Information Sensitivity Dynamics of Privately-Produced Safe Assets: Evidence from Subprime Securitization*

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Abstract

Subprime securitizations were designed to produce safe AAA bonds by insulating them from the risks associated with the underlying mortgages. Yet, the bonds became risky during the financial crisis of 2007-2009. We provide evidence that following the arrival of negative public news about subprime mortgage values, investors produced private information to discriminate across deals and AAA bonds became sensitive to their underlying pool collateral. The opacity of subprime deals amplified these effects. Prior to the shock, AAA bonds were largely insensitive to their pool collateral. These findings are consistent with information-based models of financial crises where negative shocks alter the information sensitivity dynamics of safe securities.

Keywords: Financial Crisis, Information sensitivity, Collateral, Opacity, Safe Assets, Subprime, Securitization

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1 Introduction

Safe assets are "money-like" debt securities that trade close to or at par. They play an important role in the economy by facilitating the exchange of goods, services, or assets, serving as a store of value, and as collateral in financial contracts. Examples of safe assets include debt issued by the government (treasury securities) and by the private sector (bank deposits, asset-backed commercial paper, repurchase agreements, etc.). A distinguishing feature of safe assets is that the costs of producing information about their payoffs exceed the benefits. They are, in this sense, "informationally *insensitive*" (Dang et al., 2015). There are no incentives to produce private information on their underlying collateral. All market participants are aware of this and take the price or fair value of the safe asset as a given with "no questions asked" (Holmström, 2015).

Safe assets can, however, become "informationally *sensitive*." When negative public news about underlying collateral values arrives and their price declines, decreasing the distance to default, the benefits associated with producing private information about their expected payoffs increase. When the benefits are sufficiently large to incentivize sophisticated investors to produce private information to discriminate "good" from "bad" collateral, safe assets can switch from being "informationally *insensitive*" to being "informationally *sensitive*." Adverse selection concerns can set in when efforts to restore information insensitivity, such as increasing the underlying collateral or making it more costly for investors to obtain information about their payoffs, prove to be insufficient. In the extreme, a run on the safe asset can occur. Such information sensitivity and information production dynamics play a critical role in information-based models of financial crises (Gorton and Ordonez, 2014; Dang et al., 2017) where shock-induced regime shifts in the information sensitivity of safe assets characterize a financial crisis.[1]

In this paper, we examine the information sensitivity and information production dynamics of a privately-produced safe asset – AAA-rated subprime Residential Mortgage Backed Securities (RMBS) that played a key role in the financial crisis of 2007-2009. Subprime securitizations were structured to produce safe securities in the form of AAA-rated RMBS (bonds or tranches) that could be posted as collateral in the interbank repurchase (repo) and derivatives markets. As with other securitizations, the underlying mortgage pool's cash flows were tranched such that the majority of the RMBS issued were senior, AAA-rated bonds. To protect the AAA bonds from the cash flow risks of the underlying subprime mortgages and preserve their rating, subprime securitizations employed a unique design feature – they provided dynamic credit enhancement to the AAA bonds using various trips and triggers to redistribute principal and interest payments from the underlying mortgages to the various tranches when pool performance deteriorated.

Subprime RMBS traded in an inter-dealer market away from public view. The introduction of ABX indices (credit derivatives that referenced an equally weighted portfolio of 20 subprime RMBS tranches) in 2006 provided for the first time a publicly observable market where aggregate subprime values and risks could be observed. In 2007, the ABX indices started to decline, revealing emerging risks in the subprime market. As Figure 3 shows, the AAA bonds, which had traded

[1]See Dang et al. (2020b) for a review of the "information view" of financial crises.

close to par up until then, also declined. However, they did not decline uniformly. As Figure 4 shows, some bonds declined more than others. Using hand-collected data from monthly remittance reports filed by trustees on deals, we examine whether their decline was related to how exposed they were to their underlying pool collateral.

The exposure individual AAA bonds had to losses in their underlying pools depended on their subordination. Subordination was both deal and bond specific in that it reflected the dynamic credit enhancement features of the deal – the triggers and reprioritization of cash flows that were unique to the deal. As Figure 5 shows, AAA bond subordination increased as underlying pool performance deteriorated in an attempt to restore information insensitivity. We find that bonds that had higher subordination declined less following the decline in the ABX (crisis period). In contrast, prior to the decline in the ABX (pre-crisis period), they were insensitive to their subordination. These findings are not influenced by which ABX (sub)index we use to define the crisis period and are stronger for AAA bonds tranched from pools with lower credit quality (lower average borrower FICO scores or higher proportion of adjustable rate mortgages (ARMs)). They indicate that AAA bond prices became informationally sensitive following the decline in the ABX.

The decline in the ABX was a publicly observable negative shock to collateral values that signaled to market participants that there were risks emerging in the subprime market. But, its decline did not reveal which pools were expected to suffer losses, nor how exposed the individual tranches were to the risks in the underlying pool. We examine whether the increased information sensitivity of AAA bonds following the decline in the ABX incentivized investors to produce private information on subprime deals.

Subprime deals were complex, their complexity a natural consequence of tranching safe securities from risky cash flows (Gorton and Metrick, 2013). They were also opaque. Originators provided limited information on the underlying pool, and whatever information investors could obtain from rating agencies was coarse (Ashcraft et al., 2011).[2] Detailed loan level information was available from data providers but expensive. Only sophisticated investors with the resources and the capabilities to analyze such granular information could use it to produce private information (Hanson and Sunderam, 2013; Pagano and Volpin, 2012). Such investors relied on a platform called Intex for the cash flow models required to conduct the bottom-up (loan-level up) analysis on deals and determine tranche level exposures. Importantly, Intex periodically updated its cash flow models and deal collateral information. These updates allowed investors to revise their cash flow projections as and when new information became available.

To determine whether sophisticated investors used the updates to revise their cash flow expectations, we examine bond price reactions to the updates. We find no reactions to these updates prior to the decline in the ABX. However, once the ABX started its decline, we find that bond prices reacted significantly to the updates. These results indicate that investors used Intex updates to revise their cash flow models ("produce" new information) during the crisis but not before.

[2]For instance, the prospectus statement only provided summary statistics about the underlying pool.

We explore this implied regime shift in information production surrounding the decline in the ABX by tracking the number of collateral updates issued by Intex on every deal on a monthly basis. We find that both the number of monthly updates as well as the number of deals with updates doubled following the decline in the ABX. These results indicate a shift in information production on subprime deals following the decline in the ABX.

However, opacity is a double-edged sword (Hanson and Sunderam, 2013; Pagano and Volpin, 2012; Gorton and Ordonez, 2014; Monnet and Quintin, 2017; Dang et al., 2017, 2020a). In good times, prior to the arrival of negative public information, it minimizes the adverse selection costs associated with trading the safe asset. By facilitating an equilibrium of "symmetric ignorance" (Dang et al., 2020a), it ensures that unsophisticated investors do not suffer a "winners curse" in the presence of sophisticated investors. Consequently, the safe asset can trade without the fear of adverse selection, at or near par. However, it shifts the adverse selection problem to the bad times by inducing sophisticated investors to unearth information that had been undisclosed or undiscovered in good times, especially if they stand to earn large profits. By doing so, it can cause the price of the safe asset to decline sharply.

To specifically examine how deal opacity influenced the information sensitivity and information production dynamics we construct two measures of opacity. First, we follow Ghent et al. (2019) and use a deal's legal filings to construct static measures that reflect three different dimensions of a deal's complexity, all of which were critical to assessing a bond's subordination—cash flow waterfall structure, pool description, and number of tranches. Second, we construct a dynamic measure of pool performance reporting quality using the monthly variation in reporting across remittance reports and third-party data vendors. We find that the increase in the number of updates following the decline in the ABX was most pronounced for complex deals and deals with poor reporting quality. Furthermore, we find that AAA bonds tranched from such deals became more sensitive to their subordination following the decline in the ABX relative to ones tranched from less opaque deals. These findings indicate that the opacity of subprime deals induced sophisticated investors to produce more information following the decline in the ABX, amplifying the information sensitivity of AAA bonds.

Collectively, our results show that the decline in the ABX indices was a signal event that alerted market participants to emerging risks in the subprime market. This public shock altered the information sensitivity of safe AAA RMBS and incentivized sophisticated investors to produce information to distinguish across deals. They support the view that crises are informational events that alter the dynamics of information production and information sensitivity of safe assets.

An emerging literature provides evidence on this view, of which the two closest ones to our paper are Brancati and Macchiavelli (2019) and Foley-Fisher et al. (2020). Brancati and Macchiavelli (2019) show that during the financial crisis of 2007-2009, the market's expectation of bank default risk (as implied by their CDS spreads) was amplified when analysts produced more precise information (i.e., when there is less dispersion in analyst forecasts) about the bank's future profitability, more so when the bank was already expected to perform poorly. Such effects were not present during the pre-crisis period. Foley-Fisher et al. (2020) show that the shift in the information sensitivity of AAA tranches of Collateralized Loan Obligations (CLOs) coincided with the emergence of adverse selection concerns during the COVID-19 pandemic of 2020. When the pandemic threatened profitability and elevated the risk of downgrades and defaults on leveraged loans (the underlying collateral), AAA tranche prices declined by varying degrees, and disagreement over "marks" (third-party prices used to mark loans to market) rose. Prior to the pandemic, these AAA tranches traded at or close to par.

Two other studies use flow data to illustrate the dynamics of information production and information sensitivity that accompany a financial crisis. Gallagher et al. (2020) examine information production and redemptions in Money Market Mutual Funds (MMMF) exposed to sovereign bond default risk during the Eurozone crisis of 2011-2012. They show that, although all funds experienced redemptions, sophisticated investors withdrew from funds with larger exposures. In response, fund managers rebalanced their portfolios away from such risky sovereign debt to restore the information insensitivity of their shares. Pérignon et al. (2018) examine funding dry-ups from 2008-2014 in the European wholesale funding market in unsecured Certificate of Deposits (CDs). They show that while high-quality banks retain funding from informed investors, weaker banks that are expected to perform poorly lose funding from both uninformed and informed investors (lenders) and that this shift in information sensitivity occurs when negative public information (rating downgrades) becomes available.

