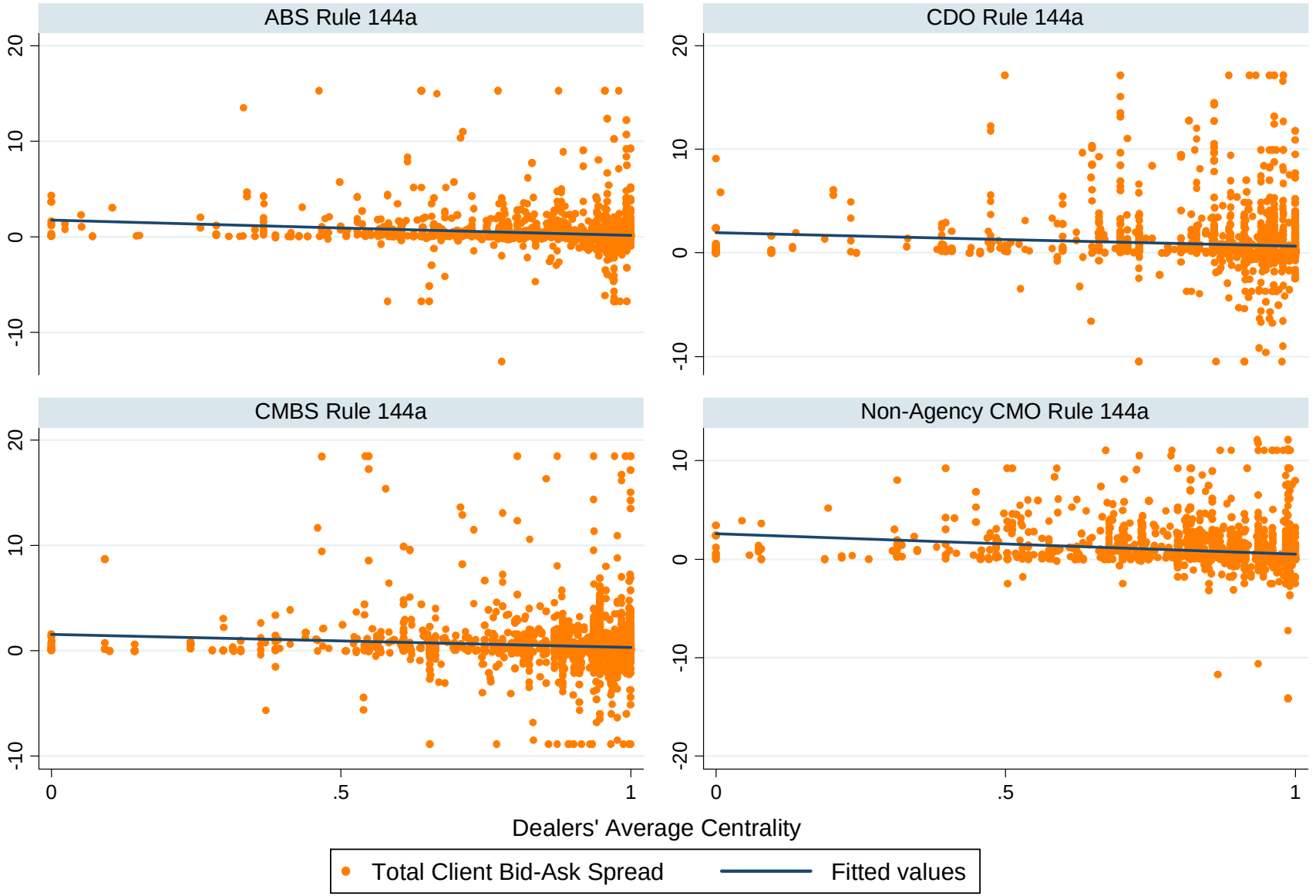
Legend: The daily moving-average Client Bid-Ask spreads are presented with a rolling window of 7 trading days (includes 3 days forward and 3 days backward). Larger size spreads are total client bid-ask spreads resulting from a chain with both buy from customer and sell to customer having volume greater than $100,000 of original balance. The 1% tails of the Bid-Ask spreads within each product subtype, placement type and investment grade are winsorized to reduce influence of outliers.

Figure 11a: Total Client Non-Retail Bid-Ask Spreads and Dealers' Centrality (Registered)



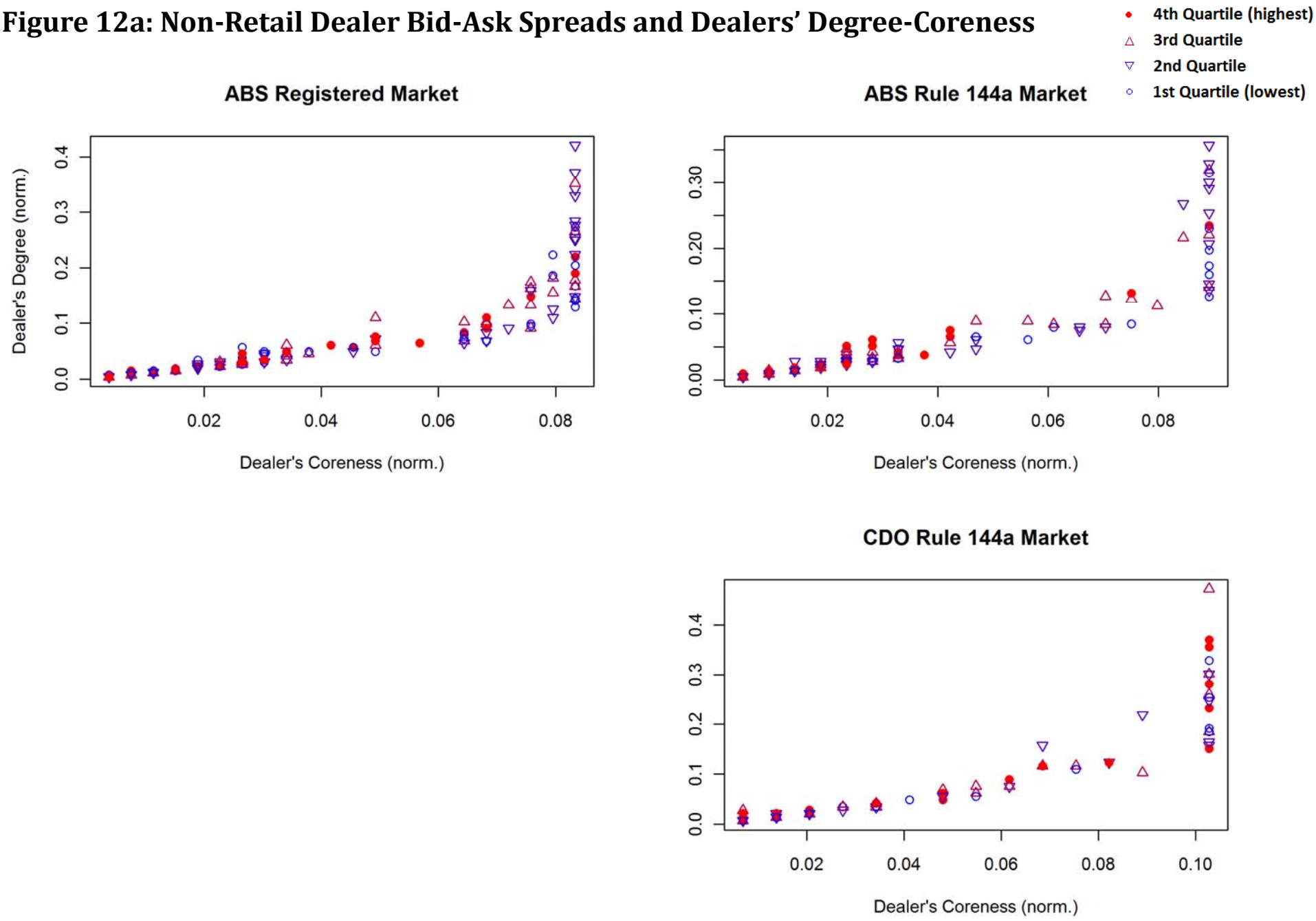
Legend: Average Dealers Centrality is the average betweenness centrality measure of all dealers that intermediated within a particular chain underlying a spread observation. Larger size spreads are total client bid-ask spreads resulting from a chain with both buy from customer and sell to customer having volume greater than $100,000 of original balance. The 1% tails of the Bid-Ask spreads within each product type, placement type and investment grade are winsorized to reduce influence of outliers. Spreads are adjusted for coupon and factor payments.

Figure 11b: Total Client Non-Retail Bid-Ask Spreads and Dealers' Centrality (Rule 144a)



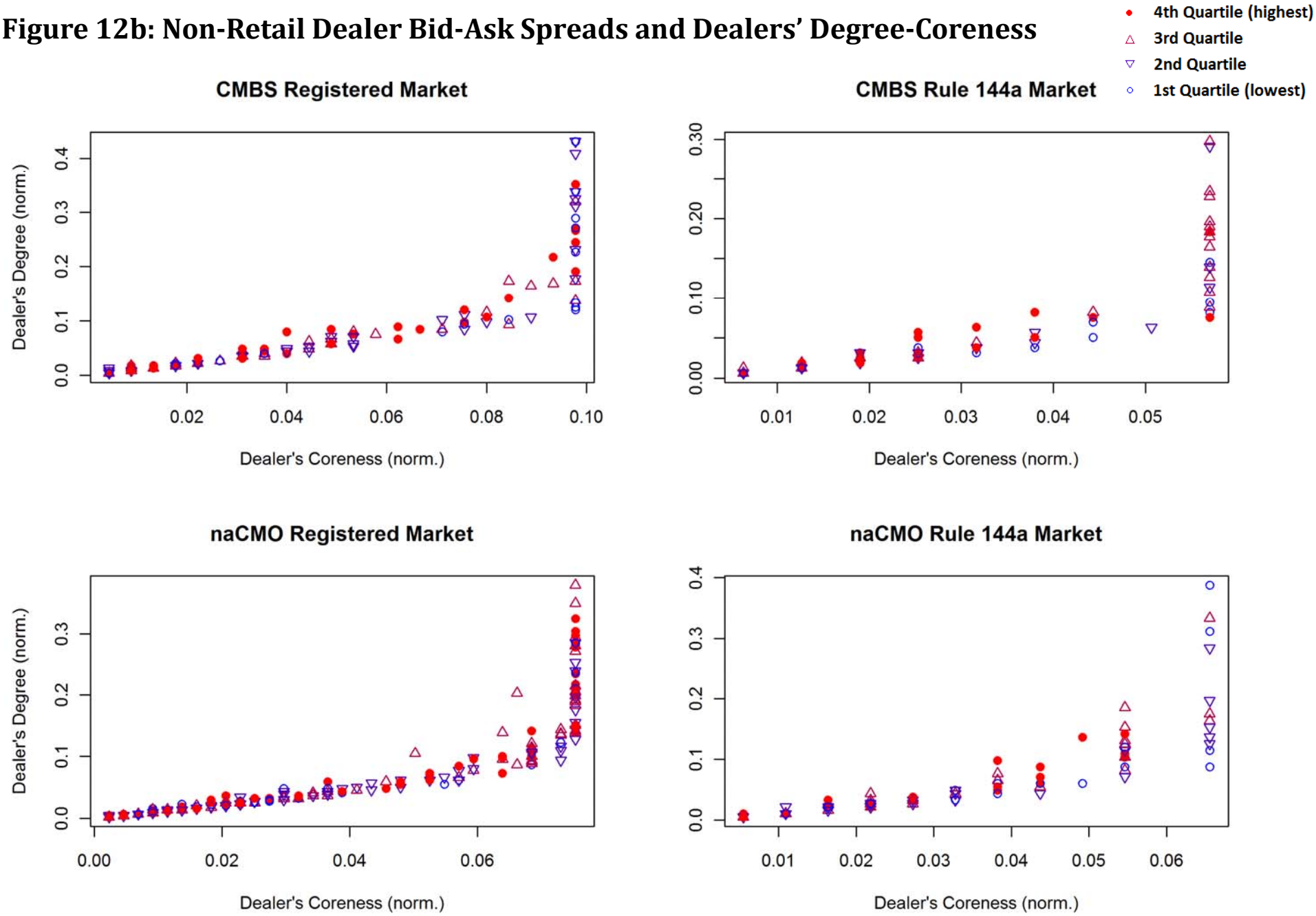
Legend: Average Dealers Centrality is the average betweenness centrality measure of all dealers that intermediated within a particular chain underlying a spread observation. Since most of transaction chains in Rule 144a issues have volume larger than $100,000 of original balance, we do not differentiate trades by size on this graph. The 1% tails of the Bid-Ask spreads within each product type, placement type and investment grade are winsorized to reduce influence of outliers. Spreads are adjusted for coupon and factor payments.

