Cheap Talk in the Mortgage-Backed Securities Offerings

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Abstract

We provide the first empirical evidence of cheap-talk signaling in the offering process of residential mortgage-backed securities (RMBS). Based on the framework of Backus et al. (2019) in analyzing a separating equilibrium with signaling, we find that RMBS issuers use pre-issuance written communication for cheap-talk signaling in that the RMBS deals with more pre-issuance written communication suffer higher subsequent losses. Importantly, institutional investor RMBS holdings show that mutual funds avoid the deals associated with cheap-talk signaling, whereas insurance companies are indifferent. Cheap-talk signaling during the offering process is also associated with more hedging text in the risk factor sections of final issuance documents.

Keywords: Communication, Information, Uncertain Text, Risk Factor, Cheap-Talk Signaling, Separating Equilibrium

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I. Introduction

Cheap-talk signaling models (Crawford and Sobel (1982)) are fundamental to understanding the behaviors of economic agents in communicating payoff-relevant private information. Empirical validation of these models is emerging and growing (see, e.g., Backus et al. (2019)). Similar studies are still scarce in the setting of financial markets. It is widely believed that communication in the security offering process is critical for issuers and investors. Nonetheless, there is seldom empirical studies devoted to documenting evidence of cheap-talk signaling. Our study aims to fill this important void in this literature.

The empirical challenge in studying signaling equilibria is that two premises in these equilibria, private information and beliefs, are typically unobservable. We study an important asset class, residential mortgage-backed securities (RMBS), which has received much attention since the 2008 financial crisis. Ample evidence shows that huge losses suffered by RMBS investors during the crisis are information-related.[1] Our starting point is the issuance written communications in the RMBS offering process. We overcome the challenge by extracting information in written communications of issuance process in their entirety .

In practice, RMBS issuance written communications include final prospectus supplements and other written communications preceding the final prospectus supplements.[2] Security offering Reform (SOR) enacted in December 2005 refers to the latter as a free writing prospectus (FWP).[3] The information disclosed in the final prospectus is verifiable through auditing, credit ratings, and subsequent security and collateral defaults. In contrast, FWPs

[1]For example, in a press release by the Department of Justice dated November 20, 2012, "Residential Mortgage-Backed Securities (RMBS) Working Group Co-Chair New York Attorney General Eric T. Schneiderman today filed a Martin Act complaint against Credit Suisse Securities (USA) LLC and its affiliates for making fraudulent misrepresentations and omissions to promote the sale of RMBS to investors." Similar press releases have also reported complaints on all major RMBS issuers, including JP Morgan Chase, CITI Group, Morgan Stanley, and Bank of America. See Appendix A for more detailed descriptions of an incomplete list of the SEC-charged cases.

[2]Most public offerings of ABS are conducted through expedited SEC registration procedures known as shelf offerings or shelf registration. The prospectus itself is general and not specific to an ABS deal. The final prospectus supplement is specifically created for each ABS deal.

[3]According to the SEC, a free writing prospectus is "*a written communication that constitutes an offer to sell or a solicitation of an offer to buy securities that are or will be the subject of a registration statement.*"

entail little cost to file, voluntary, and the information disclosed in the FWPs is difficult to verify since the status of the collateral and securities at the time is unobservable to investors and subject to change before the final prospectus supplements. The FWPs thus provides a good setting for detecting evidence on cheap-talk signaling in our analysis. Considering the nature and specific formats of FWPs, we distinguish FWPs into two major types: loan tape and textual documents. The former is an electronic file or set of numeric files that captures individual loan data. The latter includes preliminary versions of the prospectus supplements and various updates on the deal. Compared to textual FWPs, loan tape contains information that is verifiable and more costly to produce.[4] Therefore, we expect textual FWPs to resemble cheap-talk more than loan-tape FWPs.

Our research design follows Backus et al. (2019), who highlight the importance of three kinds of evidence to document a separating equilibrium in a signaling game. First, senders sort, in that the private type of senders is correlated with the signal they are observed sending. Second, receivers' beliefs about private types reflect that sorting. Third, sender sorting is incentive-compatible in equilibrium. In our setting of RMBS offerings, issuers are the senders, investors are the receivers, and the private type corresponds to the asset quality in the offerings. FWPs are the cheap-talk signals. We observe considerable variations in asset quality, the usage of FWPs, and investor behaviors.

RMBS issuance process provides a novel and unique setting for studying signaling equilibria. Similar to Kawai et al. (2022), we can observe subsequent loan defaults, a correlate of the private information of the issuers that corresponds to evidence of sender sorting. Furthermore, a key distinguishing feature of asset-backed securities (such as RMBS) from corporate securities is minimal business or management of the issuing entity upon forming an asset pool. This feature provides two advantages. First, investors generally focus on the characteristics and quality of the assets at issuance to make investment decisions, in contrast to equity IPOs, for which the management of the issuing entity after issuance is important.

[4]In general, loan tape will be included in the final prospectus. This cost to some extent can be accrued to the final prospectus.