Our study differs from this literature in its focus on subprime securitizations and the unique design features employed to produce safe debt. It explicitly shows that subprime AAA RMBS were sensitive to their tranche-specific exposure to underlying mortgage collateral during the financial crisis of 2007-2009. Furthermore, it shows that the opacity of subprime RMBS made it difficult for investors to assess their loss exposure, amplifying the information sensitivity of subprime AAA RMBS.[3]

Our results also provide additional details that inform our understanding of how the risks in the subprime sector set off the financial crisis of 2007. Gorton (2009) documents that the ABX – bond basis, which arbitrage should normally render close to zero, started widening from July 2007 onward. He ascribes the failure of arbitrage to narrow this basis to adverse selection fears by repo counterparties in accepting subprime RMBS as collateral. Our results, which show that collateral opacity made it difficult for investors to assess their loss exposure and amplified the information sensitivity of individual RMBS, confirm the adverse selection problems identified by Gorton (2009) in the repo market, which set off the run in the interbank markets (Gorton and Metrick, 2012). Our results also suggest collateral opacity and the associated difficulty in assessing loss exposure as a possible reason as to why Stanton and Wallace (2011) find the prices of ABX during the crisis to be only weakly correlated with underlying pool performance measures.

The rest of the paper is organized as follows. The institutional details on how

[3]Hanson and Sunderam (2013) argue that securitization blunts investor incentives to build the information production infrastructure needed to analyze collateral (cash flows) when most of the bonds that are tranched are informationally insensitive and that this lack of information infrastructure can exacerbate collapses during bad times.

dynamic credit enhancement was structured to insulate the AAA tranches from the risks in the underlying pool are provided in Section 2, and on the construction of ABX indices in 3. Section 4 provides details on our data-gathering process, sample characteristics, and variable construction. Section 5 presents the empirical results. Section 6 concludes with a summary.

2 Dynamic credit enhancement in subprime securitizations

Subprime securitization involves "pooling" low credit quality, non-conforming, residential mortgage loans and "tranching" the pool's cash flows (i.e., the monthly aggregate principal and interest payments) by issuing RMBS (bonds). Like other prime and Alt-A mortgage securitizations, bonds of varying seniority are issued with a majority being senior AAA-rated bonds, in a "senior/subordinate" structure (alternatively referred to as a "six-pack" structure because there are three mezzanine and three subordinate bonds junior to the senior bonds). The mezzanine and subordinate bonds are tranched to be thick enough to absorb pool losses to justify the AAA rating of the senior bonds. The "cash waterfall", which determines how the bonds are paid, is top-down (losses are allocated bottom-up). The principal is allocated sequentially where only the senior bonds are paid, and the mezzanine and subordinate bonds are "locked out" for a period of time (sequential amortization). Similarly, interest is also paid out monthly and sequentially, beginning with the senior bonds.

A unique feature of subprime securitization is dynamic credit enhancement provided through an "excess spread/overcollaterlization" ("XS/OC") structure that builds the credit enhancement from the pool itself (Gorton and Souleles, 2007). The deal is initially structured such that the principal balance of the loans exceeds that of the bonds – i.e., it is overcollateralized.[4] However, the allocation of this credit enhancement over time depends on a set of triggers linked to pool performance. When defaults and prepayments occur, the OC is used to absorb losses up to a target level. If OC drops below its minimum target level, an acceleration feature is triggered that diverts all excess cash flows to the senior bonds entitled to principal payments in order to accelerate bond amortization. Accelerated amortization reduces the interest paid out on bonds, which is designed to increase excess cash flows in hopes of restoring OC to its target level. The excess spread (XS), which is the difference between the interest earned on the underlying mortgages and that paid out to the bonds, allows this cushion to be built up over time to a target level.[5] Once the target OC level is reached, the XS is paid out to the junior most bondholders and is no longer available to cover losses.

Credit enhancement is also provided through other triggers that reprioritize cash flows depending on pool performance. When the pool is performing well, stepdown provisions convert the cash flow waterfall from a sequential pay to a pro-rata basis after a predetermined "stepdown date." Stepdown provisions reduce the lockout period and begin payments for all bonds, reducing the credit

[4]For example, if an MBS deal that has an outstanding principal amount of $100 is backed by a pool of loans with an outstanding principal amount of $110, then the MBS deal is overcollateralized by $10, which creates a $10 cushion for losses.

[5]The XS is typically between 300 and 400 bps.

enhancement for senior tranches. To protect the senior bonds in the event the pool is not performing well, deals also contain triggers that prevent stepdown from occurring. A stepdown trigger is essentially a credit performance test that is performed by comparing the deal's performance to a predetermined threshold as set forth in the deal documents. The performance test must be passed to ensure the collateral is not underperforming before stepdown can occur.

The most common stepdown triggers are delinquency triggers and cumulative loss triggers. Delinquency triggers are typically based on the amount of 60+ day delinquencies, which are commonly called seriously delinquent loans (SDQ). Although the exact definition of what constitutes a 60+ day delinquent loan varies across deals, the delinquency trigger is always defined as the balance of delinquent loans as a percent of the current pool balance. Delinquency triggers can be static — a constant percent for each bond class, or dynamic — vary with the bond's current subordination. Cumulative loss triggers compare the deal's aggregate realized net loss amount as a percent of the initial pool balance to a loss schedule specified in the deal documents. Similar to the delinquency trigger, exceeding a specific loss level is taken as an indication that the deal is not performing as expected. These stepdown trigger tests —both delinquency and loss —are applied each month. If at least one test fails, stepdown does not occur, preserving the credit enhancement for the senior bonds.

The dynamic credit enhancement features of subprime securitizations cause tranche sizes and subordination levels to vary monthly to insulate the senior bonds from pool losses and make them informationally insensitive. We use the monthly variation in AAA bond subordination in our tests of information sensitivity.

3 The ABX Index

The ABX Index was a credit index created by the IHS Markit Group that provided much-needed transparency to the subprime market. The first vintage of the index was launched in January 2006 with a plan to issue a new vintage every six months.[6] Other credit indices (like the CDX) trading at the time also had a similar "roll" feature, which allowed investors to retain exposure to the most liquid securities. However, the roll feature for the ABX served a different purpose. Through its construction, the ABX provided exposure to a unique mortgage origination profile, which was designed to reflect trends in mortgage quality. Each ABX vintage referenced 20 RMBS deals issued in the previous six months. For example, the first ABX vintage includes RMBS deals issued in the second half of 2005, where the underlying mortgages on these deals originated between March and October 2005.[7] There were only four ABX vintages.[8]

Each ABX vintage had sub-indices. From each of the 20 constituent RMBS deals, five bond classes based on initial credit ratings (AAA, AA, A, BBB, BBB-) were selected to form the five credit subindices (AAA, AA, A, BBB, and BBB- ABX

[6] Markit's plan of a rolling 6-month launch halted after July 2007 with the fourth vintage. RMBS issuances declined in the second half of 2007. Of the ones issued, not enough met the index criteria. Thus, no more vintages were launched.

[7] Likewise, the second vintage included RMBS deals issued in the first 6 months of 2006, which were backed by mortgages with origination dates between September 2005 and April 2006.

[8] These are ABX 2006-1, ABX 2006-2, ABX 2007-1, and ABX 2007-2. The first set of numbers, either 2006 or 2007, indicates the year the vintage was launched, and the number after the hyphen marks whether the index began trading in January (noted by a 1) or in July (noted by a 2).

subindices).[9] Each subindex acted as a single credit default swap (CDS) contract on an equally-weighted portfolio of 20 specific RMBS bonds.

Markit Group constructed the index with the help of sixteen investment banks, who were also the licensed dealers of the ABX.[10] Markit Group gave each investment bank a list of deals to rank. The list included the largest subprime RMBS deals with principal amounts greater than $500 million issued in the previous six months that also released monthly remittance reports on the 25th of each month. Based on the rankings collected from the investment bankers, Markit selected deals for the ABX but took care to ensure no more than four deals came from the same issuer, no more than six deals had the same servicer, and the mortgage pool of each deal had at least 90% first lien loans from borrowers with a FICO credit score of at least 660.[11]

Markit indexed the ABX price to $100 at the launch date, and price changes were determined by the net cash flows of two payment legs of the ABX, which were determined by the underlying RMBS bonds. Fender and Scheicher (2009) provides a simplified formula for ABX index price calculation, which is defined in Equation (1).

[9] Initial credit rating dictated the subindex to which each bond would be included and would remain. No changes were made to subindex composition in response to subsequent bond downgrades (or upgrades).

[10] These banks are Bank of America, Barclays, Bear Stearns, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, Greenwich Capital, JP Morgan, Merrill Lynch, Morgan Stanley, Lehman Brothers, RBS, UBS, and Wachovia.

[11] See Markit ABX Index Rules (URL: http://www.markit.com/Documentation/Product/ABX)

$$
\begin{aligned}
ABX\ Price = \$100 + PV(Coupon\ payments) \\
- PV(Principal\ Writedowns) - PV(Interest\ Shortfalls)
\end{aligned} \tag{1}
$$

The first leg was a fixed payment determined by Markit *before* the index traded based on the present value of the estimated monthly inflow of fixed, no-default coupon payments[12] of the mortgages in the underlying MBS tranches, adjusting for estimated prepayments. The second leg of the cash flows was a floating leg that was determined by future expectations of principal writedowns or interest shortfalls (Fender and Scheicher, 2009). The ABX price was interpreted as a proxy for the average price of the underlying portfolio. For example, a AAA-rated subindex price of $80 implies that the market viewed the referenced AAA-rated bonds as having a weighted average value of 80% of par (Fons, 2009).

4 Data and Descriptive Statistics

We construct our sample of AAA-rated RMBS (bonds) from the deals used to constitute the ABX indices. Using deals in the ABX indices not only ensures a representative sample of the subprime market but provides two additional advantages. First, all deals included in the ABX were required to release remittance reports on the 25$^{\text{th}}$ of each month. This allows us to isolate the effect of the risk rel-

[12]Markit capped the fixed coupon rate at 5.00%. If the market expected that the present value of losses on the underlying RMBS deals would be greater than 5.00%, then the fixed coupon would be set at 5.00%, and the subindex would trade below par to account for the additional expectation of losses.

evant deal and bond-specific information on remittance release dates. Second, as index-constituents, the deals and bonds should be more sensitive to market-wide information relative to idiosyncratic information (Barberis et al., 2005; Vijh, 1994). To the extent that our sample bonds are less likely to reflect deal and bond-specific information, our tests face a higher hurdle in identifying increased informational sensitivity to deal or bond-specific information.