Figure 12a: Non-Retail Dealer Bid-Ask Spreads and Dealers' Degree-Coreness



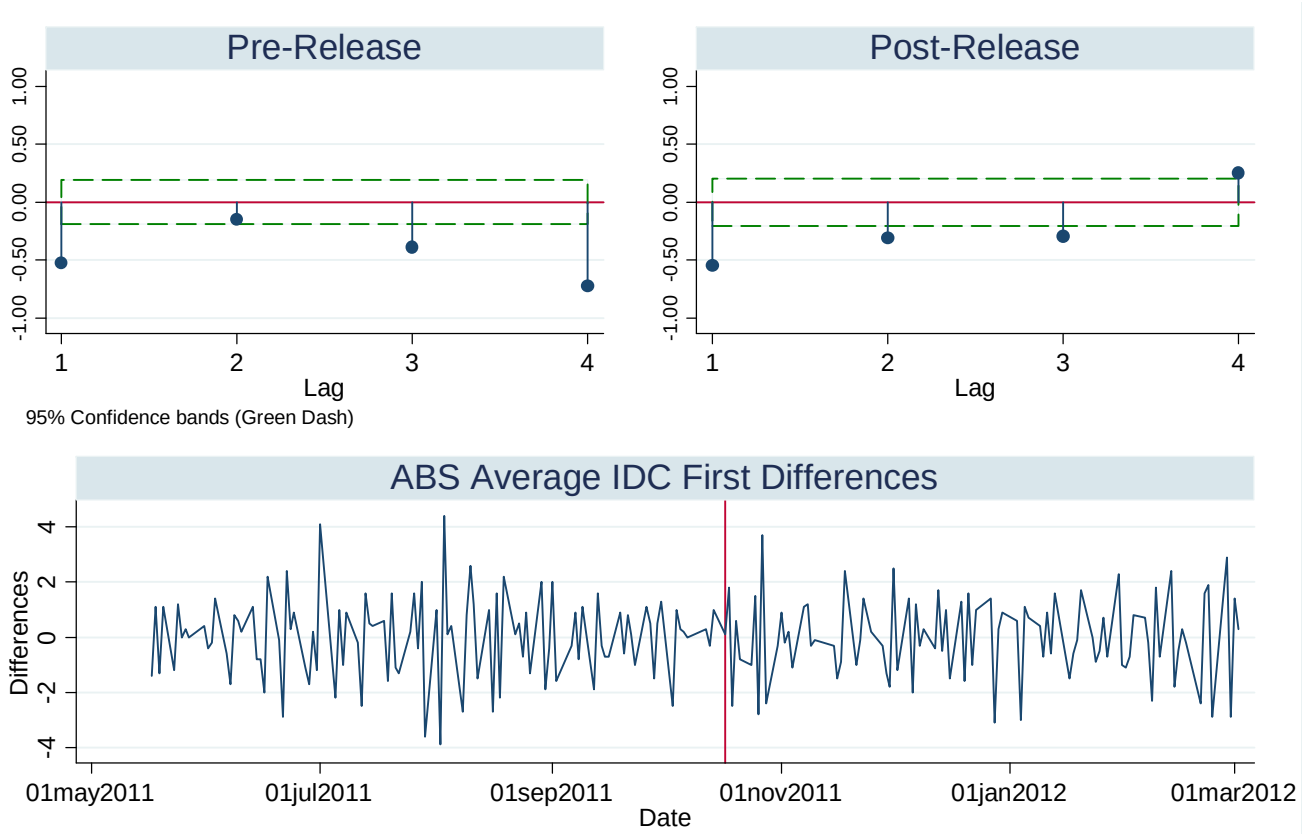
Legend: Average dealer-specific spreads are mapped according to dealer's coreness and degree centrality. Degree centrality is the size of first-order neighborhood of a particular dealer (number of immediate trading partners in the sample). Coreness is the dealers' degree in the largest subnetwork with everybody having at least the given number of immediate trading partners (k-core of the network). The higher dealer's degree relative to his coreness, the more important this dealer is as an intermediary between different groups of other dealers.

Figure 12b: Non-Retail Dealer Bid-Ask Spreads and Dealers' Degree-Coreness



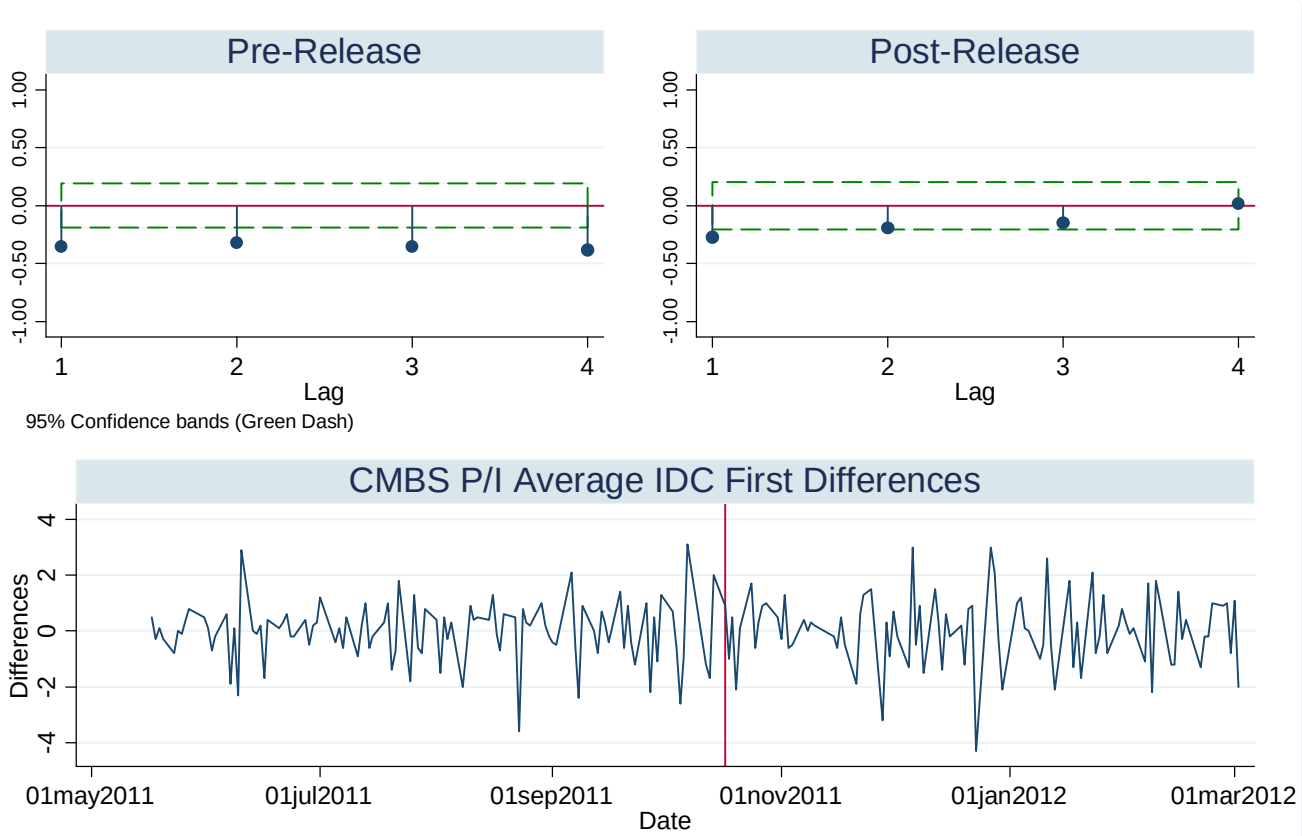
Legend: Average dealer-specific spreads are mapped according to dealer's coreness and degree centrality. Degree centrality is the size of first-order neighborhood of a particular dealer (number of immediate trading partners in the sample). Coreness is the dealers' degree in the largest subnetwork with everybody having at least the given number of immediate trading partners (k-core of the network). The higher dealer's degree relative to coreness, the more important this dealer is as an intermediary between different groups of other dealers.

Figure 13a: Partial Autocorrelations of ABS IDC Average Index



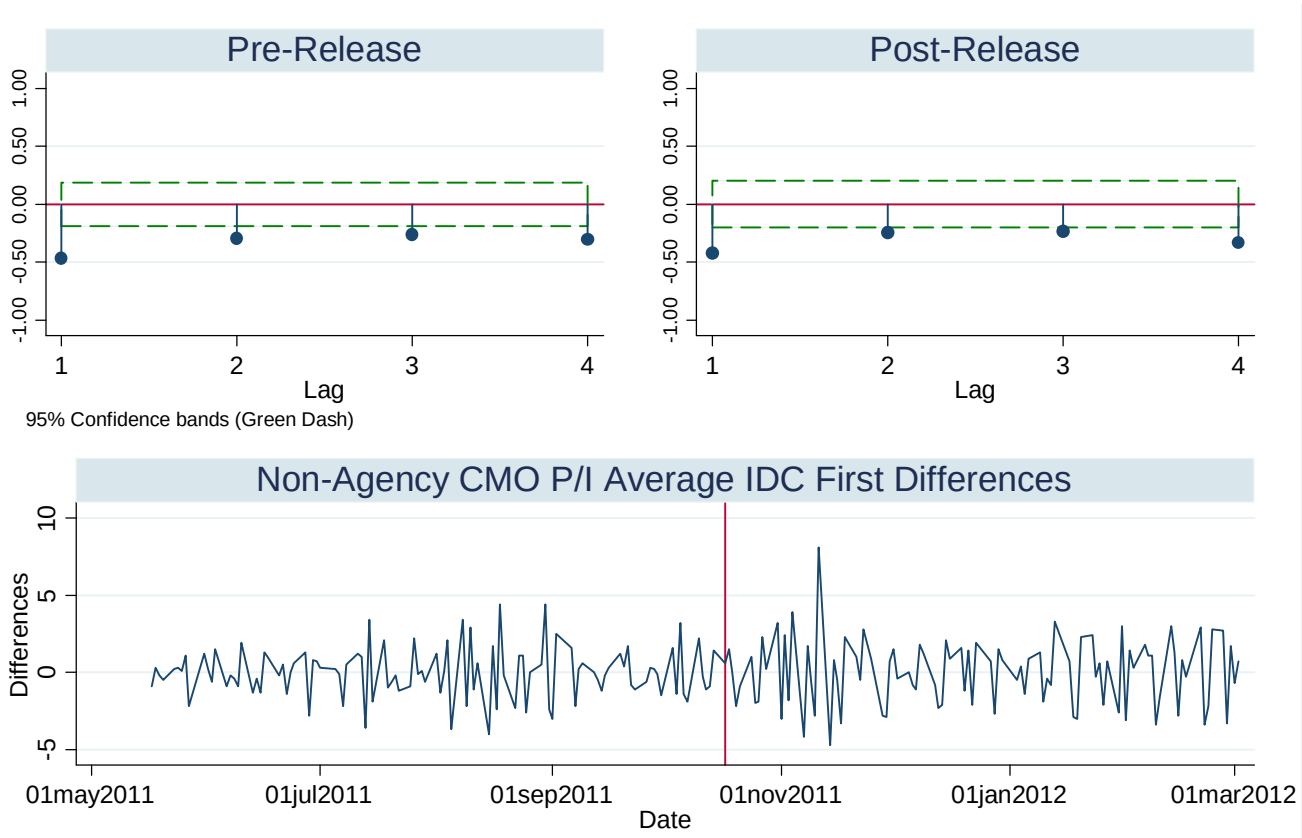
Legend: IDC Index is from the Structured Products Tables provided by FINRA and IDC publicly. The Average version of the index stands for the average (arithmetic mean) price of transactions for a particular group of securities. The Figure presents partial autocorrelations of first differences of the index with 4 lags included in the estimation, together with the time-series plot of the index first differences.

Figure 13b: Partial Autocorrelations of CMBS P/I IDC Average Index



Legend: IDC Index is from the Structured Products Tables provided by FINRA and IDC publicly. The Average version of the index stands for the average (arithmetic mean) price of transactions for a particular group of securities. The Figure presents partial autocorrelations of first differences of the index with 4 lags included in the estimation, together with the time-series plot of the index first differences.

Figure 13c: Partial Autocorrelations of Non-Agency CMO P/I IDC Average Index



Legend: IDC Index is from the Structured Products Tables provided by FINRA and IDC publicly. The Average version of the index stands for the average (arithmetic mean) price of transactions for a particular group of securities. The Figure presents partial autocorrelations of first differences of the index with 4 lags included in the estimation, together with the time-series plot of the index first differences.