Second, we can infer the ex-ante RMBS asset quality using subsequent performance, whereas the ex-post performance of corporate securities also reflects active management.[5]

We collect all the written communications in the issuance process for the private-label RMBS deals that have gone through the public offering process in 2006 and 2007. Our sample starting year 2006 follows immediately the enactment of the Securities Offering Reform (SOR) in December 2005 and the Regulation AB in January 2006, which allow us to observe and collect all the written communications in the issuance process.[6] Our sample period ends at the end of 2007 because the RMBS market dropped precipitously as the financial crisis began unfolding.

Our first set of results documents that the unobserved private type of quality of the underlying asset pool in securitization is correlated with the FWP usage. We accomplish this by examining the underlying asset value changes,i.e., the cumulative net losses of the asset pool. Controlling an extensive list of observable deal characteristics (including underwriter and time fixed effects), we find a significant relation between the textual FWP usage and the subsequent asset pool loss. When the amount of textual FWP content increases by one standard deviation, the asset pool loss increases by 1.7 percentage points. This accounts for 14% of the average loss in our sample. Interestingly, the change in the content of loan tape FWPs has a negligible and insignificant effect on subsequent pool loss. These results provide supporting evidence for (unobservable) asset quality sorting by the use of FWPs in a cheap-talk signaling equilibrium.

Our second set of tests examines whether investors understand the sorting of asset quality

[5]Information about fundamentals in the corporate setting is typically inferred from a firm's stock price reaction to corporate events. For example, Kothari, Shu, and Wysocki (2009) rely on asymmetric firm stock price responses to dividend cuts versus dividend increases to infer information on firms' fundamentals. However, making inferences from stock price reactions is challenging due to the confounding factors affecting how information is reflected in the stock prices.

[6]Regulation AB, the first regulation enacted specifically for asset-backed securities in January 2006, explicitly states that written communication in the ABS offering process is subject to the rules under SOR. Our analysis became feasible owing to the SOR after which all the written communications prior to the final prospectus need to be filed with the SEC in the form of free writing prospectuses. Prior to the SOR and Regulation AB, issuers generally use term sheets for the public offering of ABS, which are not required to be filed with SEC and this makes the term sheets unavailable to us before 2006.

by the usage of FWPs. We obtain the institutional investors' initial holdings of the RMBS from Thomson Reuter's eMAXX solution, which mainly covers the holdings of insurance companies (pension funds) and mutual funds. We find that mutual funds are sensitive to the usage of FWPs: their holdings are negatively correlated with the amount of textual FWP content. In contrast, insurance companies are insensitive to the FWP content at all. This difference between mutual funds and insurance companies may reflect their different risk attitudes, as found in recent studies.

Finally, we offer evidence of incentive compatibility in the signaling game. Why would RMBS issuers use FWPs if investors understand they correlate with unobserved asset quality? To this end, we analyze the content of the final prospectus supplements, which may contain information beyond the reported loan and pool characteristics. If the usage of FWPs correlate with increased disclosure of potential asset quality problems, issuers could face a trade-off between the usage of FWPs and securitization of riskier mortgage loans.

Building upon the recent literature on textual analysis of SEC filings, we take a holistic approach to constructing textual measures for these written communications.[7] Due to the nature of fixed income securities, investors and issuers focus more on the downside risk for RMBS (in contrast to the upside potential in the context of equity IPOs). Therefore, we focus on the usage of uncertain text in the final prospectus supplements (hereafter referred to as prospectus for brevity). We apply textual analysis to construct an uncertain text usage measure for the whole prospectus, and the four key sections of the prospectus: the Risk Factor, the Description of Certificates, the Mortgage Pool, and the Summary. The uncertain text in the Risk Factor section commonly creates contingencies for losses to hedge litigation risks, whereas the uncertain text in Mortgage Pool and Description of Certificates sections is often associated with describing numeric information.[8]

Examining the cross-sectional variations in the textual content in FWPs and those in final

[7]See, Loughran and McDonald (2011, 2013, and 2014); Hanley and Hoberg (2010, 2012); and Loughran and McDonald (2016) for a survey on the recent development of this literature.

[8]For instance, "APPROXIMATELY" dominates in the Mortgage Pool section and it is used mainly for the rounding of numeric information.

prospectus supplements, we find that the content in textual FWPs correlates positively with the uncertain word usage in the final prospectus supplement, particularly in the Risk Factor section. Upon further investigating how FWPs correlate with the distribution of uncertain word usage among the sections, we find that the content in textual FWPs positively correlates with the shuffling of uncertain word usage from the Mortgage Pool section to the Risk Factor section. Taken together, we find that textual FWPs, not loan-tape FWPs, correlate with increased elaboration in the Risk Factor section, an indication of negative private information on asset quality. This finding also demonstrates that the unobservable asset quality (relative to observed loan and deal characteristics) is known to the RMBS issuers at the time of issuance.

Additionally, we find that the mortgages underlying the deals associated with FWPs have lower FICO scores, higher loan-to-value (LTV) ratios, and a higher percentage of low-documentation loans, all of which increase the difficulty for the offering process.

Our investigation contributes to several strands of studies. First, our paper provides empirical evidence on the cheap-talk signaling models of bargaining in Farrell and Gibbons (1989), Cabral and Sákovics (1995), and Menzio (2007). Among the empirical studies, Kawai et al. (2022) document signaling in an online lending market by borrowers who seem to disclose their risk type by proposing higher interest rates. Our study closely follows Backus et al. (2019), which proposes a comprehensive framework for testing signaling models beyond providing partial evidence.