Of the four ABX vintages issued, the last two (2007-1 and 2007-2) were issued around the time the first two started to decline and did not provide sufficient pre-crisis observations to run our tests. The second vintage (2006-2), launched in July 2006, consists of deals where the underlying mortgages originated between September 2005 and April 2006, a period where defaults had started to rise when Adjustable Rate Mortgages (ARMs) with low teaser rates were reset to higher rates. To avoid any confounding informational effects from ARM resets, we focus on the bonds from the first vintage. The first vintage, launched in January 2006, provides us with the longest time series of data (January 2006 to December 2009), allowing us to examine information sensitivity before and during the crisis. Importantly, it also includes mortgages that originated between March and October 2005, well before problems in the subprime market began to emerge.

Trading in RMBS occurs in an inter-dealer market. Trading desks rely on data vendors for "evaluated" prices that represent the price they would receive in an orderly transaction under current market conditions in making their trading decisions. We obtained AAA-rated bond prices both from Interactive Data Corporation (IDC), a major provider of data services to trading desks and from

Bloomberg.[13] However, we could only obtain data for some of the bonds from Bloomberg, resulting in the Bloomberg price series being about 12% lower than the price series from IDC. We use IDC prices in our analysis to take advantage of their complete coverage over the entire period.[14] An important deal requirement for ABX inclusion is that the deal's remittance report is released on the 25th of every month. If the 25th occurs on a weekend or holiday, the report is released on the following business day. Our monthly regressions use bond prices on remittance report dates.[15] ABX prices are from IHS Markit. Markit collects quotes from major market participants and filters these quotes to remove extreme outliers and stale observations. If there are at least 3 quotes left after the filter process, Markit averages the remaining quotes and reports the composite spread.

Our key variable of interest is AAA bond subordination. It is both deal- and bond-specific in that it reflects the dynamic credit enhancement features of the deal. Subordination captures how well AAA bonds are protected against pool losses, with a lower value indicating a lower level of protection. This measure is

[13] IDC defines an orderly transaction as an institutional round lot of $1 million or more. IDC uses a proprietary rules-based pricing application, integrating credit information and observed market movement into quantitative pricing models to generate these evaluated prices. Intercontinental Exchange (ICE) Data Services bought IDC in 2015. Other competing data providers include Reuters Group (currently Thomson Reuters) and Standard and Poor's. According to IDC's annual financial statement, the price evaluation segment comprised approximately 64% of its revenue in 2007, indicating it was a well-subscribed data service.

[14] The means and standard deviations of prices from both sources are relatively the same from January 2006 through June 2007. However, during the crisis period from July 2007 through December 2009, Bloomberg prices, on average, were lower than IDC (72.59 and 81.82, respectively), but the standard deviation is approximately the same (17.68 and 17.25, respectively). Our main results remain qualitatively unchanged when we use Bloomberg prices.

[15] The exact timing of the report release is unknown (e.g., before, during, or after market close), so in robustness tests, we calculate the average bond quote and ABX price across the report date and the next four trading days (t to $t+4$) as bond and ABX price measures. Results using these pricing measures are unreported for brevity but are quantitatively similar and available upon request.

collected from monthly remittance data and is measured as a percent of mortgage collateral (Sub_t).

Mortgage delinquency and loss information is often used to measure pool performance. Third-party vendors provide this data. However, despite the fact that remittance reports are the primary source for all data collected by vendors, vendor methodologies do not capture all of the information available vis-á-vis the remittance report. This most likely stems from the high degree of heterogeneity in remittance report formatting not only across individual trustees but also across time for each trustee. Changing of report formats makes automated and machine reading of the data more difficult.[16]

Vendor data often fails to capture the true definitions of pool performance as set forth in legal documents. Vendors apply standardized definitions to remittance data to facilitate RMBS comparisons, but this is difficult because trustees follow the legal definitions when preparing remittance reports. Further, such standardization attempts increase the risk of losing relevant information and miscalculating the pool performance for a deal within a given month. Upon examining these legal documents, we identify four distinct definitions for 60+ day delinquencies, with the main differences related to how bankruptcies (BK), foreclosures (FCL), and real estate owned (REO) loans are treated.[17]

[16]Our comparison of that data required to compute the percentage of seriously delinquent loans as reported in the remittance reports and by common third-party vendors revealed discrepancies in approximately 38% of our sample.

[17]These definitions are: (1) DQ 60+ (inc. REO, BK, FCL); (2) DQ 60+, + FCL + REO, + BK; (3) DQ 60+ (inc. BK) + FCL + REO; (4) DQ 60+ (inc. FCL, REO) (No BK). The majority of the deals in the first ABX vintage follow the first definition with 14 deals; 2 deals follow the second definition; 3 follow the third definition; and one deal follows the fourth definition.

Even when a performance variable is defined the same across trustee and data vendors, reporting variation still occurs. We use cumulative net losses to illustrate. All the deals in our sample, as well as two data vendors, define cumulative net losses as aggregate losses less any subsequent recoveries. Figure 1 presents the realized loss group report of the July 2008 monthly remittance report for the J.P. Morgan Mortgage Acquisition Corporation (JMPAC) Series 2005-OPT1 deal, which shows total cumulative net losses as approximately \$34.4 million. Both data vendors record a value of over \$42 million for the same month. As a second example, Figure 2 presents the October 2007 remittance report for the First Franklin Mortgage Loan Trust (FFMLT) Series 2005-FF12, which reports cumulative net losses as approximately \$8.6 million. For the same month, the data vendors record values of over \$11 million each.

[INSERT FIGURE 1 HERE]

[INSERT FIGURE 2 HERE]

Given that the deal's definition of pool performance determines the cash flow rules, rather than relying on third-party vendors, we hand-collect the data directly from monthly remittance reports. Specifically, we collect seriously delinquent loans (SDQ), which are 60+ days delinquent, and cumulative net losses (L). For purposes of this paper, pool performance is defined as the principal amount of SDQ loans plus cumulative net losses as a percent of the initial pool balance and is denoted as $SDQL_t$, where SDQ loans are based on the deal's definition of a 60+ days delinquent loan. Similar to Stanton and Wallace (2011), we use this single aggregate credit performance to avoid including too many explanatory variables in regression models (e.g., loss rates, delinquency rates for 30, 60, 90+ days, foreclosure rates, etc.).

All other data for the macroeconomic control variables used in regression specification are obtained from Bloomberg, the Federal Housing Finance Agency (FHFA), and the Federal Reserve Bank of St. Louis's website (FRED). These control variables are the difference between the general collateral repo and 3-month LIBOR rates to account for funding conditions in the cash bond market; the LIBOR-OIS spread to account for the counterparty risk in the interbank markets; the seasonally-adjusted, monthly repeat-sales housing price index (HPI) to account for housing market conditions; the VIX and S&P index to account for general market conditions; the spot rate (10-year constant maturity Treasury rate), and the slope of the yield curve (the difference between the 10-year and the 1-year CMT) to capture expectations of future economic growth and inflation.

[INSERT TABLE 1 HERE]

Table 1 reports descriptive statistics for bond-, deal-, and ABX-level variables in three panels, corresponding to a different time frame within the sample period based on ABX index performance. Gorton (2009) argues that it was the decline in the ABX that revealed emerging risks in the subprime market and set off the "subprime panic." Panel A reports data for January 2006 through January 2007, which is the period prior to the ABX.HE.A index falling below par. Panel B is from February 2007 to June 2007, the 5 months between the drop in ABX.HE.A and the subsequent drop in ABX.HE.AAA below par.[18] Panel C reports the remainder of

[18]The AA-rated ABX index (ABX.HE.AA) dropped below par two months before the

the sample period from July 2007 to December 2009.

Table 1 shows the prices of AAA-rated RMBS and both ABX credit subindices decline across the subsample periods. The mean (median) bond price is 100.39 (100.44) in the earliest period and 100.00 (100.33) over the February 2007 to June 2007 period. It is not until after June 2007 that bond prices drop below par with a mean (median) bond price of 81.82 (89.33). The ABX.HE.AAA index exhibits similar patterns. The ABX.HE.A index has slightly lower means (medians) across these periods, which is to be expected considering the bonds referenced by the subindex are lower-rated and are exposed to more credit risk. Figure 3 plots these price movements for the AAA bonds and the ABX subindices over time. Both ABX.HE.AAA and bond prices decline throughout the sample period, almost mirroring each other.

[INSERT FIGURE 3 HERE]

Table 1 also shows that the standard deviation of AAA-rated bond prices increases over time. In Panel A, the deviation is minimal but gets progressively larger as time passes, as shown in Panel B and even more so in Panel C. Figure 4, which plots the evolution of their standard deviation at a monthly frequency, reveals a regime shift in standard deviation when the ABX.HE.AAA falls below par for the first time in mid-2007. At the beginning of the sample period, the bond price standard deviation is near zero. This is precisely the definition of a "safe" asset. There is little to no variation in prices. In early 2007, these "safe" bonds experience a slight increase in standard deviation that coincides with when the

ABX.HE.AAA

ABX.HE.A index fell below par for the first time. However, a shift in the upward trend is clearly visible in mid-2007 when the ABX.HE.AAA index falls below par for the first time, and they become "risky."

[INSERT FIGURE 4 HERE]

Table 1 also presents information on the pool performance and AAA bond subordination. $SDQL$, which captures delinquencies and losses, is low in the earliest sample period in Panel A with a mean (median) of 1.89% (1.80%). It doubles over the next five months to 3.72% (3.42%) as reported in Panel B, reflecting the higher delinquency rates due to the resetting of low-rate adjustable rate mortgages (ARMs) to higher rates. It continues to increase from July 2007 through December 2009, ballooning to a mean (median) level of 26.38% (20.58%). Sub, which captures the protection against pool losses that AAA bonds enjoy, tracks pool performance as it was designed to do. The mean (median) Sub is 23.16% (23.52%) from January 2006 to January 2007. It increases slightly to 29.9% (30.6%) between February 2007 and June 2007 before doubling to 48.93% (49.25%). Figure 5, which plots the evolution of $SDQL$ and Sub over time, shows that, as pool performance deteriorated, the dynamic credit enhancement features of subprime deals afforded adequate protection to AAA bonds, even during the crisis period.