Table 1: Number of Securities Traded in the Samples by Types

	ABS Overall	Auto	Card	ManH	SBA	Stud	Other	**CDO Overall**	CBO	CLO	CDO
Population	**12,661**	**1,193**	**410**	**661**	**350**	**1,223**	**8,824**	**7,543**	**392**	**2,993**	**4,158**
Registered	4,567	750	356	616	329	957	1,559	55	44	3	8
Rule 144a	8,094	443	54	45	21	266	7,265	7,488	348	2,990	4,150
Traded Pre-Release	**1,994**	**485**	**227**	**152**	**172**	**304**	**654**	**731**	**53**	**398**	**280**
Registered	1,425	361	211	147	169	237	300	23	22	-	1
Rule 144a	569	124	16	5	3	67	354	708	31	398	279
Traded Post-Release	**1,989**	**513**	**196**	**113**	**198**	**290**	**679**	**718**	**46**	**474**	**198**
Registered	1,359	371	183	109	188	224	284	24	22	-	2
Rule 144a	630	142	13	4	10	66	395	694	24	474	196
Traded Overall	**2,807**	**645**	**261**	**213**	**237**	**417**	**1,034**	**1,251**	**71**	**749**	**431**
Registered	1,905	466	243	206	227	328	435	29	26	-	3
Rule 144a	902	179	18	7	10	89	599	1,222	45	749	428

	CMBS Overall	IO/PO	Other	**CMO Overall**	IO/PO	PAC/TAC/NAS	SEQ/PT	SUP/Z	Other Senior	Other
Population	**13,720**	**1,421**	**12,299**	**78,350**	**8,798**	**4,520**	**29,366**	**1,456**	**15,998**	**18,212**
Registered	5,765	628	5,137	61,687	7,906	4,487	24,505	1,280	13,432	10,077
Rule 144a	7,955	793	7,162	16,663	892	33	4,861	176	2,566	8,135
Traded Pre-Release	**2,096**	**136**	**1,960**	**8,819**	**159**	**559**	**4,662**	**225**	**2,603**	**611**
Registered	1,488	54	1,434	8,203	144	555	4,393	221	2,505	385
Rule 144a	608	82	526	616	15	4	269	4	98	226
Traded Post-Release	**2,086**	**148**	**1,938**	**8,461**	**187**	**486**	**4,396**	**211**	**2,506**	**675**
Registered	1,489	49	1,440	7,815	176	481	4,158	210	2,398	392
Rule 144a	597	99	498	646	11	5	238	1	108	283
Traded Overall	**2,967**	**249**	**2,718**	**13,396**	**326**	**839**	**7,129**	**300**	**3,687**	**1,115**
Registered	1,997	94	1,903	12,355	304	832	6,712	295	3,534	678
Rule 144a	970	155	815	1,041	22	7	417	5	153	437

Legend: Population of securities stands for all issues appearing in the FINRA Securities database up to October 17, 2011. Traded are issues with at least two opposite trades with customers having at most 2 weeks execution gap in the sample period from May 16, 2011 to October 17, 2011 (Pre-Release) or from October 18, 2011 to February 29, 2012 (Post-Release). Issues that have at least one pair of trades with customers with at most 2 weeks execution gap are referred to as Traded Overall.

Table 2a: ABS and CDO Security Characteristics

Characteristic:	**ABS Overall**	Auto	Card	ManH	SBA	Stud	Other	**CDO Overall**	CBO	CLO	CDO
Traded Securities	**2807**	**645**	**261**	**213**	**237**	**417**	**1034**	**1222**	**45**	**749**	**428**
Registered	1905	466	243	206	227	328	435				
Inv. Grade	1231	330	213	66	227	301	94				
% floaters:	*42%*	*11%*	*78%*	*11%*	*0%*	*100%*	*1%*				
High Yield	674	136	30	140		27	341				
% floaters:	*56%*	*5%*	*67%*	*9%*		*96%*	*92%*				
Rule 144a	902	179	18	7	10	89	599	1222	45	749	428
Inv. Grade	291	115	12	4	10	78	72	655	21	529	105
% floaters:	*46%*	*21%*	*75%*	*25%*	*10%*	*99%*	*29%*	*98%*	*76%*	*99%*	*95%*
High Yield	611	64	6	3		11	527	567	24	220	323
% floaters:	*82%*	*6%*	*50%*	*33%*		*100%*	*91%*	*95%*	*83%*	*98%*	*93%*
Avg. Maturity	Jan-23	Feb-15	Jun-16	Feb-28	Apr-22	Dec-28	Apr-26	Oct-25	Jan-30	Jun-19	Jun-36
Registered	Aug-21	Dec-14	Jun-16	Dec-27	Apr-22	Feb-28	Apr-23				
Rule 144a	Dec-25	Jul-15	Jan-17	Mar-31	Mar-22	Feb-32	Jun-28	Oct-25	Jan-30	Jun-19	Jun-36
Vintage (<4;4-6;>6)	38%/14%/48%	93%/6%/1%	35%/38%/27%	1%/4%/95%	32%/16%/52%	22%/27%/51%	20%/8%/72%	9%/54%/37%	16%/22%/62%	9%/61%/30%	6%/47%/47%
Registered	38%/16%/46%	92%/7%/1%	34%/38%/28%	0%/3%/97%	32%/17%/51%	22%/29%/49%	18%/7%/75%				
Inv. Grade	43%/22%/35%	90%/10%/0%	31%/39%/30%	0%/2%/98%	32%/17%/51%	18%/31%/51%	44%/21%/35%				
High Yield	30%/5%/65%	96%/2%/2%	53%/30%/17%	0%/4%/96%		66%/12%/22%	11%/3%/86%				
Rule 144a	38%/10%/52%	96%/4%/0%	56%/40%/4%	43%/14%/43%	30%/0%/70%	24%/20%/56%	22%/9%/69%	9%/54%/37%	16%/22%/62%	9%/61%/30%	6%/47%/47%
Inv. Grade	56%/15%/29%	95%/4%/1%	42%/52%/6%	25%/25%/50%	30%/0%/70%	18%/20%/62%	43%/24%/33%	6%/53%/41%	24%/19%/57%	7%/59%/34%	1%/27%/72%
High Yield	29%/7%/64%	98%/2%/0%	83%/17%/0%	67%/0%/33%		64%/18%/18%	19%/7%/74%	11%/56%/33%	8%/25%/67%	16%/64%/20%	8%/53%/39%
Avg. Coupon Rate	3.09%	2.52%	1.61%	6.83%	5.42%	1.11%	3.97%	1.81%	2.36%	1.66%	2.00%
Registered	3.08%	2.34%	1.58%	6.86%	5.43%	0.99%	3.77%				
Rule 144a	3.11%	2.98%	1.99%	5.82%	5.28%	1.53%	4.14%	1.81%	2.36%	1.66%	2.00%
Avg. Factor	54.67%	77.60%	97.68%	49.91%	45.48%	78.10%	23.15%	87.76%	74.03%	90.50%	84.40%
Registered	61.11%	77.20%	97.90%	49.68%	45.89%	78.42%	23.64%				
Rule 144a	41.06%	78.64%	94.74%	56.81%	36.17%	76.93%	22.79%	87.76%	74.03%	90.50%	84.40%

Legend: Traded securities refer to issues with at least two opposite trades with customers at most 2 weeks apart in the sample period. For each instrument we take average of each characteristic within each instrument group. Vintage percentages represent relative percentage of securities with less than 4 years in between first coupon update date and the trade execution date, in between 4 and 6 years, and more than 6 years, respectively.

Table 2b: ABS and CDO Trading Characteristics

Characteristic:	**ABS Overall**	Auto	Card	ManH	SBA	Stud	Other	**CDO Overall**	CBO	CLO	CDO
Avg. Trades per Day	0.097	0.132	0.215	0.033	0.091	0.069	0.072	0.026	0.056	0.025	0.025
Registered	0.108	0.139	0.194	0.033	0.089	0.067	0.103				
Inv. Grade	0.117	0.140	0.202	0.032	0.089	0.069	0.124				
High Yield	0.092	0.137	0.136	0.033		0.047	0.098				
Rule 144a	0.074	0.113	0.499	0.030	0.139	0.078	0.048	0.026	0.056	0.025	0.025
Inv. Grade	0.118	0.121	0.562	0.024	0.139	0.079	0.083	0.028	0.079	0.024	0.039
High Yield	0.053	0.099	0.375	0.037		0.074	0.044	0.024	0.035	0.027	0.021
# of Dealers	6.03	8.25	9.94	3.02	5.27	5.71	4.59	2.38	3.44	2.34	2.33
Registered	6.74	8.51	9.90	3.06	5.26	5.67	6.40				
Rule 144a	4.54	7.56	10.56	1.86	5.40	5.84	3.28	2.38	3.44	2.34	2.33
% Interdealer Trades	13.20%	11.50%	13.81%	10.91%	18.91%	17.48%	11.53%	8.57%	7.38%	8.59%	8.66%
Registered	13.62%	10.02%	13.78%	11.21%	18.79%	16.96%	13.30%				
Rule 144a	12.31%	15.36%	14.24%	2.12%	21.68%	19.40%	10.25%	8.57%	7.38%	8.59%	8.66%
Trade Sizes (R/M/I)	14%/29%/57%	11%/35%/54%	12%/27%/61%	32%/26%/42%	4%/32%/64%	9%/27%/64%	21%/24%/55%	2%/8%/90%	20%/17%/63%	0%/6%/94%	1%/10%/89%
Registered	17%/31%/52%	14%/37%/49%	14%/30%/56%	33%/25%/42%	5%/34%/61%	10%/25%/65%	32%/26%/42%				
Inv. Grade	13%/33%/54%	13%/38%/49%	14%/30%/56%	21%/42%/37%	5%/34%/61%	10%/25%/65%	28%/34%/38%				
High Yield	27%/26%/47%	15%/33%/52%	20%/27%/53%	38%/18%/44%		5%/27%/68%	33%/23%/44%				
Rule 144a	3%/24%/73%	2%/31%/67%	0%/13%/87%	0%/35%/65%	1%/10%/89%	7%/34%/59%	3%/20%/77%	2%/8%/90%	20%/17%/63%	0%/6%/94%	1%/10%/89%
Inv. Grade	3%/27%/70%	2%/31%/67%	0%/14%/86%	0%/40%/60%	1%/10%/89%	7%/36%/57%	5%/26%/69%	1%/8%/91%	5%/26%/69%	0%/5%/95%	1%/10%/89%
High Yield	2%/21%/77%	2%/31%/67%	1%/11%/88%	0%/30%/70%		2%/17%/81%	3%/19%/78%	4%/9%/87%	50%/%/48%	1%/9%/90%	1%/10%/89%

Legend: Traded securities refer to issues with at least two opposite trades with customers at most 2 weeks apart in the sample period. For each instrument we take average of each characteristic within each instrument group. Trade sizes percentages represent proportion of retail-size trades (R) less than $100,000 of original par volume, medium-size trades (M) between $100,000 and $1,000,000 of original par volume, and institutional-size trades (I) more than $1,000,000 of original par volume.