Second, our paper is related to the growing literature using textual analysis in financial reporting. Recent studies on corporate securities offering and financial information disclosure show that managers utilize linguistic complexity and tone of disclosure to mitigate the impact of adverse information release and litigation risk.[9] Cohen, Malloy, and Nguyen (2020) analyze

[9]On linguistic complexity, see for examples, Li (2008), Bloomfield (2008), You and Zhang (2009), Miller (2010), Lehavy, Li, and Merkley (2012), Dougal, Engelberg, García, and Parsons (2012), Lawrence (2013), De Franco, Hope, Vyas, and Zhou (2015), Loughran and McDonald (2014). In the context of managing litigation risk in corporate written disclosure, see for examples, Mohan (2006), Nelson and Pritchard (2007), Rogers, Van Buskirk, and Zechman (2011), and Hanley and Hoberg (2012), Hoberg and Lewis (2015).

the price reactions to changes in corporate quarterly and annual SEC filings. They find that the changes in the Risk Factor section are most relevant in predicting future abnormal returns, and investors pay more attention to numerical items than text. Similarly, Zhou (2017) finds that more usage of numbers (relative to words) in corporate conference calls reflects positive information and induces positive price reactions.

Third, our paper further advances studies on securitized asset performance and the roles of market participants in this market.[10] Our paper contributes to the understanding of the connection between the RMBS supply side and the investors—the communication in the offering process and how different institutional investors incorporate the communication content in deciding their holdings in these assets.

II. Cheap-Talk Signaling in ABS Offering Process

In this section we provide more institutional background on the written communications in the ABS offering process and then discuss how written communications are related to cheap-talk signaling.

A. Background

ABS issuers' written communications can be classified into two categories: (1) final prospectuses supplements; and (2) pre-issuance written communications prior to the final prospectus supplements. According to Securities Offering Reform enacted in December 2005, an FWP can be used by any eligible issuer or offering participant after a registration statement has been filed. Therefore, the pre-issuance written communications in FWPs are used

[10]Notable examples include Barlevy and Fisher (2011), Haughwout, Lee, Tracy, and Van der Klaauw (2011), Keys, Seru, and Vig (2012), Chinco and Mayer (2012), Agarwal, Amromin, Ben-David, Chomsisengphet, and Evanoff (2014) on weakened standards; Ben-David (2011), Jiang, Nelson, and Vytlacil (2014), Piskorski, Seru, and Witkin (2015), Griffin and Maturana (2016), Garmaise (2015), on misrepresentations and fraud; Keys, Mukherjee, Seru, and Vig (2010), Purnanandam (2011), Nadauld and Sherlund (2013), Rajan et al. (2015), on the market fueled by poor rating models and rapid expansion of non-agency securitization markets; Demiroglu and James (2012), Dai, Zhang, and Zhao (2014), on affiliation related agency issues; Tzioumis and Gee (2013), Agarwal and Ben-David (2014), Agarwal and Ben-David (2014) on loan officer pay structure and use of other credit derivatives; among others.

frequently in the offering process of ABS.[11] After the FWPs, the last set of written communications is the final prospectus supplement, equivalent to the final prospectus in an equity IPO, and so-called because ABS issuance's reliance on shelf-registration.[12]

We classify FWPs as either textual or numeral based on the relative size of the alphabet or numeric tokens within each document. The textual FWPs include preliminary versions of the prospectus supplements and various updates on the deal. Loan-tape FWPs contain some but usually incomplete list of loan and borrower characteristics. The information in textual FWPs could be revised in the final prospectus supplement and is not verifiable since only the final version, not the preliminary versions or updates prior to the final prospectus supplement, of statistics on asset pool and securities can be verified. In contrast, loan tape contains loans that will be in the final asset pool, which can be verified. Therefore, we expect that loan-tape FWPs are more readily verifiable and more costly to produce than textual FWPs, and textual FWPs are more likely to fit the cheap-talk signaling setting.

The final prospectus supplements have a standard format, and their contents are mostly textual. Due to the fixed income feature of ABS, investors and issuers would focus more on the downside risk. We thus focus on the usage of uncertain text in the final prospectus supplements. In particular, the uncertain word usage in different sections of the supplement for different reasons. For example, the Risk Factor section mostly relates to hedging risks in wordy contingencies without much discussion of numerical details. On the other hand, the Mortgage Pool section is more related to the summary of quantitative information on loan

[11] In the mid-1990s, SEC no-action letters have permitted issuers/underwriters to use term sheets for the public offering of asset-backed securities. Term sheets must be filed with the SEC on FWPs after the SOR. There are three types of term sheets: "structural term sheets" provide factual information regarding the financial terms of an asset-backed securities transaction, including the securities to be offered and the structure of the offering; "collateral term sheets" provide data about the assets underlying the offering; and "series term sheets," combine aspects of a structural term sheet with a collateral term sheet. In the SEC letters, "computational material" is another term used to describe structural and collateral term sheets. Decrement tables, which contain maturity projections such as those commonly found in mortgage-backed and complex owner trust transactions, would appear to be series term sheets because they describe proposed structures for the offered securities but are based on data concerning the collateral pool.