[INSERT FIGURE 5 HERE]

5 Results

5.1 Information Sensitivity

The descriptive statistics show that AAA bonds started to decline once the ABX fell below par and that some bonds declined more than others. This occurred despite the bonds being protected against pool losses through increases in their subordination. In this section, we examine if their decline was associated with a shift in their information sensitivity. If the decline in the ABX signaled risks emerging in the subprime market, incentivizing market participants to produce information to assess their individual loss exposures, we should observe the decline in bond prices to be related to the exposure they had to losses in their underlying pool collateral. To examine if this is the case, we regress AAA bond prices (*Price*) on the underlying pool's performance – *SDQL*, and on the bond's subordination – *Sub*, which captures how well the credit enhancement features of the deal protect the bond from pool losses. The regression is defined in Equation (2), where *i* denotes the bond from RMBS deal *j* at month *t*. The regression also includes a bond fixed effect (λ_i) and a set of additional macroeconomic control variables ($Controls_t$).

$$Price_{i,j,t} = \alpha + \beta_1 Sub_{i,j,t} + \beta_2 SDQL_{j,t} + \beta^{'} Controls_t + \lambda_i + \epsilon_{i,j,t} \tag{2}$$

Table 2 reports the results from estimating Equation (2). The regression specification is run separately on a "Pre-Crisis" and a "Crisis" period, where the crisis period is defined based on when the ABX index falls below par for the first time. Columns 1 and 2 (Columns 3 and 4) report results using the ABX.HE.AAA

(ABX.HE.A) index for the pre-crisis and crisis period respectively.

[INSERT TABLE 2 HERE]

Table 2 shows that in the pre-crisis period, prior to the ABX.HE.AAA index falling below par for the first time in July 2007, AAA bond prices did not vary with their pool's performance ($SDQL$), nor did they vary much with their subordination (Sub). However, post July 2007, during the crisis period, they declined more if the underlying pool suffered greater losses but less if they were better protected against those losses. A similar pattern is observed when the crisis period is defined to start January 2007, when the ABX.HE.A index fell below par for the first time (Columns 3 and 4). AAA bonds that were better protected against pool losses suffered smaller price declines during the crisis period, but were invariant to such protection in the pre-crisis period.[19]

These results show that the decline in the ABX was a signal event in the subprime market that altered the information sensitivity of AAA RMBS. AAA bonds that were previously insensitive to their underlying pool collateral became sensitive to it when negative public news about the subprime market arrived.

In the following two subsections, we explore the robustness of these results. For ease of exposition, in the remainder of the paper, we only report results using the pre-crisis and crisis periods defined based on when the ABX.HE.AAA index fell below par for the first time.

[19] Chronologies of the financial crisis of 2007-2009 date its start between July and September 2007 (see for instance, Brunnermeier (2009), Kacperczyk and Schnabl (2010), or Gorton et al. (2020)). Our results are not sensitive to moving the start date to August or September 2007.

5.1.1 Adjustable Rate Mortgages

The subprime mortgage sector was characterized by a large number of adjustable-rate mortgages (ARMs). These ARMs had a low "teaser" interest rate that was fixed for a two or three-year period, at the end of which it was reset to the prevailing market interest rate plus a spread. With house prices rising, a majority of these ARMs were refinanced just prior to the end of the teaser period as borrowers sought to avoid higher interest rates. Consequently, deals experienced an influx of prepayments around reset dates.

Table 3, which provides data on the composition of the pools in our sample, shows that the average proportion of ARMs in our sample is 84.02%. A majority of these ARMs were 2/28 loans, which, on average, comprised about 70% of the underlying pool balance.[20] Given that our sample consists of deals from the first ABX vintage, these ARMs, which were originated between March and October 2005, were scheduled to reset between March and October 2007. During this period, refinancing declined when house price appreciation stalled and defaults increased. If the decline in the ABX resulted in AAA bonds becoming more sensitive to the loss protection afforded by their subordination, then we should observe bonds where the underlying pools had a greater proportion of 2/28 ARMs to display greater sensitivity to their subordination during the crisis period.

[INSERT TABLE 3 HERE]

To examine if this is indeed the case, we create a dummy variable based on the

[20]The 3/27 ARMs, which had a teaser period of three years, make up a substantially lower amount at 13.3%, on average.

median level of 2/28 loans. The dummy takes on the value of 1 ("High 2/28") if the proportion of 2/28 loans in the underlying pool is greater than the median across the deals in our sample and 0 otherwise. We run the regression specification in Equation (2) with an additional interaction term that captures the incremental sensitivity of AAA bonds to their subordination when they are tranched from deals with a high proportion of 2/28 ARMs ($Sub \times High$ *2/28*). The results of this estimation are reported in Columns 1 and 2 of Table 4. Column 1, which reports the regression from the pre-crisis periods, shows that the coefficient on the interaction term is insignificant, implying that the sensitivity of AAA bonds to their subordination did not vary with the proportion of 2/28 ARMs in the underlying pool. In contrast, Column 2, which reports the results from the crisis period, shows that not only did AAA bond prices become sensitive to their subordination, but they became more so when the underlying pool contained a high proportion of 2/28 ARMs.

[INSERT TABLE 4 HERE]

5.1.2 Mortgage Credit Quality

The quality of the underlying loan pool also depended on the creditworthiness of the borrowers. Table 3 provides summary statistics for pool FICO scores. The median FICO score for our sample is 628, and the standard deviation is about 12, indicating that pools varied in their credit quality. If the decline in the ABX altered the sensitivity of AAA bonds to their subordination, then we should observe bonds from pools with a lower credit quality to display greater sensitivity to their subordination during the crisis period.

To examine if this is the case, we create a dummy variable based on the median FICO score. The dummy takes on a value of 1 if the pool's FICO score is lower than the median ("Low FICO") and 0 otherwise. Deals in the "Low FICO" category have an average pool FICO score slightly above the subprime threshold of 620, indicating substantial credit risk in the loans backing these deals. We run the regression specification in Equation (2) with an additional interaction term that captures the incremental sensitivity of AAA bonds to their subordination when they are tranched from deals with low credit quality ($Sub \times Low\ FICO$). The results of this estimation are reported in Columns 3 and 4 of Table 4. Column 3, which reports results from the pre-crisis period, shows that AAA bonds were insensitive to their subordination irrespective of the credit quality of the underlying pool. In contrast, Column 4 shows that not only did AAA bonds become sensitive to their subordination during the crisis period, but they became more so if they were tranched from pools with lower credit quality.

These results based on static pool characteristics confirm that the decline in the ABX altered the information sensitivity of safe AAA bonds.

5.2 Information Production

The decline in the ABX was a signal to market participants that there were risks emerging in the subprime market. However, it did not reveal which pools were expected to suffer losses or how exposed individual tranches were to the risks in the underlying pool.[21] There was no robust information gathering infrastructure associated with AAA RMBS that investors could rely on to resolve information asymmetries – as with other highly-rated bonds, market participants did not have incentives to create one (Hanson and Sunderam, 2013; Monnet and Quintin, 2017). The fact, therefore, that AAA bond prices became sensitive to their underlying collateral information suggests that investors perceived the benefits of producing information on individual deals outweighed the costs of doing so. In this section, we examine whether they engaged in (increased) information production following the decline in the ABX.

Subprime deals were opaque. Originators provided only limited summary information on pools, and any information credit rating agencies used and made available to investors was coarse. Granular loan level data was available from data providers but was expensive. Analyzing deals required incorporating loan level information into cash flow models that reflected the cash waterfall structure of the deal along with its dynamic credit enhancement features. Only sophisticated investors with the resources and credit analysis capabilities could engage in such analysis (Hanson and Sunderam, 2013; Monnet and Quintin, 2017). These investors commonly used the Intex platform to analyze structured finance deals.[22] Intex provided its subscribers with two files – the collateral descriptor indicator (CDI) file and the CMO descriptor update (CDU) file. The CDI file contained the initial

[21]Pérignon et al. (2018) show that credit downgrades can be considered public news events, causing uninformed lenders to revise their beliefs. We are unable to use downgrades in our analysis because of timing. Two bonds were downgraded in October 2008 and eight in March 2009. The remaining ten bonds were downgraded after our sample period ended.

[22]According to its website, Intex provides "the industry's most complete library of [structured products], created and maintained for accurate cashflow projections and price/ yield analytics."

descriptive and cash flow information on the deal based on the prospectus and legal documents. The CDU file provided monthly collateral information, such as payments, principal balances, interest shortfalls, and triggers on an ongoing basis, with a new CDU file for each month. Together, these files provided the data and the cash flow structures necessary to value the RMBS.[23] Importantly, for our purposes, Intex also provided collateral updates whenever new or revised information became available from trustees, servicers, issuers, or other sources. Each update included a brief description of the revision and specified the prior monthly CDU files impacted by the revision.[24] These updates allowed investors to incorporate new information as it became available and revise their cash flow models.

To examine whether such investors used these updates to "produce" information, we examine bond price reactions to the updates. To do so, we regress the natural logarithm of daily bond prices on an $Intex\ Update$ dummy that takes on a value of 1 on the day the underlying deal received an update and is 0 otherwise. We run this regression on AAA bonds for both the pre-crisis and crisis periods.

[INSERT TABLE 5 HERE]

The results are reported in Table 5. Column 1 presents the results for the pre-crisis period, and Column 2 for the crisis period. Bond prices show very little reaction to the updates in the pre-crisis period. In contrast, during the crisis period,

[23] Cordell et al. (2012) provides evidence that Intex's models were reasonably accurate in assessing losses on collateralized debt obligations (CDOs) deals in a timely manner during the crisis.

[24] Examples of CDU revision notes are: "added 3-month severity calculation," "revised total losses," and "revised tranche balances."

the AAA bonds decline in value by 24 bps.[25] These results show that investors used the updates to produce information once the ABX declined from par (during the crisis period).

We use the Intex updates as our proxy for information production. We track the evolution of these updates by counting the number of updates on Intex each month for every deal in our sample. We interpret a higher frequency of monthly updates as indicating increased information production by investors. Table 6 provides summary statistics on Intex updates for both the pre-crisis and crisis periods. We report the total number of monthly updates in the pre-crisis and crisis periods in Panel A. The average monthly number of updates more than doubled from approximately 5 during the pre-crisis period to about 12 updates in the crisis period. Panel B shows that the fraction of deals that had at least one update doubled from about 20% in the pre-crisis period to about 40% in the crisis period, indicating a shift in information production once the ABX declined below par.