Table 3a: CMBS and Non-Agency CMO Security Characteristics

Characteristic:	**CMBS Overall**	IO/PO	Other	**CMO Overall**	IO/PO	PAC/TAC/NAS	SEQ/PT	SUP/Z	Other Senior	Other
Traded Securities	**2967**	**249**	**2718**	**13396**	**326**	**839**	**7129**	**300**	**3687**	**1115**
Registered	1997	94	1903	12355	304	832	6712	295	3534	678
Inv. Grade	928	42	886	2024	34	108	1137	23	681	41
% floaters:	*32%*	*100%*	*29%*	*65%*	*76%*	*12%*	*72%*	*22%*	*60%*	*93%*
High Yield	1069	52	1017	10331	270	724	5575	272	2853	637
% floaters:	*39%*	*100%*	*36%*	*71%*	*79%*	*25%*	*78%*	*31%*	*67%*	*90%*
Rule 144a	970	155	815	1041	22	7	417	5	153	437
Inv. Grade	411	104	307	110	3	2	86		19	
% floaters:	*71%*	*100%*	*61%*	*80%*	*67%*	*50%*	*81%*		*79%*	
High Yield	559	51	508	931	19	5	331	5	134	437
% floaters:	*63%*	*100%*	*59%*	*85%*	*74%*	*40%*	*77%*	*40%*	*69%*	*97%*
Avg. Maturity	Mar-39	Jun-40	Jan-39	Mar-35	Jan-36	Mar-35	Jul-35	Dec-34	Feb-35	Jun-33
Registered	Apr-40	Nov-40	Mar-40	Mar-35	Oct-35	Mar-35	Jun-35	Dec-34	Jan-35	Dec-32
Rule 144a	Dec-36	Mar-40	Apr-36	Dec-35	Jun-39	Dec-32	Mar-37	Jul-36	Dec-36	Mar-34
Vintage (<4;4-6;>6)	34%/33%/33%	48%/22%/30%	33%/34%/33%	10%/42%/48%	17%/49%/34%	2%/54%/44%	9%/49%/42%	5%/43%/52%	12%/36%/52%	14%/10%/76%
Registered	31%/34%/36%	54%/21%/25%	30%/34%/36%	8%/44%/48%	15%/51%/34%	2%/54%/44%	7%/50%/43%	4%/43%/53%	11%/36%/53%	15%/12%/73%
Inv. Grade	6%/43%/51%	4%/41%/55%	6%/43%/51%	1%/17%/82%	0%/26%/74%	0%/19%/81%	1%/24%/75%	0%/15%/85%	1%/7%/92%	0%/3%/97%
High Yield	53%/25%/22%	94%/4%/2%	51%/26%/23%	10%/49%/41%	17%/54%/29%	3%/59%/38%	8%/55%/37%	4%/45%/51%	13%/43%/44%	16%/13%/71%
Rule 144a	39%/32%/29%	45%/22%/33%	38%/34%/28%	29%/23%/48%	45%/26%/29%	0%/67%/33%	41%/39%/20%	60%/40%/0%	44%/25%/31%	12%/6%/82%
Inv. Grade	32%/33%/35%	23%/31%/46%	35%/33%/32%	12%/45%/43%	0%/33%/67%	0%/50%/50%	14%/51%/35%		6%/18%/76%	
High Yield	45%/32%/23%	90%/4%/6%	40%/35%/25%	31%/20%/49%	53%/25%/22%	0%/74%/26%	48%/35%/17%	60%/40%/0%	50%/26%/24%	12%/6%/82%
Avg. Coupon Rate	4.54%	0.88%	4.87%	8.74%	219.75%	5.77%	2.35%	6.40%	4.28%	3.15%
Registered	4.91%	0.99%	5.10%	9.05%	234.00%	5.77%	2.33%	6.43%	4.32%	3.08%
Rule 144a	3.76%	0.81%	4.32%	2.98%	3.14%	5.81%	2.71%	4.71%	3.23%	3.85%
Avg. Factor	85.12%	67.57%	86.73%	52.63%	41.20%	69.19%	58.22%	72.47%	43.71%	31.91%
Registered	85.65%	60.38%	86.90%	53.71%	39.99%	69.21%	58.20%	71.96%	43.33%	42.61%
Rule 144a	84.05%	71.93%	86.35%	39.76%	57.89%	67.61%	58.54%	102.47%	52.48%	15.30%

Legend: Traded securities refer to issues with at least two opposite trades with customers at most 2 weeks apart in the sample period. For each instrument we take average of each characteristic within each instrument group. Vintage percentages represent relative percentage of securities with less than 4 years in between first coupon update date and the trade execution date, in between 4 and 6 years, and more than 6 years, respectively.

Table 3b: CMBS and Non-Agency CMO Trading Characteristics

Characteristic:	**CMBS Overall**	IO/PO	Other	**CMO Overall**	IO/PO	PAC/TAC/NAS	SEQ/PT	SUP/Z	Other Senior	Other
Avg. Trades per Day	0.093	0.032	0.099	0.067	0.028	0.078	0.050	0.125	0.104	0.037
Registered	0.115	0.030	0.119	0.069	0.027	0.079	0.051	0.127	0.106	0.040
Inv. Grade	0.149	0.024	0.155	0.070	0.038	0.052	0.056	0.116	0.099	0.041
High Yield	0.085	0.034	0.088	0.069	0.025	0.083	0.050	0.128	0.107	0.040
Rule 144a	0.048	0.034	0.050	0.036	0.041	0.048	0.033	0.021	0.051	0.032
Inv. Grade	0.067	0.030	0.079	0.036	0.021	0.058	0.034		0.049	
High Yield	0.033	0.043	0.033	0.036	0.045	0.044	0.033	0.021	0.051	0.032
# of Dealers	5.59	2.48	5.88	3.87	2.28	3.38	3.51	7.90	4.86	2.68
Registered	6.79	2.10	7.02	3.97	2.20	3.38	3.55	8.00	4.93	2.82
Rule 144a	3.13	2.72	3.21	2.70	3.36	3.43	2.74	2.00	3.14	2.47
% Interdealer Trades	9.82%	8.11%	9.98%	13.65%	14.35%	11.61%	12.66%	24.97%	15.17%	13.24%
Registered	11.10%	4.36%	11.43%	14.02%	14.27%	11.59%	12.80%	24.98%	15.51%	16.40%
Rule 144a	7.20%	10.39%	6.59%	9.28%	15.51%	14.21%	10.39%	24.67%	7.35%	8.34%
Trade Sizes (R/M/I)	12%/25%/63%	0%/6%/94%	13%/26%/61%	55%/17%/28%	4%/18%/78%	63%/22%/15%	41%/18%/39%	88%/8%/4%	67%/15%/18%	21%/23%/56%
Registered	14%/26%/60%	0%/14%/86%	14%/27%/59%	57%/17%/26%	4%/18%/78%	63%/22%/15%	43%/17%/40%	88%/8%/4%	68%/15%/17%	31%/25%/44%
Inv. Grade	13%/27%/60%	0%/3%/97%	13%/27%/60%	59%/15%/26%	4%/16%/80%	56%/20%/24%	45%/19%/36%	93%/4%/3%	72%/11%/17%	38%/26%/36%
High Yield	16%/25%/59%	0%/20%/80%	16%/25%/59%	56%/17%/27%	4%/19%/77%	64%/22%/14%	42%/17%/41%	88%/8%/4%	68%/16%/16%	31%/25%/44%
Rule 144a	4%/20%/76%	0%/2%/98%	4%/23%/73%	5%/21%/74%	0%/16%/84%	29%/14%/57%	2%/19%/79%	5%/23%/72%	14%/25%/61%	3%/21%/76%
Inv. Grade	4%/20%/76%	0%/2%/98%	5%/23%/72%	1%/17%/82%	0%/0%/100%	0%/0%/100%	1%/16%/83%		0%/22%/78%	
High Yield	2%/20%/78%	0%/2%/98%	3%/22%/75%	6%/21%/73%	0%/17%/83%	43%/22%/35%	3%/20%/77%	5%/23%/72%	16%/26%/58%	3%/21%/76%

Legend: Traded securities refer to issues with at least two opposite trades with customers at most 2 weeks apart in the sample period. For each instrument we take average of each characteristic within each instrument group. Trade sizes percentages represent proportion of retail-size trades (R) less than $100,000 of original par volume, medium-size trades (M) between $100,000 and $1,000,000 of original par volume, and institutional-size trades (I) more than $1,000,000 of original par volume.

Table 4: Cumulative Inventory Changes by Product Types

	Registered							Rule 144a						
Category:	Overall Avg.	Avg. (+)	Num.	Avg. (-)	Num.	#Zero	Total Sec.	Overall Avg.	Avg. (+)	Num.	Avg. (-)	Num.	#Zero	Total Sec.
ABS Overall	-$20.9MM	$10.8MM	510	$58.8MM	772	623	1905	-$19.6MM	$24.1MM	218	$57.7MM	397	287	902
AUTO	-$52.5MM	$3.4MM	120	$96.4MM	258	88	466	-$42.0MM	$25.2MM	40	$74.8MM	114	25	179
CARD	-$23.9MM	$15.2MM	95	$71.2MM	102	46	243	-$41.4MM	$9.2MM	5	$87.8MM	9	4	18
MANU	-$0.1MM	$7.6MM	42	$6.9MM	48	116	206	-$4.3MM	$0.0MM	0	$10.0MM	3	4	7
SBA	-$15.1MM	$3.3MM	49	$58.9MM	61	117	227	-$60.6MM	$0.0MM	0	$121.0MM	5	5	10
STUD	-$5.8MM	$17.3MM	93	$22.9MM	153	82	328	-$6.3MM	$20.4MM	37	$39.9MM	33	19	89
Other ABS	-$9.7MM	$14.3MM	111	$38.8MM	150	174	435	-$13.7MM	$25.3MM	136	$49.9MM	233	230	599
CDO/CBO/CLO								-$1.9MM	$11.6MM	302	$19.9MM	292	628	1222
CBO								-$8.9MM	$11.9MM	14	$63.3MM	9	22	45
CLO								-$1.8MM	$12.0MM	156	$16.0MM	200	393	749
CDO								-$1.4MM	$11.0MM	132	$24.5MM	83	213	428
CMBS Overall	$8.4MM	$88.8MM	554	$43.9MM	737	706	1997	-$39.5MM	$61.9MM	191	$140.0MM	358	421	970
IO/PO	-$128.0MM	$72.8MM	8	$324.0MM	39	47	94	-$176.0MM	$355.0MM	27	$519.0MM	71	57	155
P/I	$15.2MM	$89.0MM	546	$28.3MM	698	659	1903	-$13.5MM	$13.6MM	164	$46.2MM	287	364	815
Non-Agency CMO	-$5.6MM	$19.7MM	2634	$36.1MM	3341	6380	12355	-$11.4MM	$27.4MM	196	$56.2MM	307	538	1041
IO/PO	$40.2MM	$412.0MM	43	$108.0MM	51	210	304	-$107.0MM	$207.0MM	6	$299.0MM	12	4	22
PAC/TAC/NAS	-$0.3MM	$4.8MM	133	$4.8MM	189	510	832	-$1.0MM	$8.0MM	1	$7.6MM	2	4	7
SEQ/PT	-$10.9MM	$13.1MM	1401	$48.1MM	1902	3409	6712	-$7.6MM	$30.9MM	78	$51.0MM	109	230	417
SUP/Z	$0.0MM	$1.8MM	81	$1.4MM	109	105	295	$3.5MM	$17.3MM	1	$0.0MM	0	4	5
Other Senior	-$2.1MM	$16.5MM	847	$22.5MM	952	1735	3534	-$9.1MM	$9.4MM	34	$40.9MM	42	77	153
Other	$0.0MM	$8.9MM	129	$8.5MM	138	411	678	-$11.4MM	$18.1MM	76	$44.9MM	142	219	437

Legend: Mean Ending Inventory refers to the aggregate dealer ending inventory of a security of a particular class, after all opposite transactions with customers have been matched, averaged across securities. Pos. (+) and Neg. (-) columns show conditional mean inventory changes. Negative average ending inventory means higher volume was sold than bought by aggregate dealer during the sample period. Possibly dealers had initial non-zero inventories in the beginning of the sample, that we do not take into account. Number of securities is reported for each sign of the ending inventory.

Table 5: Mean Client Spreads by Transaction Sizes

	Investment Grade				High Yield			
	ABS	**CDO**	**CMBS**	**N-A CMO**	**ABS**	**CDO**	**CMBS**	**N-A CMO**
Overall	**0.378**	**0.397**	**0.271**	**2.871**	**0.846**	**1.512**	**0.746**	**3.463**
	(0.009)	(0.036)	(0.012)	(0.027)	(0.029)	(0.128)	(0.028)	(0.018)
Retail	1.400	1.197	1.023	3.828	2.066	3.711	2.868	4.333
	(0.056)	(0.614)	(0.049)	(0.034)	(0.075)	(1.482)	(0.113)	(0.021)
	1763	11	1651	6896	901	15	1099	33432
Non-Retail	0.233	0.390	0.163	1.566	0.546	1.472	0.389	2.180
	(0.006)	(0.036)	(0.011)	(0.036)	(0.029)	(0.127)	(0.023)	(0.029)
	12475	1278	11446	5052	3660	814	6532	22667
Difference	F = 433.3	F = 1.9	F = 294.3	F = 2121.2	F = 361.4	F = 2.4	F = 458.9	F = 3541.4
	(p=0.000)	(p=0.169)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.120)	(p=0.000)	(p=0.000)
Registered	**0.418**		**0.275**	**3.011**	**1.016**		**0.684**	**3.546**
	(0.011)		(0.012)	(0.027)	(0.034)		(0.027)	(0.018)
Retail	1.423		0.995	3.829	2.116		2.761	4.337
	(0.057)		(0.048)	(0.034)	(0.075)		(0.106)	(0.021)
	1701		1554	6890	857		1062	33339
Non-Retail	0.246		0.157	1.734	0.568		0.275	2.284
	(0.007)		(0.011)	(0.040)	(0.032)		(0.020)	(0.031)
	9946		9549	4411	2099		5395	20904
Difference	F = 418.4		F = 284.6	F = 1618.7	F = 358.9		F = 530.9	F = 2942.9
	(p=0.000)		(p=0.000)	(p=0.000)	(p=0.000)		(p=0.000)	(p=0.000)
Rule 144a	**0.196**	**0.397**	**0.253**	**0.425**	**0.532**	**1.512**	**1.091**	**1.057**
	(0.016)	(0.036)	(0.035)	(0.049)	(0.053)	(0.128)	(0.101)	(0.056)
Retail	0.751	1.197	1.470	2.423	1.098	3.711	5.925	3.023
	(0.207)	(0.614)	(0.305)	(1.205)	(0.404)	(1.482)	(1.365)	(0.364)
	62	11	97	6	44	15	37	93
Non-Retail	0.182	0.390	0.190	0.407	0.516	1.472	0.933	0.953
	(0.015)	(0.036)	(0.033)	(0.048)	(0.053)	(0.127)	(0.091)	(0.054)
	2529	1278	1897	641	1561	814	1137	1763
Difference	F = 7.6	F = 1.9	F = 17.6	F = 3.3	F = 2.1	F = 2.4	F = 13.7	F = 32.0
	(p=0.006)	(p=0.169)	(p=0.000)	(p=0.068)	(p=0.149)	(p=0.120)	(p=0.000)	(p=0.000)
Reg-Rule Diff.	F = 137.0		F = 0.3	F = 2133.2	F = 59.9		F = 15.1	F = 1813.3
	(p=0.000)		(p=0.555)	(p=0.000)	(p=0.000)		(p=0.000)	(p=0.000)

Legend: A retail trade corresponds to less than $100,000 of original par traded on **either side** of transactions with customers in each matched pair. P-values for the null of spreads being zero are shown in brackets. The sample is from May 16, 2011 to February 29, 2012. Standard errors are shown in brackets.