[12] Most public offerings of ABS are conducted through expedited SEC registration procedures known as shelf offerings or shelf registration. The ABS prospectus itself is general and not specific to an ABS deal. The final prospectus supplement is specifically created for each ABS deal.

pools.

The extant theoretical literature on bargaining shows that negotiating parties can employ cheap talk as a strategic tool, facilitating a trade-off between the negotiated price and the likelihood of a successful sale. Sellers with low reserve prices are willing to signal their weakness to enhance the probability of a sale. An illuminating example is that rug stores advertise "going out of business" perennially to signal buyers their willingness to negotiate. On the other hand, cheap talk cannot credibly signal a strong bargaining position because of incentive compatibility. Various theoretical model assumptions are made to introduce seller heterogeneity. The empirical implication is that a separating equilibrium within a signaling game is in play.

In our setting, issuers could use cheap talk to signal their willingness for a trade, especially when they have private information that the asset quality underlying the deal is poor. In practice, FWPs could facilitate sales of ABS because they can reach a larger client base and provide potential ABS investors with timely written communications. At the same time, the cost of using textual FWPs is low. With the negative private information about the deal quality, issuers could elaborate in the Risk Factor section to hedge potential litigation risks. This link provides us with an ex-ante measure to examine the sorting of asset quality.

B. A Simple Model of Negotiations with Cheap-Talk Signaling

In the theoretical models of negotiation with cheap talk, a trade-off exists between price and the probability of sale. Sellers with relatively low reserve prices willingly signal their weakness in order to increase the probability of sale. Sellers differ in reserve prices or discount rates. Our assumptions about matching functions, in our case, the arrival process of players and the bargaining procedure, are general and focus on the empirical implications of a separating equilibrium of a signaling game.

The market is in continuous time and populated with buyers and sellers. The buyers arrive randomly with a Poisson arrival rate of λ_b. Each buyer's willingness to pay for the

security is p_b, and their outside option is set at 0. Once a buyer appears in the marketplace, he decides to buy or leave instantaneously.

Each seller has a private payoff-relevant type that is unknown to buyers. We assume two types of sellers: high types ($z = H$) and low types ($z = L$), where the high types are more patient than the low types. The discount rates are $r_H = 0$ and $r_L = r > 0$ for the two types, and both receive gains from trade when they can sell to a buyer. The discount rates may reflect the quality difference in the offerings. The utility of a seller of type z from selling his offerings at a price of p after a period of time t from when he arrived in the market is $e^{-r_z t}p$.

We assume that at most one H and one L type sellers can be active at any time. The H type seller is replaced immediately after a sale so that one active H type seller always exists. In contrast, the L type seller is replaced randomly with a Poisson arrival rate of λ_l after a sale. Hence, the expected time of absence of L type seller is $\frac{1}{\lambda_l}$. In this setting, patient sellers stay longer in the market than impatient sellers. When a buyer arrives, she can observe the number of sellers. If there is only one seller, then the buyer knows that he is H type. If there are two sellers, the buyer knows that one of each type is present.

Buyers and sellers interact in the marketplace as follows. In the first stage, the seller can send a cheap-talk signal $s \in strong, weak$ upon each buyer's arrival to the marketplace and let θ_z denote the seller's signaling strategy that maps types into probability distributions over signals. These cheap-talk signals are costless and unverifiable but may affect the buyer's beliefs in equilibrium. Conditional on a signal s, the buyer has updated beliefs $\mu(s)$ over the seller's type.

In the second stage, the seller and buyer engage in a Nash bargaining game. The buyer chooses who to "negotiate" with given her belief about the seller's type conditional on the sellers' signals, which captures the idea of bargaining power. The buyer beliefs $\mu(s)$ are mapped into a probability of sale $q(s)$ and a negotiated price conditional on the sale, $q(s)$. The two parties split the surplus of trade between them, given the buyer's beliefs about the seller's type. Sellers' payoffs, $\pi_z(p(s), q(s))$, depend on both outcomes and the seller type z.

In a separating Perfect Bayes Nash Equilibrium, the L type seller chooses to reveal his weakness by sending the "weak" signal to negotiate a sale at a low price once a buyer arrives, while the H type chooses the "strong" signal and only sells if he is alone and for a high price.
Proposition 1: $\theta_z, \mu(s), \pi_z(p(s), q(s))$ satisfy the following conditions in a separating Perfect Bayes Nash Equilibrium:

1. Sellers of different types choose different signaling strategies:

$$\theta_H \neq \theta_L. \tag{1}$$

2. Buyers' beliefs are derived from Bayes's rule and thus reflect separation of seller types:

$$\mu(strong) \neq \mu(weak). \tag{2}$$

3. Incentive Compatibility:

$$\pi_H(p(strong), q(strong)) \geq \pi_H(p(weak), q(weak)); \tag{3}$$

$$\pi_L(p(weak), q(weak)) \geq \pi_L(p(strong), q(strong)). \tag{4}$$

The model setup affords an intuitive proof of this proposition. First, the H type seller chooses the "strong" signal in equilibrium and receives the equilibrium price $p_H = p_b$. The H type seller is patient with the discount rate is $r_H = 0$, implying that his endogenous reservation value is p_H. Nash bargaining requires splitting the surplus between the endogenous reservation value and p_b. and therefore $p_H = p_b$.