[INSERT TABLE 6 HERE]

5.3 Impact of Opacity on Information Sensitivity and Production

Deal opacity is beneficial in good times (i.e., prior to the arrival of the negative public shock to subprime collateral values). It minimizes the adverse selection

[25] We also run this regression individually for all rated bonds referenced by the ABX index. Irrespective of their rating, bond prices have little to no reaction to Intex updates during the pre-crisis period. During the crisis period, only AAA bonds respond statistically to updates. All other bonds continue to show no reaction. These results are unreported but available upon request.

problem associated with trading AAA bonds by ensuring that investors are "symmetrically ignorant" (Dang et al., 2020b). Unsophisticated (uninformed) investors do not have to fear being taken advantage of by sophisticated investors (Pagano and Volpin, 2012), and the AAA bonds can trade at or near par. However, it shifts the adverse selection problem to the bad times. When a negative public shock to subprime values arrives, it can incentivize sophisticated investors to produce information on individual deals because they can profit at the expense of unsophisticated (uninformed) investors. The very fear of such a possibility can cause AAA bonds to decline sharply.

To specifically explore the influence of deal opacity on the information sensitivity and information production dynamics of AAA bonds, we construct measures to capture two dimensions of deal opacity. The first is a direct measure of how complex the deal is (e.g., cash flow structure or internal tranching structure), and the second captures an indirect consequence of complexity - the information environment.

We follow Ghent et al. (2019) to construct the direct measures of deal complexity using three components from the deal's prospectus supplement —cash flow waterfall structure, pool descriptions, and the number of tranches. Each measure captures a different dimension of a deal's complexity. We capture cash waterfall complexity as the number of pages in the prospectus supplement used to describe how cash flows from the underlying collateral were to be distributed across the various tranches conditional on pool performance. RMBS deals often subdivided the underlying mortgage collateral into multiple loan groups. A loan group could back a specific group of bonds, or multiple loan groups could cross-collateralize each other to back multiple senior bonds. We capture this aspect of a deal's complexity (pool complexity) as the number of pages used to describe the underlying mortgage pool backing the deal. Another dimension of a deal's complexity is the number of tranches or security groups created by the deal. More tranches allow for more complex cash flow rules. An investor would need to model the cash flow waterfalls across a large number of securities to see what cash flows he would receive in any given scenario. We measure this dimension of a deal's complexity as the number of tranches in the deal.

Panel A of Table 7 presents the summary statistics for these measures. The mean (median) number of pages describing a deal's cash flow waterfall is 24.15 (24.50). This suggests that an investor needs to read about 24 pages of legal documentation, on average, to understand the variety of factors that may trigger the complex cash flow rules in different economic states, which would impact the performance of a particular bond. The mean (median) number of pages used to describe the collateral pool is 26.9 (21), with a standard deviation of approximately 22 pages, implying that investors had to read between 27-50 pages to interpret the information they received in the remittance reports fully. The mean (median) number of tranches in our sample deals is 14.45 (14.5) with a standard deviation of approximately 4 tranches, implying that investors had to model the cash flows for 10-18 tranches per deal.[26]

[26] Ghent et al. (2019) construct additional measures of deal complexity. For instance, they use the number of collateral groups as another complexity measure because it allows for more complex waterfall structures. We forgo this measure because the majority of the deals in our sample only have two loan groups. They also use prospectus file size as a complexity measure. We do not

The second dimension of deal complexity is the information environment. To assess their loss exposures, investors also required information on pool performance. The monthly remittance reports filed by trustees did not report pool performance in a uniform or standardized way. Pool performance reporting varied considerably month-to-month across the same deal and across trustees. Moreover, the legal definition of specific performance measures, such as what constituted a seriously delinquent loan, also varied across deals. Investors typically relied on third-party data vendors for standardized pool performance information. However, our examination revealed discrepancies in the data reported on the same deal between third-party data vendors and the remittance reports. Such discrepancies probably arose because data vendors employed automated data collection processes that missed some data points or details or because they standardized the data to facilitate comparison across deals and RMBSs.

We exploit this variation in reporting across remittance reports and third-party data vendors to construct a dynamic proxy for the quality of pool performance reporting. The pool performance measure we pick is the cumulative net losses because it is consistently defined as cumulative losses less subsequent recoveries in all deal prospectus supplements and by the third-party vendors (ABSNet and Blackbox) from which we obtain our data.[27] Each month, for every deal, we use the values reported by all three sources to calculate the coefficient of variation

because trustee websites do not provide PDFs for all deals in our sample. We rely on Bloomberg for the prospectuses not available on the trustee's website, but Bloomberg provides prospectus supplements only as text files. Given that text and PDF files vary in size, we chose not to use file size as a measure of deal complexity.

[27]Both vendors are now owned by Moody's, but the data used in this paper are from when both were standalone companies.

($CV\ Aggregate\ Loss$) by dividing the standard deviation of cumulative net losses by the mean cumulative net loss. We interpret deals with high $CV\ Aggregate\ Loss$ as having low reporting quality. Summary statistics for this variable, which are reported in Panel B of Table 7 show that reporting quality deteriorated from the pre-crisis period, where the mean $CV\ Aggregate\ Loss$ was 0.174, to 0.546 in the crisis period.

[INSERT TABLE 7 HERE]

To examine if deal opacity influenced the information sensitivity of the AAA tranches, we create an opaque dummy and add its interaction with bond subordination to our baseline regression specification in Equation 2 and run it separately for the "Pre-Crisis" and "Crisis" periods.[28] The opacity dummy takes the value of 1 if the opacity measure is above the median and 0 otherwise. Table 8 reports the results.

[INSERT TABLE 8 HERE]

In Columns 1 - 6, the opacity dummy is based on the deal complexity measures. Columns 2, 4, and 6, which report the crisis period regressions using the waterfall, pool, and tranches measures of deal complexity, respectively, show that AAA bonds were more sensitive to their subordination if they were tranched from relatively more opaque deals. In contrast, Columns 1, 3, and 5, which report similar regressions from the pre-crisis period, show that they were largely insensitive to

[28]We do not include our opacity measures as an independent variable because they are static (and hence absorbed in the bond fixed effect).

their subordination irrespective of their opacity. Similarly, Columns 7 and 8 use the pool performance reporting quality measure. Column 8, which reports the results from the crisis period, shows that AAA bonds were more sensitive to their subordination if they were tranched from deals with low pool performance reporting quality. In contrast, Column 7 shows that they remain insensitive to their subordination during the pre-crisis period. These results indicate that the opacity of the deals amplified the information sensitivity of AAA bonds following the decline in the ABX.

To explore whether sophisticated investors produced more information on opaque deals, we examine the evolution of Intex updates for deals classified as opaque based on our proxies for deal opacity. Panel A of Table 9 reports the number of updates on deals based on our pool complexity proxy and Panel B based on the information environment proxy. Both panels show that the increase in the number of updates from the pre-crisis period to the crisis period is higher for more complex deals (above median pool complexity) relative to less complex ones, indicating more information production in opaque deals.

Taken together, the results from Tables 8 and 9 provide evidence that the opacity of subprime deals incentivized sophisticated investors to produce more information increasing the information sensitivity of AAA bonds following the decline in the ABX.

[INSER TABLE 9 HERE]

6 Conclusion

In this paper, we provide empirical evidence on the dynamics of information production and information sensitivity associated with AAA-rated subprime Residential Mortgage Backed Securities (RMBS) during the financial crisis of 2007-2009. Subprime securitizations had dynamic credit enhancement features that insulated senior, AAA-rated RMBS bonds from the cash flow risks of the underlying subprime mortgage collateral. They were safe, informationally insensitive securities in that the costs of producing information on their underlying collateral outweighed the benefits. Market participants had no incentive to produce information on them, and they traded close to or at par. Yet, during the financial crisis of 2007-2009, the prices of these safe securities varied considerably — they became risky. We provide evidence that this risk reassessment was precipitated by the decline in the ABX indices, which signaled to market participants risks emerging in the subprime market. Unsure of their individual loss exposures, investors engaged in information production to distinguish across deals, causing their prices to vary with their individual collateral exposure. These effects were more pronounced in opaque deals where investors found it difficult to assess their loss exposures.

These findings provide empirical support for the informational view of financial crises, emphasizing the sensitivity of safe, money-like debt to collateral values. According to this view, for securities to be used in a money-like fashion, they have to be informationally insensitive, where market participants have no incentive to produce information on their underlying collateral. This occurs when collateral is opaque, and the parties to the transaction are symmetrically ignorant about the collateral value. Debt designed to have these features is particularly suited to perform this money-like function. A financial crisis originates when an event destabilizes this equilibrium, causing safe assets to lose their money-like property. This occurs because a negative shock causes market participants to produce information about the opaque collateral, setting off adverse selection concerns that result in liquidity dry-ups and runs in the money market. Our results support this view by providing empirical evidence that the negative information conveyed by the decline in the ABX resulted in AAA RMBS that were safe and informationally insensitive becoming informationally sensitive.

References

Ashcraft, Adam, Paul Goldsmith-Pinkham, Peter Hull, and James Vickery, "Credit ratings and security prices in the subprime MBS market," *American Economic Review*, 2011, *101* (3), 115–119.

Barberis, Nicholas, Andrei Shleifer, and Jeffrey Wurgler, "Comovement," *Journal of Financial Economics*, 2005, *75* (2), 283–317.

Brancati, Emanuele and Marco Macchiavelli, "The information sensitivity of debt in good and bad times," *Journal of Financial Economics*, 2019, *133* (1), 99–112.

Brunnermeier, Markus K, "Deciphering the liquidity and credit crunch 2007-2008," *Journal of Economic Perspectives*, 2009, *23* (1), 77–100.

Cordell, Larry, Yilin Huang, and Meredith Williams, "Collateral Damage: Sizing and Assessing the Subprime CDO Crisis," *Federal Reserve Bank of Philadelphia Working Paper. Available at https://www.philadelphiafed.org/-/media/frbp/assets/working-papers/2011/wp11-30.pdf*, 2012.

Dang, Tri Vi, Gary B. Gorton, and Bengt Holmström, "The information sensitivity of a security (Working paper)," *Columbia University, Yale School of Management, and Massachusetts Institute of Technology*, 2015.

_ , _ , and _ , "Ignorance, debt and financial crises (Working paper)," *Columbia University, Yale School of Management, and Massachusetts Institute of Technology*, 2020.