Table 6a: ABS and CDO Mean Client Spreads by Transaction Sizes

ABS

Sell Size

Buy Size	ABS Investment Grade								ABS High Yield							
	ABS Registered				ABS Rule 144a				ABS Registered				ABS Rule 144a			
	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall
Retail	1.339	1.322	1.616	**1.361**	0.597	2.411	0.029	**0.790**	2.170	1.956	3.168	**2.242**	0.917	1.865	2.337	**1.190**
	(0.059)	(0.259)	(0.321)	(0.060)	(0.165)	(0.880)	(0.362)	(0.210)	(0.116)	(0.148)	(0.351)	(0.095)	(0.505)	(0.843)	(1.527)	(0.460)
	1167	125	119	1411	31	7	7	45	421	117	69	607	26	2	5	33
Med.	1.711	0.276	0.287	**0.330**	0.923	0.386	0.258	**0.352**	1.640	0.563	0.788	**0.749**	0.773	0.593	1.281	**0.731**
	(0.238)	(0.013)	(0.036)	(0.015)	(0.993)	(0.062)	(0.043)	(0.045)	(0.149)	(0.054)	(0.145)	(0.051)	(0.415)	(0.087)	(0.364)	(0.100)
	138	2993	718	3849	8	488	228	724	122	613	144	879	4	286	71	361
Large	1.741	0.328	0.209	**0.263**	0.400	0.190	0.107	**0.119**	1.971	0.835	0.488	**0.670**	0.852	0.662	0.437	**0.455**
	(0.227)	(0.024)	(0.008)	(0.010)	(0.513)	(0.038)	(0.011)	(0.011)	(0.166)	(0.118)	(0.042)	(0.041)	(1.402)	(0.279)	(0.063)	(0.062)
	152	935	5300	6387	9	236	1577	1822	128	224	1118	1470	7	85	1119	1211
Overall	**1.416**	**0.321**	**0.245**	**0.418**	**0.614**	**0.342**	**0.126**	**0.196**	**2.035**	**0.797**	**0.660**	**1.016**	**0.890**	**0.616**	**0.495**	**0.532**
	(0.057)	(0.014)	(0.010)	(0.011)	(0.211)	(0.045)	(0.011)	(0.016)	(0.084)	(0.050)	(0.046)	(0.034)	(0.434)	(0.092)	(0.063)	(0.053)
	1457	4053	6137	11647	48	731	1812	2591	671	954	1331	2956	37	373	1195	1605

CDO/CBO/CLO

Sell Size

Buy Size	CDO/CBO/CLO Investment Grade								CDO/CBO/CLO High Yield							
	CDO Rule 144a				CBO/CLO Rule 144a				CDO Rule 144a				CBO/CLO Rule 144a			
	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall	Retail	Med.	Large	Overall
Retail					4.010		0.062	**2.036**	11.429			**11.429**	1.782			**1.782**
					(0.000)		(0.000)	(1.974)	(5.714)			(5.714)	(0.562)			(0.562)
					1		1	2	3			3	12			12
Med.	4.241	0.506	0.452	**0.779**	0.472	0.360	0.731	**0.464**		3.298	1.268	**2.868**		0.007	-0.634	**-0.124**
	(0.000)	(0.250)	(0.294)	(0.287)	(0.235)	(0.121)	(0.402)	(0.139)		(0.751)	(1.634)	(0.688)		(0.520)	(1.494)	(0.508)
	2	23	2	27	2	91	35	128		41	11	52		47	12	59
Large		0.326	0.623	**0.608**	-0.066	0.719	0.308	**0.314**		4.870	2.422	**2.476**		1.985	0.431	**0.463**
		(0.412)	(0.113)	(0.109)	(0.479)	(0.367)	(0.037)	(0.037)		(2.169)	(0.208)	(0.210)		(0.690)	(0.126)	(0.125)
		12	229	241	5	18	868	891		8	355	363		7	333	340
Overall	**4.241**	**0.444**	**0.621**	**0.625**	**0.578**	**0.420**	**0.324**	**0.337**	**11.429**	**3.555**	**2.387**	**2.589**	**1.782**	**0.263**	**0.394**	**0.417**
	(0.000)	(0.214)	(0.112)	(0.102)	(0.576)	(0.117)	(0.039)	(0.037)	(5.714)	(0.716)	(0.208)	(0.207)	(0.562)	(0.468)	(0.132)	(0.128)
	2	35	231	268	8	109	904	1021	3	49	366	418	12	54	345	411

Legend: A retail trade corresponds to less than $100,000 of original par traded. An institutional trade corresponds to more than $1,000,000 of original par traded. Empty cells stand for less than ten spread observations in the particular sample. In each cell the mean spread is shown with its standard errors in brackets and number of observations in each category. The sample is from May 16, 2011 to February 29, 2012.

Table 6b: CMBS and Non-Agency CMO Mean Client Spreads by Transaction Sizes

CMBS

Buy Size	Sell Size: CMBS Investment Grade – CMBS Registered – Retail	Med.	Large	Overall	CMBS Investment Grade – CMBS Rule 144a – Retail	Med.	Large	Overall	CMBS High Yield – CMBS Registered – Retail	Med.	Large	Overall	CMBS High Yield – CMBS Rule 144a – Retail	Med.	Large	Overall
Retail	1.129	0.678	0.861	**1.038**	0.978	3.248	0.328	**1.379**	2.825	2.406	2.667	**2.776**	3.569	0.070	-0.100	**2.953**
	(0.059)	(0.152)	(0.138)	(0.052)	(0.477)	(0.770)	(0.224)	(0.322)	(0.122)	(0.463)	(0.403)	(0.114)	(1.533)	(0.070)	(0.000)	(1.292)
	904	114	232	1250	33	20	23	76	718	68	90	876	19	3	1	23
Med.	0.880	0.290	0.257	**0.300**	2.721	0.360	0.324	**0.377**	2.106	0.319	0.420	**0.431**	0.957	0.843	0.366	**0.772**
	(0.244)	(0.018)	(0.046)	(0.019)	(1.091)	(0.089)	(0.202)	(0.089)	(0.379)	(0.037)	(0.085)	(0.039)	(0.559)	(0.184)	(0.269)	(0.159)
	97	2115	811	3023	5	279	130	414	81	1180	321	1582	4	212	39	255
Large	0.785	0.158	0.095	**0.124**	1.513	0.037	0.158	**0.162**	3.142	0.347	0.238	**0.326**	14.748	1.245	0.960	**1.134**
	(0.141)	(0.040)	(0.015)	(0.015)	(1.002)	(0.091)	(0.036)	(0.035)	(0.405)	(0.080)	(0.025)	(0.027)	(2.476)	(0.594)	(0.107)	(0.120)
	207	835	5788	6830	16	135	1353	1504	105	405	3489	3999	10	63	823	896
Overall	**1.050**	**0.268**	**0.140**	**0.275**	**1.298**	**0.392**	**0.175**	**0.253**	**2.797**	**0.412**	**0.309**	**0.684**	**6.640**	**0.926**	**0.932**	**1.091**
	(0.054)	(0.018)	(0.015)	(0.012)	(0.426)	(0.079)	(0.037)	(0.035)	(0.113)	(0.040)	(0.026)	(0.027)	(1.484)	(0.194)	(0.103)	(0.101)
	1208	3064	6831	11103	54	434	1506	1994	904	1653	3900	6457	33	278	863	1174

Non-Agency CMO

Buy Size	Sell Size: CMO Investment Grade – CMO Registered – Retail	Med.	Large	Overall	CMO Investment Grade – CMO Rule 144a – Retail	Med.	Large	Overall	CMO High Yield – CMO Registered – Retail	Med.	Large	Overall	CMO High Yield – CMO Rule 144a – Retail	Med.	Large	Overall
Retail	3.736	5.578	3.831	**3.799**	2.423			**2.423**	4.211	3.953	3.171	**4.162**	3.265	5.141	1.670	**3.427**
	(0.039)	(0.238)	(0.356)	(0.038)	(1.205)			(1.205)	(0.023)	(0.061)	(0.164)	(0.022)	(0.534)	(2.122)	(0.335)	(0.531)
	5419	191	101	5711	6			6	20573	2325	528	23426	41	9	5	55
Med.	3.682	2.112	2.279	**2.572**		0.459	0.430	**0.454**	4.045	2.609	3.704	**3.317**	2.009	1.037	1.494	**1.136**
	(0.123)	(0.102)	(0.280)	(0.079)		(0.108)	(0.383)	(0.115)	(0.042)	(0.054)	(0.268)	(0.037)	(0.546)	(0.103)	(0.391)	(0.100)
	448	1015	106	1569		128	32	160	4968	5467	653	11088	27	363	34	424
Large	4.152	3.918	1.051	**2.064**		0.130	0.400	**0.391**	5.460	4.289	1.546	**2.943**	3.489	1.745	0.872	**0.938**
	(0.077)	(0.105)	(0.038)	(0.040)		(0.206)	(0.052)	(0.051)	(0.090)	(0.091)	(0.039)	(0.037)	(0.648)	(0.262)	(0.065)	(0.064)
	731	630	2660	4021		15	466	481	4945	2990	11794	19729	11	70	1296	1377
Overall	**3.778**	**3.092**	**1.194**	**3.011**	**2.423**	**0.425**	**0.402**	**0.425**	**4.386**	**3.365**	**1.721**	**3.546**	**2.867**	**1.233**	**0.891**	**1.057**
	(0.034)	(0.076)	(0.040)	(0.027)	(1.205)	(0.099)	(0.054)	(0.049)	(0.023)	(0.040)	(0.039)	(0.018)	(0.350)	(0.107)	(0.064)	(0.056)
	6598	1836	2867	11301	6	143	498	647	30486	10782	12975	54243	79	442	1335	1856

Legend: A retail trade corresponds to less than $100,000 of original par traded. An institutional trade corresponds to more than $1,000,000 of original par traded. Empty cells stand for less than ten spread observations in the particular sample. In each cell the mean spread is shown with its standard errors in brackets and number of observations in each category. The sample is from May 16, 2011 to February 29, 2012.