Second, the L type seller chooses the "weak" signal in equilibrium and receives the equilibrium price p_L. If the seller chooses not to settle immediately, the expected value of waiting is $p_L \mathbf{E}_t[e^{-rt}] = \frac{\lambda_b p_L}{r+\lambda_b}$ because the buyer's arrival time follows an exponential distribution. This

is the reservation value of the seller for immediate settlement. Nash bargaining implies

$$p_L = \frac{1}{2}\frac{\lambda_b p_L}{r+\lambda_b} + \frac{1}{2}p_b \tag{5}$$

Third, we can verify the incentive compatibility for both types of sellers. It is clearly not optimal for the H type seller to deviate. Suppose that the L type seller chooses "strong" instead of "weak" signals. The buyer arrives and observes two sellers with "strong" signals. Assume the buyer will transact with the buyers with equal probability. Hence, the deviating L type either sells at p_b or receives the expected value of waiting, that is

$$\frac{1}{2}\frac{\lambda_b p_L}{r+\lambda_b} + \frac{1}{2}p_b, \tag{6}$$

which equals the equilibrium price for the L seller.

From this simple model, we can derive the empirical implications for our tests. First, the sorting of the seller types can be tested using the subsequent default of the securitized loans. Second, we can infer RMBS investors' beliefs from their holdings, especially from different types of investors. Investors could have different reservation values. Therefore, they should have different holdings across the seller types. Finally, we need to demonstrate the trade-off faced by the L type sellers. Our approach is to show that waiting is especially costly for the L type sellers because their offerings are more difficult to transact.

III. Data and Summary Statistics

A. Free Writing Prospects

Our data on pre-issuance written communications come from the Electronic Data Gathering, Analysis, and Retrieval (EDGAR) system of the SEC. We start with a list of RMBS deals in Bloomberg and link deals to SEC filings by matching deal name. For each deal, we

compare its name with the ABS names in EDGAR.[13] If multiple matches are found, we then read the final prospectus supplements filed with the SEC to pin down the correct match. To examine the relation between securitized mortgage deals and written communications in MBS public offering process, we collect data on securitized residential mortgage deals for 2006 and 2007. We focus on this time period because SOR was enacted in December 2005 which clarified the content, permissible use, and potential liability of written communications in ABS public offering. This allows us to collect these offering documents systematically. The drastic housing market decline leading to a precipitous drop in the number of securitized mortgage deals post-2007 delineates the end point of our sample.

These FWPs are downloaded from EDGAR on SEC filings of RMBS deals. Given that FWPs are a new form of SEC filing, in Appendix C, we list examples of FWPs on one specific mortgage deal. FWPs provide data covering basic statistics for collateral assets, structural and collateral term sheet, detailed loan level data, and updates of these information.

A novel approach of our study is that we analyze the content of these FWPs and use textual analysis to classify these documents as textual FWPs or loan data FWPs. This allows us to investigate the potential economic mechanism driving the relation between deal cumulative net loss and FWP usage. A loan data FWP covers loan-level information, which is commonly referred to as loan tape. loan tape FWP provides information on individual loan such as its FICO score, LTV ratio, specific loan terms, among others. The main characteristic of loan tape FWP is its quantitative nature. To provide a measure for the quantitative nature of loan tape FWP, we break down its content into alphabet and numeric tokens.[14]

[13]SEC has a directory for all types of ABS filers (over 10,000 with SIC code 6189).

[14]A token is a structure representing a lexeme that explicitly indicates its categorization for the purpose of parsing. To obtain tokens from a FWP document, we first parse the document to strip off various html tags, then we break the remaining document into tokens by any white space. We define a token as a numeric token if the first character is a number (0 to 9). Similarly, we define a token as an alphabet token if the first character is a letter (a to z or A to Z).

Panel A of Table I shows the content characteristics of loan tape FWP. We can see that it is dominated by numeric tokens. For example, the average number of numeric tokens in FWPs is over 820 thousand whereas the average number of alphabet tokens is about 380 thousand. In fact, even the alphabet tokens in loan tape FWP are likely to be quantitative information because some dummy variables are presented in alphabet form. For example, for the documentation of an individual loan, the value could be "Full" or "Low". For the occupancy of the property for each loan, the value could be "Owner Occupied" or "Investor".[15] The quantitative nature of loan tape FWP can also be seen from the alphabet to numeric token ratio with an average of 0.5.