_ , _ , and _ , "The information view of financial crises," *Annual Review of Financial Economics*, 2020, *12*, 39–65.

_ , _ , _ , and Guillermo Ordonez, "Banks as secret keepers," *American Economic Review*, 2017, *107* (4), 1005–29.

Fender, Ingo and Martin Scheicher, "The pricing of subprime mortgage risk in good times and bad: evidence from the ABX. HE indices," *Applied Financial Economics*, 2009, *19* (24), 1925–1945.

Foley-Fisher, Nathan, Gary B Gorton, and Stéphane Verani, "Adverse Selection Dynamics in Privately-Produced Safe Debt Markets," Technical Report, National Bureau of Economic Research 2020.

Fons, Jerome S., "Shedding Light on Subprime RMBS," *The Journal of Structured Finance*, 2009, *15* (1), 81–91.

Gallagher, Emily A, Lawrence DW Schmidt, Allan Timmermann, and Russ Wermers, "Investor information acquisition and money market fund risk rebalancing during the 2011–2012 eurozone crisis," *The Review of Financial Studies*, 2020, *33* (4), 1445–1483.

Ghent, Andra C., Walter N. Torous, and Rossen I. Valkanov, "Complexity in structured finance," *The Review of Economic Studies*, 2019, *86* (2), 694–722.

Gorton, Gary and Andrew Metrick, "Securitization," in "Handbook of the Economics of Finance," Vol. 2, Elsevier, 2013, pp. 1–70.

Gorton, Gary B., "The subprime panic," *European Financial Management*, 2009, *15* (1), 10–46.

_ **and Andrew Metrick**, "Securitized banking and the run on repo," *Journal of Financial Economics*, 2012, *104* (3), 425–451.

_ **and Guillermo Ordonez**, "Collateral crises," *American Economic Review*, 2014, *104* (2), 343–78.

_ **and Nicholas S. Souleles**, "Special purpose vehicles and securitization," in "The Risks of Financial Institutions," University of Chicago Press, 2007, pp. 549–602.

Gorton, Gary B, Andrew Metrick, and Lei Xie, "An econometric chronology of the financial crisis of 2007-2008," *Available at SSRN 2615029*, 2020.

Hanson, Samuel G. and Adi Sunderam, "Are there too many safe securities? Securitization and the incentives for information production," *Journal of Financial Economics*, 2013, *108* (3), 565–584.

Holmström, Bengt, "Understanding the role of debt in the financial system," *BIS working paper No. 479*, 2015.

Kacperczyk, Marcin and Philipp Schnabl, "When safe proved risky: commercial paper during the financial crisis of 2007–2009," *Journal of Economic Perspectives*, 2010, *24* (1), 29–50.

Monnet, Cyril and Erwan Quintin, "Rational opacity," *The Review of Financial Studies*, 2017, *30* (12), 4317–4348.

Pagano, Marco and Paolo Volpin, "Securitization, transparency, and liquidity," *The Review of Financial Studies*, 2012, *25* (8), 2417–2453.

Pérignon, Christophe, David Thesmar, and Guillaume Vuillemey, "Wholesale funding dry-ups," *The Journal of Finance*, 2018, *73* (2), 575–617.

Stanton, Richard and Nancy Wallace, "The bear's lair: Index credit default swaps and the subprime mortgage crisis," *The Review of Financial Studies*, 2011, *24* (10), 3250–3280.

Vijh, Anand M., "The spinoff and merger ex-date effects," *The Journal of Finance*, 1994, *49* (2), 581–609.

Figures and Tables

Figure 1: Excerpt from the July 2008 JPMAC 2005-OPT1 Remittance Report

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J.P. Morgan Mortgage Acquisition Corporation, Series 2005-OPT1

July 25, 2008

Realized Loss Group Report					
Group Number	Current Loss	Cumulative Loss	Ending Balance	Balance of Liquidated Loans	Net Liquidation Proceeds
1	1,527,587.13	20,761,308.40	205,001,450.31	2,755,900.01	1,167,611.73
2	1,734,966.33	12,461,461.01	179,675,774.13	3,382,969.37	1,648,003.04
TOTAL	3,262,553.46	33,222,769.41	384,677,224.44	6,138,869.38	2,815,614.77

Loss Detail:

Non Recoverables from Losses	48,176.36
Group 1	14,633.01
Group 2	33,543.35
Subsequent Losses	9,460.54
Group 1	6,776.22
Group 2	2,684.32
Subsequent Recoveries	6,358.77
Group 1	6,246.23
Group 2	112.54
Current Net Realized Losses	3,313,831.59
Group 1	1,576,293.48
Group 2	1,785,714.47
Cumulative Net Realized Losses	34,363,852.34
Group 1	21,598,983.02
Group 2	12,764,869.32
Current Applied Losses	0.00

THE BANK OF NEW YORK MELLON

Figure notes: This figure presents the realized loss group report of the July 2008 monthly remittance report for the J.P. Morgan Mortgage Acquisition Corporation (JMPAC), Series 2005-OPT1 deal, which is a constituent of the ABX index.

Figure 2: Excerpt from the October 2007 FFMLT 2005-FF12 Remittance Report

LaSalle Bank

First Franklin Mortgage Loan Trust
Mortgage Loan Asset-Backed Certificates
Series 2005-FF12

Distribution Date: 25-Oct-07
Historical Realized Loss Summary
Total (All Loans)

	Current Realized Loss				Previous Liquidations/Payoffs							
Distribution Date	Beginning Scheduled Balance	Net Liquidation Proceeds	Realized Loss	Loan Count	Claims on Prior Liquidations		Recovery on Prior Liquidations		(Claims)/Recoveries on Prior Payoffs		Realized Loss Adjusted	Cumulative Realized Loss
					Amount	Count	Amount	Count	Amount	Count		
25-Oct-07	2,684,910.98	1,975,538.86	709,372.12	11	(5,451.16)	8	4,828.88	2	(553.75)	6	710,548.15	8,568,006.90
25-Sep-07	6,422,041.03	4,281,400.94	2,140,640.09	28	0.00	0	0.00	0	0.00	0	2,140,640.09	7,857,458.75
27-Aug-07	1,915,463.36	1,326,709.73	588,753.63	11	0.00	0	5,113.80	4	(6,089.01)	13	589,728.84	5,716,818.66
25-Jul-07	3,183,009.02	2,351,858.58	831,150.44	15	(4,528.40)	6	174.80	3	(1,420.80)	9	836,924.84	5,127,089.82
25-Jun-07	3,066,725.24	2,453,324.59	613,400.65	14	0.00	0	0.00	0	0.00	0	613,400.65	4,290,164.98
25-May-07	2,678,387.72	2,100,711.51	577,676.21	9	0.00	0	0.00	0	(1,198.78)	3	578,874.99	3,676,764.33
25-Apr-07	4,009,238.83	2,982,657.29	1,026,581.54	16	(364.80)	1	0.00	0	(8,868.00)	13	1,035,814.34	3,097,889.34
26-Mar-07	1,417,237.06	1,004,617.20	412,619.86	8	(3,976.29)	1	0.00	0	(34,157.16)	1	450,753.31	2,062,075.00
26-Feb-07	3,050,182.60	2,401,465.64	648,716.96	16	0.00	0	159,581.40	1	0.00	0	489,135.56	1,611,321.69
25-Jan-07	2,416,094.02	1,874,591.35	541,502.67	8	0.00	0	0.00	0	0.00	0	541,502.67	1,122,186.13
26-Dec-06	492,672.84	444,541.49	48,131.35	3	0.00	0	5,000.00	1	0.00	0	43,131.35	580,683.46
27-Nov-06	950,416.98	746,013.51	204,403.47	6	0.00	0	0.00	0	0.00	0	204,403.47	537,552.11
25-Oct-06	276,078.42	222,617.09	53,461.33	2	0.00	0	0.00	0	0.00	0	53,461.33	333,148.64
25-Sep-06	287,200.00	281,971.62	5,228.38	1	0.00	0	0.00	0	0.00	0	5,228.38	279,687.31
25-Aug-06	348,400.73	143,757.14	204,643.59	3	0.00	0	0.00	0	0.00	0	204,643.59	274,458.93
25-Jul-06	167,536.22	164,395.23	3,140.99	1	0.00	0	0.00	0	0.00	0	3,140.99	69,815.34
26-Jun-06	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	66,674.35
25-May-06	270,886.32	204,211.97	66,674.35	1	0.00	0	0.00	0	0.00	0	66,674.35	66,674.35
25-Apr-06	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
27-Mar-06	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
27-Feb-06	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
25-Jan-06	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0.00
Total	33,636,481.37	24,960,383.74	8,676,097.63	153	(14,320.65)	16	174,698.88	11	(52,287.50)	45	8,568,006.90	

Figure notes: This figure presents the historical realized loss summary of the October 2007 monthly remittance report for the First Franklin Mortgage Loan Trust (FFMLT) Series 2005-FF12 deal, which is a constituent of the ABX index.