Table 7a: Distribution of Total Client Non-Retail Bid-Ask Spreads

Roundtrip Spreads:	Obs.	**Mean**	**St. Dev.**	10th Perc.	25th Perc.	**Median**	75th Perc.	90th Perc.
ABS	16,135	**0.304**	1.041	-0.024	0.006	**0.057**	0.303	0.894
Registered	12,045	0.302	0.871	-0.014	0.008	0.058	0.326	0.895
Rule 144a	4,090	0.310	1.427	-0.085	0.000	0.052	0.251	0.888
Investment Grade	12,475	0.233	0.691	-0.025	0.006	0.047	0.243	0.770
Registered	9,946	0.246	0.672	-0.015	0.008	0.048	0.262	0.802
Rule 144a	2,529	0.182	0.756	-0.094	0.000	0.043	0.193	0.590
High Yield	3,660	0.546	1.753	-0.016	0.004	0.115	0.531	1.548
Registered	2,099	0.568	1.459	-0.004	0.016	0.155	0.622	1.523
Rule 144a	1,561	0.516	2.084	-0.035	0.000	0.072	0.398	1.587
Overall CDO (R144a)	2,092	**0.811**	2.531	0.000	0.000	**0.158**	0.740	2.586
CDO	681	1.772	3.505	-0.003	0.066	0.535	1.965	5.556
CBO/CLO	1,411	0.347	1.708	0.000	0.000	0.121	0.424	1.339
Investment Grade	1,278	0.390	1.296	0.000	0.021	0.136	0.494	1.391
CDO	266	0.598	1.648	-0.573	0.071	0.302	0.879	2.163
CBO/CLO	1,012	0.335	1.182	0.000	0.008	0.127	0.372	1.058
High Yield	814	1.472	3.623	-0.020	0.000	0.321	1.791	5.556
CDO	415	2.525	4.121	0.000	0.000	0.829	3.293	9.201
CBO/CLO	399	0.376	2.604	-0.660	0.000	0.061	0.678	2.678
CMBS	17,978	**0.245**	1.470	-0.609	0.000	**0.110**	0.454	1.180
Registered	14,944	0.200	1.258	-0.607	0.000	0.104	0.430	1.096
Rule 144a	3,034	0.469	2.226	-0.612	0.000	0.145	0.625	1.663
Investment Grade	11,446	0.163	1.177	-0.653	-0.029	0.097	0.410	1.059
Registered	9,549	0.157	1.120	-0.644	-0.023	0.095	0.395	1.020
Rule 144a	1,897	0.190	1.428	-0.738	-0.068	0.112	0.485	1.250
High Yield	6,532	0.389	1.868	-0.518	0.000	0.133	0.535	1.418
Registered	5,395	0.275	1.468	-0.541	0.000	0.122	0.476	1.218
Rule 144a	1,137	0.933	3.079	-0.450	0.000	0.223	0.930	2.599
Non-Agency CMO	27,719	**2.068**	4.121	0.000	0.172	**0.882**	3.113	5.076
Registered	25,315	2.188	4.246	0.000	0.199	0.995	3.252	5.191
Rule 144a	2,404	0.807	2.057	0.000	0.000	0.193	1.000	2.716
Investment Grade	5,052	1.566	2.535	0.004	0.126	0.518	2.444	4.609
Registered	4,411	1.734	2.631	0.061	0.144	0.683	2.736	4.823
Rule 144a	641	0.407	1.204	0.000	0.000	0.070	0.326	1.241
High Yield	22,667	2.180	4.389	0.000	0.194	0.985	3.266	5.144
Registered	20,904	2.284	4.507	0.000	0.217	1.049	3.328	5.247
Rule 144a	1,763	0.953	2.272	0.000	0.016	0.271	1.302	3.175

Legend: Client Bid-Ask Spreads include one-shot round-trips with no interdealer trades involved, chains involving multiple interdealer rounds, both non-split matches (same volume traded through a chain) and splits (matches of unequal sizes). The sample is from May 16, 2011 to February 29, 2012. The 1% tails of the Bid-Ask spreads within each product type, placement type and investment grade are winsorized to reduce influence of outliers. Spreads are adjusted for coupon and factor payments.

Table 7b: Total Client Non-Retail Bid-Ask Spreads for Pre- and Post-Release Samples

	Pre-Release				Post-Release				Difference	
Roundtrip Spreads:	Obs.	**Mean**	**St. Dev.**	Median	Obs.	**Mean**	**St. Dev.**	Median	**Mean** Equality Test	**Median** Equality Test
ABS	8,228	**0.294**	0.979	0.056	7,907	**0.314**	1.100	0.057	F = 1.48 (p=0.22)	F = 0.16 (p=0.69)
Registered	6,337	0.302	0.808	0.061	5,708	0.302	0.936	0.054	F = 0.00 (p=0.99)	F = 4.48 (p=0.03)
Rule 144a	1,891	0.268	1.410	0.039	2,199	0.345	1.441	0.063	F = 2.96 (p=0.09)	F = 28.07 (p=0.00)
Investment Grade	6,324	0.222	0.640	0.047	6,151	0.245	0.738	0.048	F = 3.30 (p=0.07)	F = 0.37 (p=0.54)
Registered	5,152	0.238	0.632	0.050	4,794	0.254	0.713	0.047	F = 1.42 (p=0.23)	F = 1.20 (p=0.27)
Rule 144a	1,172	0.151	0.671	0.033	1,357	0.210	0.822	0.056	F = 3.95 (p=0.05)	F = 15.47 (p=0.00)
High Yield	1,904	0.534	1.646	0.117	1,756	0.558	1.862	0.112	F = 0.17 (p=0.68)	F = 0.14 (p=0.71)
Registered	1,185	0.579	1.288	0.178	914	0.553	1.655	0.127	F = 0.15 (p=0.70)	F = 4.09 (p=0.04)
Rule 144a	719	0.460	2.106	0.056	842	0.564	2.065	0.094	F = 0.95 (p=0.33)	F = 5.60 (p=0.02)
Overall CDO (R144a)	1,073	**0.920**	2.849	0.141	1,019	**0.696**	2.142	0.173	F = 4.15 (p=0.04)	F = 3.03 (p=0.08)
CDO	419	1.963	3.732	0.554	262	1.466	3.089	0.475	F = 3.55 (p=0.06)	F = 0.59 (p=0.44)
CBO/CLO	654	0.251	1.806	0.093	757	0.429	1.614	0.137	F = 3.77 (p=0.05)	F = 10.26 (p=0.00)
Investment Grade	649	0.333	1.331	0.131	629	0.448	1.258	0.151	F = 2.55 (p=0.11)	F = 4.02 (p=0.05)
CDO	162	0.617	1.615	0.318	104	0.568	1.706	0.287	F = 0.05 (p=0.82)	F = 0.48 (p=0.49)
CBO/CLO	487	0.238	1.209	0.102	525	0.425	1.150	0.137	F = 6.31 (p=0.01)	F = 6.88 (p=0.01)
High Yield	424	1.818	4.065	0.321	390	1.095	3.031	0.322	F = 8.36 (p=0.00)	F = 0.00 (p=0.98)
CDO	257	2.812	4.386	0.893	158	2.057	3.614	0.757	F = 3.62 (p=0.06)	F = 0.12 (p=0.73)
CBO/CLO	167	0.288	2.924	0.000	232	0.440	2.352	0.122	F = 0.30 (p=0.58)	F = 15.20 (p=0.00)
CMBS	9,159	**0.172**	1.521	0.084	8,819	**0.322**	1.412	0.138	F = 47.17 (p=0.00)	F = 91.89 (p=0.00)
Registered	7,488	0.110	1.268	0.079	7,456	0.290	1.242	0.131	F = 76.21 (p=0.00)	F = 70.76 (p=0.00)
Rule 144a	1,671	0.445	2.321	0.120	1,363	0.498	2.103	0.191	F = 0.42 (p=0.52)	F = 12.07 (p=0.00)
Investment Grade	5,821	0.095	1.188	0.075	5,625	0.233	1.162	0.124	F = 39.25 (p=0.00)	F = 54.17 (p=0.00)
Registered	4,783	0.090	1.137	0.075	4,766	0.226	1.099	0.119	F = 35.25 (p=0.00)	F = 34.99 (p=0.00)
Rule 144a	1,038	0.122	1.397	0.075	859	0.274	1.462	0.141	F = 5.31 (p=0.02)	F = 15.48 (p=0.00)
High Yield	3,338	0.304	1.965	0.100	3,194	0.478	1.757	0.179	F = 14.24 (p=0.00)	F = 54.90 (p=0.00)
Registered	2,705	0.147	1.470	0.088	2,690	0.403	1.454	0.163	F = 41.37 (p=0.00)	F = 34.05 (p=0.00)
Rule 144a	633	0.977	3.253	0.178	504	0.879	2.846	0.265	F = 0.29 (p=0.59)	F = 4.79 (p=0.03)
Non-Agency CMO	13,832	**2.192**	4.678	0.894	13,887	**1.945**	3.474	0.873	F = 25.05 (p=0.00)	F = 0.38 (p=0.54)
Registered	12,680	2.317	4.834	1.005	12,635	2.059	3.554	0.995	F = 23.50 (p=0.00)	F = 0.25 (p=0.62)
Rule 144a	1,152	0.821	1.864	0.169	1,252	0.795	2.220	0.236	F = 0.10 (p=0.75)	F = 13.86 (p=0.00)
Investment Grade	2,617	1.766	2.815	0.550	2,435	1.350	2.174	0.486	F = 34.80 (p=0.00)	F = 1.81 (p=0.18)
Registered	2,283	1.971	2.932	0.755	2,128	1.480	2.238	0.634	F = 39.49 (p=0.00)	F = 3.11 (p=0.08)
Rule 144a	334	0.364	1.033	0.063	307	0.454	1.366	0.078	F = 0.87 (p=0.35)	F = 0.37 (p=0.54)
High Yield	11,215	2.292	5.009	0.994	11,452	2.071	3.679	0.979	F = 14.27 (p=0.00)	F = 0.32 (p=0.57)
Registered	10,397	2.393	5.156	1.060	10,507	2.176	3.754	1.042	F = 12.10 (p=0.00)	F = 0.21 (p=0.65)
Rule 144a	818	1.008	2.083	0.245	945	0.906	2.425	0.300	F = 0.90 (p=0.34)	F = 2.54 (p=0.11)

Legend: The Pre-Release Sample is from May 16, 2011 to October 17, 2011 and the Post-Release Sample is from October 18, 2011 to February 29, 2012. The 1% tails of the Bid-Ask spreads within each product type, placement type and investment grade are winsorized to reduce influence of outliers. Spreads are adjusted for coupon and factor payments.

Table 8a: Total Client Non-Retail Bid-Ask Spreads by ABS and CDO/CBO/CLO Categories

Category:	**ABS Overall**	Auto	Card	ManH	SBA	Stud	Other	**CDO Overall**	CBO	CLO	CDO
Overall	**0.304**	**0.075**	**0.062**	**1.224**	**0.713**	**0.467**	**0.558**	**0.811**	**0.251**	**0.358**	**1.772**
	(0.008)	(0.003)	(0.006)	(0.129)	(0.014)	(0.038)	(0.027)	(0.055)	(0.055)	(0.051)	(0.134)
Registered	0.302	0.072	0.078	1.294	0.714	0.511	0.553				
	(0.008)	(0.003)	(0.007)	(0.124)	(0.014)	(0.050)	(0.026)				
	12045	4001	3143	268	1522	1127	1984				
Rule 144a	0.310	0.087	-0.011	-0.211	0.668	0.342	0.563	0.811	0.251	0.358	1.772
	(0.022)	(0.008)	(0.009)	(1.115)	(0.075)	(0.034)	(0.049)	(0.055)	(0.055)	(0.051)	(0.134)
	4090	1193	659	13	56	392	1777	2092	155	1256	681
Difference	F = 0.1	F = 3.0	F = 62.5	F = 1.9	F = 0.4	F = 7.8	F = 0.0				
	(p=0.747)	(p=0.083)	(p=0.000)	(p=0.165)	(p=0.543)	(p=0.005)	(p=0.859)				
Investment Grade	**0.233**	**0.072**	**0.057**	**0.960**	**0.713**	**0.443**	**0.344**	**0.390**	**0.220**	**0.352**	**0.598**
	(0.006)	(0.003)	(0.006)	(0.160)	(0.014)	(0.033)	(0.025)	(0.036)	(0.032)	(0.042)	(0.101)
Registered	0.246	0.068	0.072	0.985	0.714	0.468	0.323				
	(0.007)	(0.003)	(0.007)	(0.169)	(0.014)	(0.043)	(0.022)				
	9946	3287	2982	111	1522	1063	981				
Rule 144a	0.182	0.088	-0.012	0.560	0.668	0.367	0.378	0.390	0.220	0.352	0.598
	(0.015)	(0.010)	(0.009)	(0.221)	(0.075)	(0.037)	(0.055)	(0.036)	(0.032)	(0.042)	(0.101)
	2529	885	645	7	56	342	594	1278	131	881	266
Difference	F = 15.0	F = 3.8	F = 55.7	F = 2.5	F = 0.4	F = 3.2	F = 0.8				
	(p=0.000)	(p=0.052)	(p=0.000)	(p=0.114)	(p=0.543)	(p=0.072)	(p=0.362)				
High Yield	**0.546**	**0.088**	**0.179**	**1.415**		**0.766**	**0.712**	**1.472**	**0.420**	**0.374**	**2.525**
	(0.029)	(0.008)	(0.030)	(0.190)		(0.301)	(0.042)	(0.127)	(0.315)	(0.137)	(0.202)
Registered	0.568	0.090	0.189	1.512		1.226	0.778				
	(0.032)	(0.009)	(0.031)	(0.172)		(0.527)	(0.046)				
	2099	714	161	157		64	1003				
Rule 144a	0.516	0.085	0.063	-1.111		0.176	0.657	1.472	0.420	0.374	2.525
	(0.053)	(0.015)	(0.090)	(2.468)		(0.078)	(0.068)	(0.127)	(0.315)	(0.137)	(0.202)
	1561	308	14	6		50	1183	814	24	375	415
Difference	F = 0.7	F = 0.1	F = 1.9	F = 1.3		F = 3.9	F = 2.2				
	(p=0.405)	(p=0.764)	(p=0.174)	(p=0.250)		(p=0.052)	(p=0.138)				
Grade Difference	**F = 111.2**	**F = 3.6**	**F = 16.6**	**F = 3.4**		**F = 1.1**	**F = 56.1**	**F = 67.2**	**F = 0.4**	**F = 0.0**	**F = 72.6**
	(p=0.000)	(p=0.059)	(p=0.000)	(p=0.067)		(p=0.286)	(p=0.000)	(p=0.000)	(p=0.523)	(p=0.881)	(p=0.000)
Registered	F = 97.5	F = 5.0	F = 13.7	F = 4.8		F = 2.1	F = 79.2				
	(p=0.000)	(p=0.025)	(p=0.000)	(p=0.030)		(p=0.149)	(p=0.000)				
Rule 144a	F = 37.1	F = 0.0	F = 0.8	F = 0.5		F = 4.9	F = 10.2	F = 67.2	F = 0.4	F = 0.0	F = 72.6
	(p=0.000)	(p=0.847)	(p=0.384)	(p=0.511)		(p=0.027)	(p=0.001)	(p=0.000)	(p=0.523)	(p=0.881)	(p=0.000)

Legend: Client Bid-Ask Spreads include one-shot round-trips with no interdealer trades involved, chains involving multiple interdealer rounds, both non-split matches (same volume traded through a chain) and splits (matches of unequal sizes). The sample is from May 16, 2011 to February 29, 2012. The 1% tails of the Bid-Ask spreads within each product sub-type, placement type and investment grade are removed. Standard errors are shown in brackets.