In contrast, a textual FWP is mostly dominated by alphabet-tokens and has a descriptive nature. Panel B of Table I shows that the average number of numeric tokens for textual FWP is 23 thousand and the number of alphabet tokens is around 301 thousand. The average alphabet to number ratio is 51 for textual FWP, in sharp contrast to an average alphabet to number ratio of 0.5 for loan tape FWP. Moreover, examining the interquartile difference (Q3/Q1) for the alphabet-number ratio, we observe that the ratio of the 75^{th} percentile to the 25^{th} percentile is close to 20 for textual FWP. The interquartile difference measured by Q3 to Q1 ratio is only about 2 for loan tape FWP. This reflects another important difference between these two types of FWPs.[16]

Table I about here

For every deal, we create two measures of FWP content, one for loan tape FWP and another for textual FWP. For loan tape FWP, we sum up the number of alphabet tokens and the number of numeric tokens and use the natural logarithm of this sum to measure content of loan tape FWP and we label it as "Log(loan tape FWP)" in our tables. Similarly, we label the measure of textual FWP content as "Log(Textual FWP)". In addition, we

[15]Certainly different deals may use different words to represent these values. The example here is based on the deal in Appendix C.

[16]loan tape FWP is also much more standardized in format while textual FWP is much less structured.

collect information on deal performance and characteristics. These include cumulative net loss, original collateral balance, the number of tranches, the percentage of loans with low documentation (including loans with no documentation), the average FICO score, the loan-to-value (LTV) ratio at 75 percentile, the percentage of adjustable rate mortgages, negative amortization, purchase loans, single family property, owner-occupied house, and second lien. We also collect regional and macroeconomic variables, the credit spread, and 10-year treasury yield and use them in our analyses.

Table II Panel A reports the summary statistics of the FWP variables and other characteristics for mortgage deals; the details of variable construction can be found in Appendix B. For our sample, the cumulative net loss is 12% of the initial collateral balance per deal on average with a standard deviation of 8.6%. The average number of FWPs per deal is 1.6 with a standard deviation of 1.8. More than half of mortgage deals had at least one FWP. At the same time, there are 25% deals with three or more FWPs. The logarithm of the sum of alphabet and numeric tokens of textual FWPs has an average of 7.9 with a standard deviation of 6.3, while for loan tape FWPs, the average is lower at 4.6 with a slightly larger standard deviation at 6.6. The original collateral balance is about \$870 million on average with a standard deviation of \$520 million. The mortgage deals had about 22 tranches per deal on average. More than 60% loans in mortgage deals had low documentation on average. Panel B shows the correlation matrix between deal cumulative net loss and FWP variables. For the key variables of interests, we find that the number of FWPs, multiplicity of FWPs, the logarithm token size of textual FWPs and loan tape FWPs are highly positively correlated with deal cumulative net loss.

Table II about here

B. The Textual Content of Final Prospectus Supplements

Next, we analyze the content of final prospectus supplement. We extract the final prospec-

tus supplements for our sample deals from the SEC filings. To analyze the textual content, we first parse the individual documents following the procedure in Loughran and McDonald (2011, 2013). We add one additional step in the parsing procedure to separate the final prospectus supplement from the general shelf-registration statement. This is because the final prospectus in general includes both parts and only the supplement is prepared for a specific deal. All the textual measures are based on the supplement. The style and format of the final prospectuses vary across deals and some deals are submitted to SEC in XML format while others are in txt format. We also extract the table of content from each final prospectus supplement in order to obtain the textual content for individual sections. We exclude the deals with unorganized format for which the key sections are not identifiable.

Due to the nature of fixed income securities, investors and issuers focus more on the downside risk for RMBS (in contrast to the upside potential in the context of equity IPOs; see Hanley and Hoberg (2010, 2012)), we focus on the usage of uncertain word usage in the final prospectus supplements. Our uncertain words are based on the aggregate list of *uncertain*, *weak modal*, *negative* word lists (Loughran and McDonald (2011)). We first measure the usage of uncertain words for the whole document of final prospectus supplement. Among the 2600 Loughran and McDonald (2011) aggregate uncertain words, we find that two words: *may* and *approximately* alone account for 24.7% of the uncertain words used in the MBS final prospectus supplements. The word *may* accounts for 18.6% and the word *approximately* accounts for 6.1%.[17] To provide micro-foundation on the uncertain word usage, we also measure it for four key individual sections: the Risk Factor section, the Description of Certificate section, the Mortgage Pool section, and the Summary section.[18]

We aggregate the usage of uncertain words in the whole document of the final prospectus supplement ($UncProp$) and its four key sections ($UncRiskFactor$ for the Risk Factor section; $UncCertificate$ for the Description of Certificates section; $UncMortgagePool$ for

[17] We carefully exclude the cases in which "May" is used to refer to the calendar month. To do so, we identify and exclude the instances for "20XX May" and "May 20XX".

[18] Appendix D provides more details on how we extract these individual sections from the final prospectus supplements.

the Mortgage Pool section; and *UncSummary* for the Summary section).[19] On average, a prospectus supplement uses 1267 uncertain words with a standard deviation of 493 uncertain words. The four key sections account for slightly above 60% of the uncertain word usage in the final prospectus supplement. Among the four sections, there are 277 and 269 uncertain words on average in the Risk Factor and the Description of Certificates section respectively, followed by 124 in the Mortgage Pool section and 102 in the Summary section. Another interesting observation is that the correlation between uncertain word usage in the whole final prospectus supplement and individual sections is highest for the Risk Factor section (0.62) and lowest for the Summary section (0.12).