Figure 3: Average Bond and ABX Prices across Time

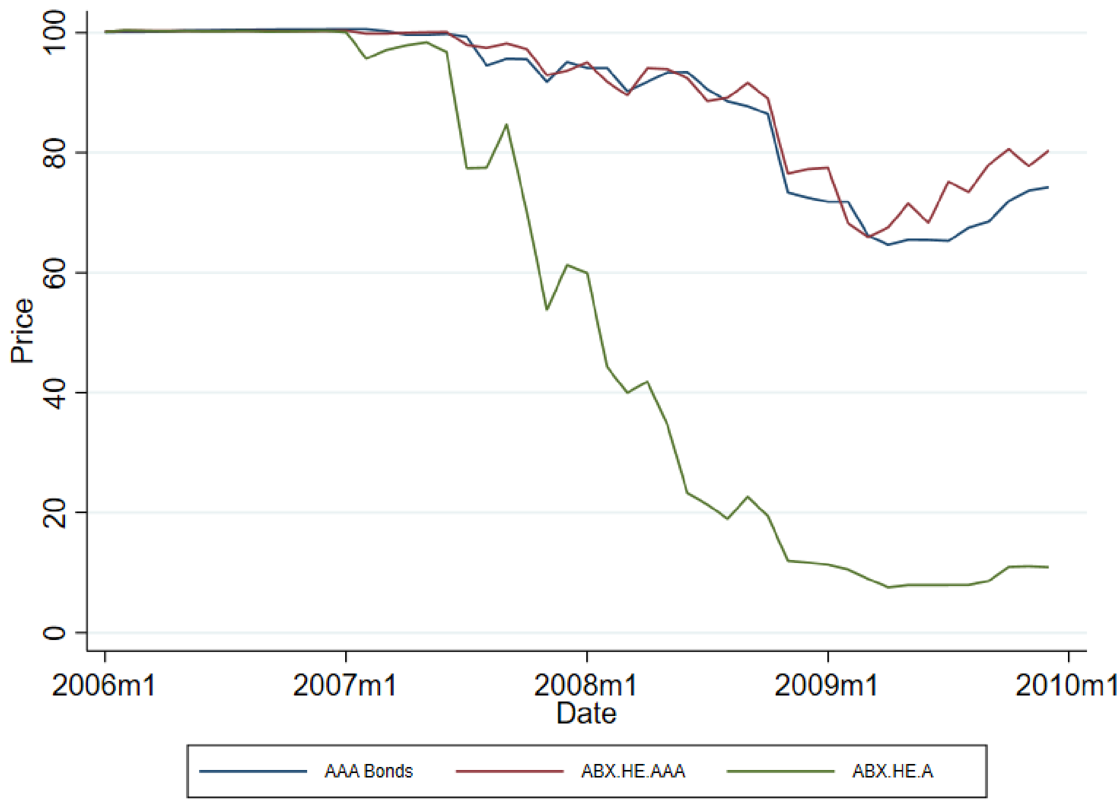

Figure notes: This figure plots the monthly average price for the AAA-rated RMBS referenced in the ABX, as well as the AAA- and A-rated ABX subindex prices. Bond prices are from IDC and ABX prices are from IHS Markit.

Figure 4: Standard Deviation of Bond Prices across Time

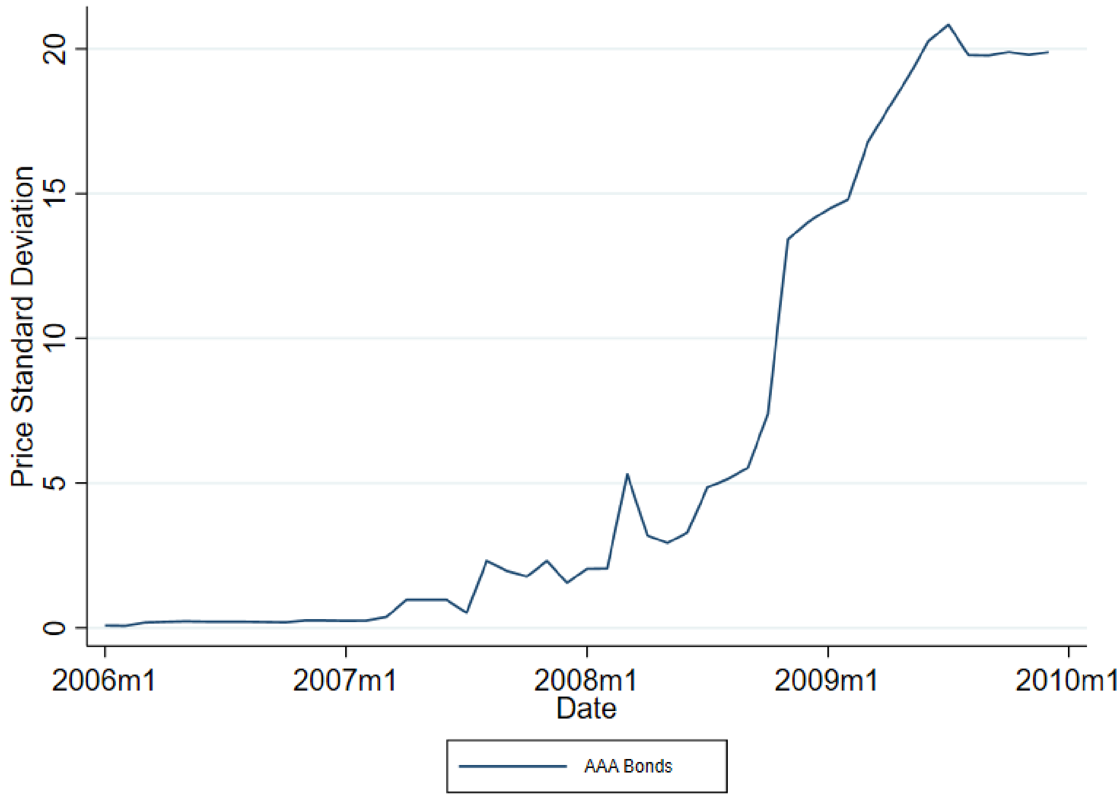

Figure notes: This figure plots the monthly standard deviation of bond prices for the referenced AAA-rated RMBS from the first ABX vintage. Bond price data are from IDC.

Figure 5: Bond Subordination and Pool Performance across Time

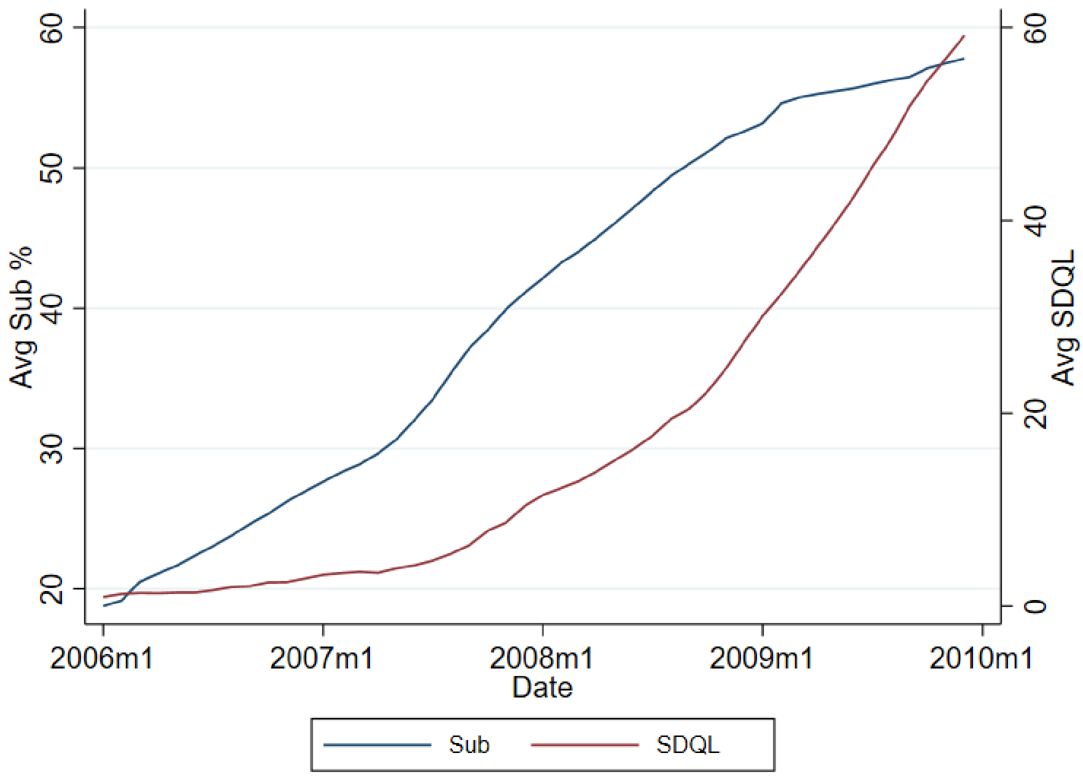

Figure notes: This figure plots the bond subordination (Sub) for the AAA-rated RMBS bonds referenced by the ABX and the performance of the pool backing those bonds ($SDQL$).

Table 1: Descriptive Statistics for Bond-, Deal-, and ABX-Level Variables

Panel A: January 2006 through Jan 2007

	Obs	Mean	Std. Dev.	P25	P50	P75
IDC Bond Price	260	100.388	0.259	100.178	100.435	100.576
Bloomberg Price	222	100.389	0.340	100.219	100.375	100.500
AAA Sub	260	23.162	7.214	20.674	23.521	27.218
SDQL	260	1.887	1.086	1.117	1.796	2.448
ABX.HE.AAA	13	100.285	0.043	100.272	100.28	100.308
ABX.HE.A	13	100.248	0.087	100.206	100.262	100.306

Panel B: February 2007 through June 2007

	Obs	Mean	Std. Dev.	P25	P50	P75
IDC Bond Price	100	99.999	0.839	99.651	100.332	100.571
Bloomberg Price	72	100.236	0.354	100.000	100.219	100.500
AAA Sub	100	29.909	8.711	26.811	30.594	33.523
SDQL	100	3.717	1.315	2.790	3.416	4.465
ABX.HE.AAA	5	99.979	0.116	99.863	99.993	100.064
ABX.HE.A	5	97.159	1.039	96.78	97.113	97.868

Panel C: July 2007 through December 2009

	Obs	Mean	Std. Dev.	P25	P50	P75
IDC Bond Price	600	81.818	17.250	72.621	89.332	94.225
Bloomberg Price	549	72.495	17.676	61.250	73.688	86.938
AAA Sub	600	48.932	17.503	40.312	49.249	59.684
SDQL	600	26.375	19.149	10.816	20.582	39.105
ABX.HE.AAA	30	84.353	10.540	76.513	88.806	93.655
ABX.HE.A	30	29.537	25.083	10.500	19.205	44.266

Bond Prices are as of the 25^{th} of each month, which is the date remittance reports for all deals are released. Sub is the percent of subordination for a bond each month. $SDQL$ is the sum of 60+ day delinquent loan balances and cumulative net losses relative to the initial pool balance stated as a percent. $ABX.HE.AAA$ and $ABX.HE.A$ is the price of the AAA and A-rated ABX credit subindices, respectively, on the remittance report release date. Each panel reports a different time period.