Table 8b: Total Client Non-Retail Bid-Ask Spreads by CMBS and CMO Categories

Category:	CMBS Overall	IO/PO	Other	CMO Overall	IO/PO	PAC/TAC/NAS	SEQ/PT	SUP/Z	Other Senior	Other
Overall	**0.245**	**0.351**	**0.243**	**2.068**	**3.130**	**2.760**	**2.075**	**2.679**	**1.857**	**1.919**
	(0.011)	(0.114)	(0.011)	(0.025)	(0.196)	(0.060)	(0.041)	(0.175)	(0.028)	(0.103)
Registered	0.200	0.156	0.200	2.188	3.346	2.768	2.137	2.675	1.942	2.853
	(0.010)	(0.248)	(0.010)	(0.027)	(0.214)	(0.060)	(0.043)	(0.179)	(0.029)	(0.165)
	14944	116	14828	25315	466	1939	13198	267	8130	1315
Rule 144a	0.469	0.478	0.468	0.807	1.110	1.006	1.174	2.849	0.479	0.591
	(0.040)	(0.097)	(0.043)	(0.042)	(0.216)	(0.495)	(0.062)	(0.698)	(0.115)	(0.061)
	3034	179	2855	2404	50	9	914	6	500	925
Difference	F = 41.6	F = 1.5	F = 37.6	F = 771.4	F = 54.5	F = 14.0	F = 160.8	F = 0.1	F = 152.7	F = 165.6
	(p=0.000)	(p=0.227)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.794)	(p=0.000)	(p=0.000)
Inv. Grade	**0.163**	**0.464**	**0.159**	**1.566**	**3.783**	**1.777**	**1.707**	**1.436**	**1.632**	**0.498**
	(0.011)	(0.127)	(0.011)	(0.036)	(0.580)	(0.165)	(0.051)	(0.587)	(0.062)	(0.054)
Registered	0.157	0.407	0.156	1.734	4.345	1.811	1.771	1.436	1.693	1.109
	(0.011)	(0.331)	(0.011)	(0.040)	(0.641)	(0.168)	(0.054)	(0.587)	(0.065)	(0.115)
	9549	37	9512	4411	38	160	2671	8	1286	248
Rule 144a	0.190	0.482	0.171	0.407	0.737	0.387	0.888		0.630	0.056
	(0.033)	(0.131)	(0.034)	(0.048)	(0.509)	(0.219)	(0.114)		(0.183)	(0.021)
	1897	117	1780	641	7	4	209		78	343
Difference	F = 0.9	F = 0.0	F = 0.2	F = 460.0	F = 20.0	F = 31.3	F = 48.7		F = 30.4	F = 80.6
	(p=0.342)	(p=0.832)	(p=0.678)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)		(p=0.000)	(p=0.000)
High Yield	**0.389**	**0.228**	**0.393**	**2.180**	**3.067**	**2.851**	**2.169**	**2.717**	**1.900**	**2.429**
	(0.023)	(0.194)	(0.023)	(0.029)	(0.208)	(0.063)	(0.050)	(0.179)	(0.031)	(0.136)
Registered	0.275	0.038	0.278	2.284	3.258	2.854	2.230	2.713	1.989	3.259
	(0.020)	(0.329)	(0.020)	(0.031)	(0.225)	(0.063)	(0.053)	(0.183)	(0.032)	(0.199)
	5395	79	5316	20904	428	1779	10527	259	6844	1067
Rule 144a	0.933	0.470	0.960	0.953	1.171	1.501	1.259	2.849	0.451	0.907
	(0.091)	(0.135)	(0.096)	(0.054)	(0.238)	(0.845)	(0.073)	(0.698)	(0.132)	(0.094)
	1137	62	1075	1763	43	5	705	6	422	582
Difference	F = 49.7	F = 1.5	F = 48.2	F = 454.2	F = 40.9	F = 3.2	F = 116.3		F = 128.5	F = 113.9
	(p=0.000)	(p=0.228)	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.075)	(p=0.000)		(p=0.000)	(p=0.000)
Grade Diff.	**F = 78.3**	**F = 1.0**	**F = 83.0**	**F = 178.2**	**F = 1.4**	**F = 37.2**	**F = 42.0**	**F = 4.9**	**F = 14.9**	**F = 173.9**
	(p=0.000)	(p=0.309)	(p=0.000)	(p=0.000)	(p=0.242)	(p=0.000)	(p=0.000)	(p=0.028)	(p=0.000)	(p=0.000)
Registered	F = 26.0	F = 0.6	F = 28.7	F = 119.0	F = 2.6	F = 33.9	F = 36.9	F = 4.8	F = 17.0	F = 87.2
	(p=0.000)	(p=0.430)	(p=0.000)	(p=0.000)	(p=0.107)	(p=0.000)	(p=0.000)	(p=0.029)	(p=0.000)	(p=0.000)
Rule 144a	F = 58.6	F = 0.0	F = 59.8	F = 57.5	F = 0.7	F = 1.6	F = 7.5		F = 0.6	F = 77.4
	(p=0.000)	(p=0.947)	(p=0.000)	(p=0.000)	(p=0.423)	(p=0.248)	(p=0.006)		(p=0.425)	(p=0.000)

Legend: Client Bid-Ask Spreads include one-shot round-trips with no interdealer trades involved, chains involving multiple interdealer rounds, both non-split matches (same volume traded through a chain) and splits (matches of unequal sizes). The sample is from May 16, 2011 to February 29, 2012. The 1% tails of the Bid-Ask spreads within each product sub-type, placement type and investment grade are removed. Standard errors are shown in brackets.

Table 9: Definitions of Control Variables used in Regressions

4-6 Years Vintage Dummy	The number of years between the first coupon or first Moody's rating date and the trade execution date
> 6 Years Vintage Dummy	The number of years between the first coupon or first Moody's rating date and the trade execution date
Investment Grade Dummy	Dummy variable which is equal to one if the instrument is rated as investment grade
Security Specific Match Volume	The average logarithm of matched trade volume for the instrument standardized by subtracting the instrument category mean volume and dividing by the instrument category standard deviation
Deviation of Particular Match	The standardized matched log(volume) for the transaction less the average standardized matched log(volume) for the particular instrument
Floating Coupon Dummy	Dummy variable equal to one if the instrument has a floating coupon rate and zero otherwise
Number of Trades in Sample	The total number of opposite matches found for this particular security during the sample period
Gap in Execution Time	The number of days between the two matched transactions with customers of opposite sides
Number of Dealers	The number of dealers active in the instrument's trading
Proportion of Interdealer Trades	The number of trades between dealers divided by the total number of trades in the instrument during the sample period
Dealers Importance Dummy	The 5%-top most important dummy based on the centrality measure: The measure of dealers' activity and participation in interdealer trades in particular product is averaged across all dealers who participated in a chain of transactions underlying each total client spread observation.
Dealers Coreness	The dealer-specific coreness value, normalized by the size of the interdealer market within each product sub-type, demeaned and standardized within each submarket
Dealers Degree Residual	The difference between dealer-specific degree centrality and coreness, normalized by the size of the interdealer market within each product sub-type, demeaned and standardized within each submarket
Number of Rounds in the Deal	The number of rounds in the chain of transactions underlying each total client spread observation (C-D-C = 1 round, C-D-D-C = 2 rounds, C-D-D-D-C = 3 etc.)

Table 10a: Fixed-Effects Regression for Non-Retail Total Client Spreads (Part 1)

Categories:	**ABS**					**CDO/CBO/CLO**	
Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*	Variables:	**CDO**	**CBO/CLO**
4-6 Years Vintage Dummy	**0.155** (0.030)	0.067 (0.026)	0.380 (0.106)	F = 8.25 p = 0.004	*4-6 Years Vintage Dummy*	-0.481 (0.751)	0.096 (0.143)
> 6 year Vintage Dummy	**0.144** (0.029)	0.127 (0.026)	0.143 (0.086)	F = 0.03 p = 0.857	*> 6 year Vintage Dummy*	-0.477 (0.742)	0.266 (0.140)
Investment Grade Dummy	**-0.185** (0.029)	-0.196 (0.032)	-0.157 (0.062)	F = 0.30 p = 0.584	*Investment Grade Dummy*	-1.702 (0.260)	0.008 (0.138)
Security Specific Match Volume	**-0.138** (0.022)	-0.132 (0.022)	-0.191 (0.046)	F = 1.31 p = 0.252	*Security Specific Match Volume*	-0.472 (0.179)	-0.103 (0.067)
Deviation of Particular Match	**-0.052** (0.009)	-0.052 (0.009)	-0.059 (0.019)	F = 0.13 p = 0.722	*Deviation of Particular Match*	0.004 (0.234)	0.007 (0.088)
Floating Coupon Dummy	**0.054** (0.017)	0.057 (0.019)	0.096 (0.048)	F = 0.60 p = 0.438	*Floating Coupon Dummy*	-0.762 (0.659)	-0.268 (0.185)
Number of Trades in Sample	**-0.077** (0.018)	-0.038 (0.016)	-0.135 (0.046)	F = 3.88 p = 0.049	*Number of Trades in Sample*	-0.379 (0.276)	-0.113 (0.084)
Gap in Execution Time	**0.002** (0.002)	0.002 (0.002)	-0.002 (0.005)	F = 0.71 p = 0.398	*Gap in Execution Time*	-0.007 (0.057)	-0.041 (0.025)
Number of Dealers	**0.003** (0.002)	-0.004 (0.002)	0.014 (0.009)	F = 4.19 p = 0.041	*Number of Dealers*	0.019 (0.080)	0.025 (0.043)
Proportion of Interdealer Trades	**0.131** (0.070)	0.163 (0.091)	0.079 (0.144)	F = 0.24 p = 0.621	*Proportion of Interdealer Trades*	-0.483 (0.979)	-0.181 (0.403)
Dealers Importance Dummy	**-0.275** (0.040)	-0.214 (0.038)	-0.399 (0.105)	F = 2.72 p = 0.099	*Dealers Importance Dummy*	0.216 (0.352)	-0.731 (0.173)
Number of Rounds in the Deal	**0.163** (0.016)	0.174 (0.019)	0.150 (0.028)	F = 0.48 p = 0.491	*Number of Rounds in the Deal*	0.931 (0.358)	0.087 (0.192)
Auto	0.595 (0.052)	0.536 (0.060)	0.683 (0.113)		CDOs	3.663 (0.964)	----
Card	0.565 (0.060)	0.526 (0.068)	0.658 (0.145)		CBO	----	1.367 (0.309)
ManH	1.421 (0.136)	1.448 (0.134)	0.168 (1.072)		CLO	----	1.264 (0.306)
SBA	1.084 (0.057)	1.012 (0.066)	1.094 (0.122)				
Stud	0.776 (0.069)	0.788 (0.089)	0.702 (0.119)				
Other	0.856 (0.059)	0.814 (0.066)	0.910 (0.118)				

Legend: The Regression includes fixed-effects for each of the subcategories and placement types (Registered or Rule 144a). S.E. shown in brackets. To test the equality of slope coefficients for Registered and Rule 144a securities within each category Wald tests are performed with F-statistics and p-values reported for each variable.