IV. Empirical Analysis

We now conduct empirical analysis to test our hypothesis and discuss our findings. Our empirical analysis consists of tests for the three predictions of separating equilibrium: sorting, beliefs, and incentive compatibility.

A. Mortgage Loan Quality and Evidence for Sorting

A.1. Subsequent Loan Loss

We now investigate the relationship between deal performance and the usage and content of FWPs. We use the cumulative net loss of the collateral pool in a mortgage deal as the measure for securitized loan performance. Specifically, we measure deal-level cumulative net loss rate as the sum of all losses of principal suffered until December 2014 divided by the total original balance of all mortgages. We conduct the following OLS regressions:

$$\text{Cumulative net loss} = \alpha + \beta \times \text{FWP usage/content} + \text{Deal characteristics} + \text{Fixed effects}.$$

[19] These different sections serve different purposes and they can also be prepared by various groups participating in the deal. Risk Factor sections are usually prepared by legal counsel, the Mortgage Pool sections by loan officers and the Description of Certificates sections by structured finance analysts.

Table III reports the estimation results. We find that both the number of FWPs and the multiplicity of FWPs have a significant positive effect on the cumulative net loss. Controlling for mortgage deal characteristics, regional and macroeconomic variables, the deal cumulative net loss is higher by about 1.1% for a one-standard deviation increase in the use of FWPs (0.61×1.82). This accounts for 9% of the average mortgage deal cumulative net loss. For mortgage deals with multiple FWPs (two and above), the cumulative net loss is higher by 2.1% and accounts for 18% of the average deal cumulative net loss. Our evidence supports the hypothesis that more FWP usage is associated with higher deal cumulative net loss unexplained by the observable control variables.

We perform similar analysis on the relation between deal cumulative net loss and the content of FWPs. Our estimation results show that textual FWPs is significantly positively related to cumulative net loss. The estimated coefficient suggests that when the aggregate content of textual FWPs increases by one-standard deviation, deal cumulative net loss is higher by 1.4%. In the meantime, the loan-tape FWP has a negligible and insignificant relation to deal cumulative net loss. This may reflect that the reported loan-level information in loan-tape FWPs is generally consistent with the final prospectus supplement and thus verifiable. The provision of loan-tape FWPs is also more costly. However, the inclusion of loan-tape FWPs does not render the textual FWPs redundant. Considering that textual FWPs are more likely the cheap-talk signal, this contrast provides suggestive evidence on deal quality sorting on cheap-talk signals in the form of textual FWPs.

Table III about here

Turning to other control variables, we find that the number of tranches increases the cumulative net loss. To the extent that the number of tranches of mortgage deal serves as a proxy for product complexity of securitization, this finding suggests that product complexity adversely affects mortgage deal performance. Consistent with our intuition, high FICO score

has a negative effect on the cumulative net loss while high percentage of low documentation and LTV increase the cumulative net loss. The former reflects higher borrower credit worthiness and thus better loan quality. The latter indicates higher risk because of higher borrower leverage. High percentage of loans with second lien also increases cumulative net loss. On the other hand, original collateral balance and high underwriter reputation had no significant effect on deal cumulative net loss, possibly due to the lead underwriter fixed effect on deal performance. In all regression specifications, house price changes have a negative effect on the cumulative net loss, suggesting that housing price decline contributed to the loss in collateral.

B. FWPs and Investor Beliefs

In this section we test the hypothesis that investors' beliefs reflect loan quality sorting results across FWPs. We use data on institutional investor holdings to show how FWPs guide investors' behavior. We examine whether and which investors' beliefs are consistent with loan quality sorting results.

We merge institutional investors' initial RMBS holdings from Thomson Reuters' eMAXX database and data from EDGAR. The eMAXX data mainly cover the RMBS holdings of mutual funds, insurance companies, and pension funds. We then aggregate holdings by each institutional investor among all the AAA-rated securities in each deal with the reported holdings closest to the deal issuance date. In our sample, institutional investors typically report the largest amount in their holdings for each security near the issuance date. We construct the ownership of these RMBS for mutual fund and insurance company holdings and evaluate the sensitivities of the RMBS holdings of these institutional investors to the usage and contents of FWPs, controlling for other commonly used deal characteristics. This analysis is based on deal-investor-level observations. Specifically, we regress holdings for investor i and deal j, $hldg_{i,j}$, on the FWP contents, using the specification

$$
\begin{aligned}
hldg_{i,j} &= \alpha_0 + \alpha_i + \beta_1 \times FWP\ contents_j \\
&\quad + \beta_2 \times Deal\ characteristics_j + Fixed\ effects.
\end{aligned}
$$

We include the control variables used in the deal-level regression analysis, issuance semester fixed effects, lead-underwriter fixed effects, and investor fixed effects. We include fixed effects for each investor for two reasons. First, we need to account for investor-specific characteristics such as type of institution, balance sheet information, and investment and risk management practices. Second, for each deal, we want to normalize the holdings for each investor by the size of their investment portfolio at the start of the sample period to capture the relative increment size for each holding.[20] The investor fixed effects subsume the normalizing denominator, such as the logarithm of the portfolio size at the start of the sample period, and we measure the holdings as the logarithm of the dollar amount, thereby providing a measure of relative increment size.