Table 2: Information Sensitivity of AAA Bonds

	ABX.HE.AAA		ABX.HE.A	
	Pre-Crisis	Crisis	Pre-Crisis	Crisis
VARIABLES	(1)	(2)	(3)	(4)
Sub	0.048***	1.276***	0.005	1.005***
	(4.32)	(13.75)	(1.25)	(13.38)
SDQL	-0.043	-0.125***	-0.066***	-0.071*
	(-1.09)	(-3.12)	(-4.37)	(-1.79)
Constant	120.744***	-201.618***	83.451***	-217.362***
	(9.95)	(-4.83)	(15.05)	(-5.83)
Observations	360	600	260	700
Bond FE	Yes	Yes	Yes	Yes
Within R^2	0.341	0.744	0.734	0.756
Adj. R^2	0.411	0.805	0.824	0.798

This table shows the results of the bond information sensitivity regressions defined in Equation (2). Bond Prices are as of remittance report release dates. Sub is the percent of subordination for a bond each month. $SDQL$ measures pool performance and is the amount of seriously delinquent loans and losses relative to the initial pool balance. The "Pre-Crisis" and "Crisis" sample periods in Columns 1 and 2 (Columns 3 and 4) are defined based on the month that the ABX.AAA.HE (ABX.A.HE) subindex price average drops below par for the first time. For Columns (1) and (2) (Columns (3) and 4), "Pre-Crisis" is defined as January 2006 to June 2007 (January 2007), while the "Crisis" period is July 2007 (February 2007) through December 2009. All regressions control for general market uncertainty via the VIX and the S&P 500, repo market conditions with the LIBOR-OIS spread, funding conditions in the cash bond market with the spread between the general collateral repo and 3-month LIBOR rates, housing prices with the seasonally-adjusted HPI, and contain bond fixed effects. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Descriptive Statistics for Initial Pool Characteristics

Variable	Obs	Mean	Std. Dev.	P25	P50	P75
Adjustable Rate Mortgages	20	84.02	6.17	80.55	83.55	88.06
2/28 ARMs	20	69.98	8.57	62	72.41	76.83
3/27 ARMs	20	13.32	7.27	7.05	12.65	18.81
Avg. FICO	20	629.10	11.84	619.50	627.50	634.50

This table shows descriptive statistics for the mortgage pools backing the RMBS deals in our sample. Pool characteristics are collected from prospectus supplements. Adjustable rate mortgages (ARMs) are the percent of the outstanding principal amount of adjustable rate loans relative to the pool balance. 2/28 and 3/27 are the percent of outstanding principal amounts of 2/28 and 3/27 loans, respectively, relative to pool balance. Average FICO is the weighted average FICO score of the underlying pool, where the weight is based on outstanding mortgage principal amounts relative to the pool balance.

Table 4: Information Sensitivity of AAA Bonds and Mortgage Pool Characteristics

VARIABLES	Pre-Crisis (1)	Crisis (2)	Pre-Crisis (3)	Crisis (4)
Sub	0.039*	0.963***	0.028	1.230***
	(1.72)	(7.97)	(1.37)	(13.28)
SDQL	-0.040	-0.143***	-0.021	-0.093**
	(-0.70)	(-3.67)	(-0.38)	(-2.17)
Sub x High 2/28	0.010	0.379***		
	(0.67)	(4.98)		
Sub x Low FICO			0.018	0.205***
			(1.50)	(2.68)
Constant	120.546***	-175.721***	120.338***	-225.310***
	(10.88)	(-4.24)	(10.88)	(-5.03)
Observations	360	600	360	600
Bond FE	Yes	Yes	Yes	Yes
Within R^2	0.342	0.754	0.345	0.747
Adj. R^2	0.411	0.813	0.413	0.807

This table shows the results of the bond information sensitivity regressions with initial mortgage pool characteristics. Bond Prices are as of remittance report release dates. Sub is the percent of subordination for a bond each month. $SDQL$ measures pool performance and is the amount of seriously delinquent loans and losses relative to the initial pool balance. "High 2/28" equals one if the initial percent of 2/28 ARM principal balances relative to pool balance is above the median of all deals and zero otherwise. "Low FICO" equals one if the FICO credit score of the underlying mortgage pool is below the median of all deals and zero otherwise. The sample period is July 2007 through December 2009. All regressions control for general market uncertainty via the VIX and S&P 500, repo market conditions with the LIBOR-OIS spread, funding conditions in the cash bond market with the spread between the general collateral repo and 3-month LIBOR rates, housing prices with the seasonally-adjusted HPI, and contain bond fixed effects. Robust standard errors are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: Intex Information Production Regressions

	Pre-Crisis	Crisis
VARIABLES	(1)	(2)
Intex Update	-0.002	-0.238***
	(0.00)	(0.05)
Constant	4.634***	1.379***
	(0.01)	(0.07)
Adjusted R^2	0.114	0.453
Observations	49366	73504

The dependent variable is the natural log of daily bond midprices. *Intex Update* is an indicator variable equal to one for the day the deal received an Intex update and zero otherwise. The sample periods in the first and second columns are defined as January 2006 through June 2007 and July 2007 through December 2008, respectively. All regressions control for general market uncertainty via the VIX and S&P 500, repo market conditions with the LIBOR-OIS spread, funding conditions in the cash bond market with the spread between the general collateral repo and 3-month LIBOR rates, and contain bond fixed effects. Robust standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Descriptive Statistics for Intex Updates across Periods

Panel A: Number of Monthly Intex Updates

	Mean	Std.	Min	Median	Max
January 2006 - June 2007	5.33	3.77	2	4	13
July 2007 - December 2008	11.65	9.43	2	10	32

Panel B: Fraction of Deals with at Least One Monthly Intex Update

	Mean	Std.	Min	Median	Max
January 2006 - June 2007	0.18	0.19	0.05	0.18	0.40
July 2007 - December 2008	0.42	0.33	0.00	0.35	1.00

This table presents the descriptive statistics for Intex updates for the “Pre-Crisis” period (January 2006 - June 2007) and the “Crisis” period (July 2007 - December 2008). Panel A reports the summary statistics for the total number of updates during the month. Panel B presents the fraction of deals with at least one Intex update during the month.

Table 7: Descriptive Statistics for Complexity Measures and Reporting Quality

Panel A. Static Deal Complexity Measures

	Mean	Std. Dev.	P25	P50	P75
Waterfall Pages	24.15	10.06	16.00	24.50	28.50
Pool Description Pages	26.90	22.11	9.00	21.00	33.00
Number of Tranches	14.45	4.33	11.50	14.50	17.00

Panel B. Monthly Reporting Quality Measures across Pre-Crisis and Crisis Periods

	Mean	Std. Dev.	P25	P50	P75
Pre-Crisis Period					
CV Aggregate Loss	0.174	0.241	0.023	0.141	0.252
Low Reporting Quality	0.472	0.500	0.000	0.000	1.000
Crisis Period					
CV Aggregate Loss	0.546	0.227	0.418	0.579	0.706
Low Reporting Quality	0.500	0.500	0.000	0.500	1.000

This table presents the descriptive statistics for deal complexity in Panel A and reporting quality in Panel B. Following Ghent et al. (2019), deal complexity measures are constructed based on the deal's prospectus supplement. There are two monthly reporting quality measures - *CV Aggregate Loss*, which is the coefficient of variation for the monthly aggregate loss across data providers, and *Low Reporting Quality*, which is an indicator variable equal to one if the monthly coefficient of variation for a deal is above the median and zero otherwise. The "Pre-Crisis" period is defined as January 2006-June 2007, and the "Crisis" is defined as July 2007-December 2009.

Table 8: Information Sensitivity of AAA Bonds and Deal Opacity

VARIABLES	Pre-Crisis (1)	Crisis (2)	Pre-Crisis (3)	Crisis (4)	Pre-Crisis (5)	Crisis (6)	Pre-Crisis (7)	Crisis (8)
Sub	0.041**	1.191***	0.048***	1.114***	0.047***	0.871***	0.042***	1.129***
	(2.46)	(12.38)	(2.79)	(9.80)	(2.64)	(8.09)	(2.87)	(9.91)
SDQL	-0.044	-0.158***	-0.043	-0.146***	-0.044	-0.143***	-0.051	-0.175***
	(-0.84)	(-3.78)	(-0.78)	(-3.51)	(-0.82)	(-3.63)	(-0.87)	(-4.16)
Sub x Waterfall	0.027**	0.200***						
	(2.18)	(2.78)						
Sub x Pool			0.000	0.209***				
			(0.00)	(3.01)				
Sub x Tranches					0.002	0.566***		
					(0.17)	(8.12)		
Sub x Low Reporting Quality							0.012	0.150**
							(1.20)	(2.46)
Low Reporting Quality							-0.318	-2.679
							(-1.24)	(-0.82)
Constant	120.795***	-194.175***	120.742***	-188.877***	120.653***	-175.780***	119.663***	-173.793***
	(10.92)	(-4.66)	(10.88)	(-4.47)	(10.88)	(-4.34)	(10.74)	(-4.19)
Observations	360	600	360	600	360	600	360	600
Bond FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Within R^2	0.355	0.747	0.341	0.747	0.341	0.768	0.344	0.754
Adj. R^2	0.422	0.807	0.409	0.807	0.410	0.823	0.411	0.812

This table reports the results of the bond information sensitivity regressions with deal opacity measures. Bond Prices are as of remittance report release dates. Sub is the percent of subordination for a bond each month. $SDQL$ measures pool performance and is the amount of seriously delinquent loans and losses relative to the initial pool balance. For each complexity measure, we create an indicator variable to designate highly complex deals, which is equal to one if that measure is above the median for the sample and zero otherwise. $Reporting\ Quality$ is an indicator variable equal to one if the monthly coefficient of variation for a deal is above the median and zero otherwise. The sample period is July 2007 through December 2009. All regressions control for general market uncertainty, repo market conditions, funding conditions in the cash bond market, and housing prices and contain bond fixed effects. Robust standard errors are reported in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Descriptive Statistics for Intex Updates across Time

Panel A. Deal Complexity	Less Complex		More Complex	
	Mean	Std.	Mean	Std.
January 2006 - June 2007	3.28	2.73	1.94	1.72
July 2007 - December 2008	5.28	5.07	5.72	5.02

Panel B. Reporting Quality	Higher Quality		Lower Quality	
	Mean	Std.	Mean	Std.
January 2006 - June 2007	4.02	4.09	2.62	3.00
July 2007 - December 2008	5.22	4.70	5.89	5.24

The information production descriptive statistics across opaque deals based on complexity and information environment. Complex deals are classified as low (high) complexity based on whether the number of pages in the prospectus supplement describing the mortgage pool is below (above) the median and are reported in Panel A. Summary statistics for deals classified as having low (high) monthly reporting quality are reported in Panel C. A deal has low (high) reporting quality if the coefficient of variation for aggregate losses is above (below) the median each month.