Table 10b: Fixed-Effects Regression for Non-Retail Total Client Spreads (Part 2)

Categories:	**CMBS**					**Non-Agency CMO**		
Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*	Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*
4-6 Years Vintage Dummy	**0.312** (0.041)	0.187 (0.041)	0.515 (0.115)	F = 7.22 p = 0.007	*4-6 Years Vintage Dummy*	**0.753** (0.077)	0.414 (0.096)	0.637 (0.121)	F = 2.07 p = 0.150
> 6 year Vintage Dummy	**0.109** (0.036)	-0.001 (0.035)	0.409 (0.159)	F = 6.37 p = 0.012	*> 6 year Vintage Dummy*	**0.635** (0.071)	0.279 (0.092)	0.379 (0.127)	F = 0.41 p = 0.523
Investment Grade Dummy	**-0.185** (0.030)	-0.087 (0.028)	-0.516 (0.096)	F = 18.58 p = 0.000	*Investment Grade Dummy*	**-0.728** (0.047)	-0.658 (0.053)	-0.468 (0.088)	F = 3.47 p = 0.062
Security Specific Match Volume	**-0.055** (0.037)	-0.039 (0.029)	0.058 (0.095)	F = 0.96 p = 0.327	*Security Specific Match Volume*	**-0.477** (0.035)	-0.833 (0.044)	-0.074 (0.076)	F = 73.83 p = 0.000
Deviation of Particular Match	**-0.109** (0.014)	-0.117 (0.014)	-0.048 (0.045)	F = 2.15 p = 0.143	*Deviation of Particular Match*	**-0.354** (0.050)	-0.474 (0.056)	-0.442 (0.113)	F = 0.06 p = 0.804
Floating Coupon Dummy	**0.117** (0.026)	0.105 (0.026)	-0.098 (0.102)	F = 3.72 p = 0.054	*Floating Coupon Dummy*	**0.183** (0.046)	0.299 (0.050)	-0.237 (0.117)	F = 17.85 p = 0.000
Number of Trades in Sample	**-0.137** (0.027)	-0.092 (0.022)	-0.207 (0.076)	F = 2.13 p = 0.144	*Number of Trades in Sample*	**0.119** (0.026)	0.012 (0.028)	-0.032 (0.062)	F = 0.42 p = 0.516
Gap in Execution Time	**-0.010** (0.003)	-0.009 (0.003)	-0.006 (0.012)	F = 0.07 p = 0.797	*Gap in Execution Time*	**0.075** (0.012)	0.082 (0.013)	0.015 (0.020)	F = 8.04 p = 0.005
Number of Dealers	**-0.002** (0.005)	-0.004 (0.004)	0.003 (0.016)	F = 0.16 p = 0.686	*Number of Dealers*	**-0.092** (0.007)	-0.087 (0.008)	-0.022 (0.014)	F = 17.00 p = 0.000
Proportion of Interdealer Trades	**-0.161** (0.097)	-0.377 (0.080)	1.392 (0.638)	F = 7.57 p = 0.006	*Proportion of Interdealer Trades*	**0.853** (0.216)	0.554 (0.228)	0.492 (0.360)	F = 0.02 p = 0.884
Dealers Importance Dummy	**-0.506** (0.063)	-0.431 (0.047)	-0.616 (0.203)	F = 0.78 p = 0.376	***Dealers Importance Dummy***	**-0.114** (0.061)	0.035 (0.065)	-0.481 (0.130)	F = 12.61 p = 0.000
Number of Rounds in the Deal	**0.071** (0.015)	0.056 (0.014)	0.418 (0.116)	F = 9.66 p = 0.002	*Number of Rounds in the Deal*	**1.264** (0.059)	1.262 (0.063)	0.670 (0.099)	F = 25.64 p = 0.000
P/I	1.113 (0.066)	0.952 (0.053)	1.486 (0.217)		IO/PO	1.829 (0.195)	2.222 (0.212)	1.580 (0.511)	
IO/PO	0.843 (0.126)	0.561 (0.252)	1.341 (0.224)		PAC/TAC/NAS	1.183 (0.112)	1.994 (0.132)	0.773 (0.649)	
					SEQ/PT	1.408 (0.090)	2.022 (0.110)	1.444 (0.161)	
					SUP/Z	1.930 (0.185)	2.913 (0.202)	3.047 (1.054)	
					Other Senior	1.237 (0.097)	2.106 (0.118)	0.849 (0.224)	
					Other	1.145 (0.123)	2.110 (0.177)	1.254 (0.212)	

Legend: The Regression includes fixed-effects for each of the subcategories and placement types (Registered or Rule 144a). S.E. shown in brackets. To test the equality of slope coefficients for Registered and Rule 144a securities within each category Wald tests are performed with F-statistics and p-values reported for each variable.

Table 11a: Fixed-Effects Regression for Non-Retail Dealer Spreads (Part 1)

Categories:	**ABS**					**CDO/CBO/CLO**	
Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*	Variables:	**CDO**	**CBO/CLO**
4-6 Years Vintage Dummy	**0.140** (0.023)	0.068 (0.019)	0.383 (0.083)	F = 13.61 p = 0.000	*4-6 Years Vintage Dummy*	-0.833 (0.749)	0.216 (0.089)
> 6 year Vintage Dummy	**0.108** (0.020)	0.095 (0.017)	0.144 (0.065)	F = 0.53 p = 0.468	*> 6 year Vintage Dummy*	-1.020 (0.732)	0.187 (0.097)
Investment Grade Dummy	**-0.164** (0.022)	-0.176 (0.024)	-0.141 (0.050)	F = 0.41 p = 0.524	*Investment Grade Dummy*	-1.466 (0.214)	-0.143 (0.091)
Security Specific Match Volume	**-0.115** (0.015)	-0.119 (0.014)	-0.134 (0.034)	F = 0.17 p = 0.679	*Security Specific Match Volume*	-0.353 (0.149)	-0.118 (0.046)
Deviation of Particular Match	**-0.037** (0.006)	-0.044 (0.006)	-0.017 (0.015)	F = 2.88 p = 0.089	*Deviation of Particular Match*	0.164 (0.213)	0.062 (0.066)
Floating Coupon Dummy	**0.053** (0.013)	0.058 (0.014)	0.081 (0.035)	F = 0.36 p = 0.551	*Floating Coupon Dummy*	-0.213 (0.528)	-0.163 (0.171)
Number of Trades in Sample	**-0.065** (0.012)	-0.023 (0.011)	-0.152 (0.031)	F = 15.00 p = 0.000	*Number of Trades in Sample*	-0.728 (0.233)	-0.125 (0.056)
Gap in Execution Time	**0.006** (0.002)	0.004 (0.002)	0.012 (0.005)	F = 1.95 p = 0.162	*Gap in Execution Time*	0.042 (0.063)	0.009 (0.016)
Number of Dealers	**0.002** (0.002)	-0.005 (0.002)	0.016 (0.005)	F = 14.53 p = 0.000	*Number of Dealers*	0.066 (0.068)	-0.009 (0.023)
Proportion of Interdealer Trades	**0.145** (0.043)	-0.009 (0.047)	0.348 (0.100)	F = 10.41 p = 0.001	*Proportion of Interdealer Trades*	1.683 (1.009)	0.243 (0.205)
Dealers Coreness	**-0.052** (0.011)	-0.040 (0.011)	-0.075 (0.029)	F = 1.28 p = 0.258	***Dealers Coreness***	0.278 (0.137)	-0.117 (0.050)
Dealers Degree Residual	**-0.034** (0.007)	-0.028 (0.007)	-0.045 (0.019)	F = 0.68 p = 0.410	***Dealers Degree Residual***	-0.488 (0.141)	-0.041 (0.035)
Auto	0.371 (0.029)	0.373 (0.031)	0.333 (0.057)		CDOs	3.884 (0.851)	----
Card	0.353 (0.037)	0.362 (0.039)	0.376 (0.093)		CBO	----	0.793 (0.210)
ManH	1.181 (0.111)	1.271 (0.111)	-0.035 (0.717)		CLO	----	0.645 (0.201)
SBA	0.709 (0.040)	0.712 (0.040)	0.804 (0.111)				
Stud	0.541 (0.043)	0.597 (0.052)	0.412 (0.080)				
Other	0.597 (0.038)	0.606 (0.037)	0.545 (0.067)				

Legend: The Regression includes fixed-effects for each of the subcategories and placement types (Registered or Rule 144a). S.E. shown in brackets. To test the equality of slope coefficients for Registered and Rule 144a securities within each category Wald tests are performed with F-statistics and p-values reported for each variable.

Table 11b: Fixed-Effects Regression for Non-Retail Dealer Spreads (Part 2)

Categories:	**CMBS**					**Non-Agency CMO**			
Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*	Variables:	**Overall**	*Reg.*	*R144a*	*Slopes Eq.*
4-6 Years Vintage Dummy	**0.305** (0.031)	0.201 (0.029)	0.526 (0.097)	F = 10.41 p = 0.001	*4-6 Years Vintage Dummy*	**0.723** (0.044)	0.491 (0.053)	0.655 (0.104)	F = 1.99 p = 0.158
> 6 year Vintage Dummy	**0.080** (0.028)	-0.005 (0.025)	0.323 (0.129)	F = 6.22 p = 0.013	*> 6 year Vintage Dummy*	**0.614** (0.044)	0.366 (0.053)	0.384 (0.105)	F = 0.02 p = 0.882
Investment Grade Dummy	**-0.170** (0.023)	-0.080 (0.020)	-0.510 (0.081)	F = 26.60 p = 0.000	*Investment Grade Dummy*	**-0.535** (0.028)	-0.455 (0.029)	-0.421 (0.074)	F = 0.19 p = 0.666
Security Specific Match Volume	**-0.004** (0.026)	0.020 (0.019)	0.024 (0.070)	F = 0.00 p = 0.951	*Security Specific Match Volume*	**-0.333** (0.020)	-0.533 (0.024)	-0.069 (0.065)	F = 44.85 p = 0.000
Deviation of Particular Match	**-0.103** (0.011)	-0.098 (0.010)	-0.097 (0.042)	F = 0.00 p = 0.979	*Deviation of Particular Match*	**-0.356** (0.027)	-0.438 (0.029)	-0.280 (0.077)	F = 3.69 p = 0.055
Floating Coupon Dummy	**0.162** (0.019)	0.136 (0.018)	-0.049 (0.081)	F = 4.95 p = 0.026	*Floating Coupon Dummy*	**0.202** (0.027)	0.266 (0.028)	-0.113 (0.086)	F = 17.33 p = 0.000
Number of Trades in Sample	**-0.129** (0.020)	-0.096 (0.016)	-0.169 (0.066)	F = 1.17 p = 0.280	*Number of Trades in Sample*	**0.150** (0.014)	0.085 (0.015)	-0.102 (0.056)	F = 10.55 p = 0.001
Gap in Execution Time	**-0.004** (0.003)	-0.004 (0.003)	-0.001 (0.010)	F = 0.08 p = 0.782	*Gap in Execution Time*	**0.106** (0.008)	0.113 (0.009)	0.067 (0.020)	F = 4.68 p = 0.031
Number of Dealers	**-0.002** (0.004)	-0.001 (0.003)	-0.006 (0.013)	F = 0.12 p = 0.730	*Number of Dealers*	**-0.062** (0.003)	-0.058 (0.003)	-0.007 (0.014)	F = 12.88 p = 0.000
Proportion of Interdealer Trades	**0.143** (0.056)	-0.052 (0.047)	1.355 (0.398)	F = 12.32 p = 0.000	*Proportion of Interdealer Trades*	**0.653** (0.080)	0.504 (0.084)	0.404 (0.273)	F = 0.12 p = 0.726
Dealers Coreness	**-0.052** (0.015)	-0.027 (0.010)	-0.102 (0.049)	F = 2.25 p = 0.134	***Dealers Coreness***	**0.146** (0.021)	0.150 (0.022)	0.063 (0.052)	F = 2.36 p = 0.125
Dealers Degree Residual	**-0.004** (0.011)	-0.021 (0.009)	0.057 (0.043)	F = 3.08 p = 0.079	***Dealers Degree Residual***	**-0.004** (0.021)	0.039 (0.023)	-0.332 (0.047)	F = 50.69 p = 0.000
P/I	0.638 (0.027)	0.528 (0.023)	1.042 (0.113)		IO/PO	1.066 (0.130)	1.420 (0.141)	0.816 (0.220)	
IO/PO	0.589 (0.105)	0.343 (0.202)	1.070 (0.142)		PAC/TAC/NAS	1.013 (0.068)	1.571 (0.079)	0.810 (0.336)	
					SEQ/PT	0.979 (0.056)	1.448 (0.068)	0.908 (0.097)	
					SUP/Z	1.366 (0.103)	2.049 (0.112)	0.994 (0.540)	
					Other Senior	0.875 (0.065)	1.485 (0.076)	0.561 (0.140)	
					Other	0.871 (0.079)	1.625 (0.114)	0.920 (0.142)	

Legend: The Regression includes fixed-effects for each of the subcategories and placement types (Registered or Rule 144a). S.E. shown in brackets. To test the equality of slope coefficients for Registered and Rule 144a securities within each category Wald tests are performed with F-statistics and p-values reported for each variable.