Table IV reports results on whether initial RMBS holdings of mutual funds and insurance companies are related to the use of FWPs. The results show that mutual funds tend to hold fewer RMBS deals of FWPs, especially textual FWPs. Our coefficient estimates indicate that a one-standard-deviation increase in textual FWPs decreases mutual fund holdings by 9% (7%) without (with) loan-tape FWPs in the regression specification. In contrast, insurance companies are insensitive to the usage of FWPs.

Table IV about here

Recent studies show that insurance companies neglected the risks in this market. Our results show that mutual funds hold the belief that the RMBS deals with FWPs have quality problems, whereas insurance companies are agnostic.

[20]This is similar to measuring the growth rate, as in Merrill, Nadauld, and Strahan (2019).

C. Mortgage Types and Incentive Compatibility

The deals associated with FWPs have lower quality, and at least some investors understand this and shun such deals. But why would issuers signal lower quality? Here, we try to address this question by examining incentive compatibility. Specifically, we document the trade-off between the usage of FWPs and the certain characteristics of the securitized loans that reduce the likelihood of a sale.

C.1. Linking FWPs to Final Prospectus Supplement Content

Given that FWPs are cheap-talk and sort securitized loan quality, we still need evidence that issuers know the loan quality problems ex ante and face the trade off between cheap-talk signaling and securitization of lower quality loans. To achieve this, we now analyze the potential inter-connections linking these FWPs to the content of the final prospectus supplements.

We regress the uncertain word usage in the final prospectus supplements and the four key sections on the FWP content. The control variables are the same as in the regressions discussed in previous sections. The regressions take the following form:

$$\begin{aligned}\text{Prospectus Uncertain Word Usage} \;=\; & \alpha_u + \beta_u \times \text{FWP usage/content} \\ & + \text{Deal charact.} + \text{Fixed effects.}\end{aligned}$$

Table V reports the results of analyzing the determinants of the final prospectus supplement content, focusing on how FWP content affects the use of uncertain words in the whole document and four key sections of the final prospectus supplement. The dependent variable is the number of uncertain words the whole document of final prospectus supplement (UncProp) in column (1), in Risk Factors section (UncRiskFactor) in column (2), in Description of Certificates section (UncCertificate) in column (3), in the Mortgage Pool (UncMortgagePool) section in column (4), and in Summary section (UncSummary) in column

(5).

Our results indicate that the percentage of uncertain words used in the final prospectus supplement is positively related to the token size of textual FWPs and to a less extent loan tape FWPs. Examining across the individual sections reveals a key finding of the table that the textual FWP content in the pre-issuance period is significantly positively related to uncertain words used in the Risk Factor section. On the other hand, loan tape content has the most positive relation to the uncertain word usage in the Description of Certificates section. The textual FWP content is negatively correlated with the uncertain words used in the Description of Certificates and the Mortgage Pool sections.

On the deal collateral characteristics, we can see that uncertain words used in the Risk Factor section are also related to deals with more low documentation, lower FICO and higher LTV loans. In the online appendix, we also report the results using a system of simultaneous equations to account for the joint determination of the uncertain word usage in the four key sections and the results are qualitatively similar.

Table V about here

To better understand the dynamics between the FWP content and the four sections of final prospectus supplement, we create another set of normalized measures for the four sections. For example, we define

$$\text{PctRiskFactor} = 100 \times \frac{\text{UncRiskFactor}}{(\text{UncRiskFactor} + \text{UncCertificate} + \text{UncMortgagePool} + \text{UncSummary})},$$

and also similarly define PctCertificate, PctMortgagePool, and PctSummary. PctRiskFactor measures the percentage of uncertain words used in the Risk Factor section relative to all the uncertain words in the four sections. By construction, PctRiskFactor, PctCertificate, PctMortgagePool, and PctSummary add up to 100. Therefore, we can evaluate when a (cross-sectional) change in the FWP content leads to a change in uncertain word usage of one particular section, how other sections are affected. In other words, we can test whether

there are any shuffling actions in the uncertain word usage in the final prospectus supplement in responding to the pre-issuance written communication in FWPs.

Table VI reports the regression results. The key finding is that when textual FWP content increases, the percentage of uncertain words used in the Risk Factor section increases whereas the usage in the Mortgage Pool section decreases. One standard deviation increase in the textual FWP content corresponds to 2.3 percentage points decrease in uncertain words used in the Mortgage Pool section and 2.2 percentage points increase in the Risk Factor section. Given that on average there are 35 percent of uncertain words used in the Risk Factor section and 16 percent of uncertain words used in the Mortgage Pool section, these changes are economically meaningful. This result suggests that when more textual FWP content in the pre-issuance period is used, a portion of the uncertain words in the final prospectus supplement is shuffled from the Mortgage Pool section where numerical information is discussed to the Risk Factor section where risk contingencies are discussed without much numerical information.

Taken together, the results in this analysis point to a common pattern: textual FWPs correlate with more disclosed contingencies in the Risk Factor of the final prospectus supplement to hedge such risks.

Table VI about here

C.2. The Usage of FWPs and Deal Characteristics

We regress the usage and contents of FWP on the deal characteristics in the following specification,

$$\text{FWP usage/ Document content} = f(\text{Deal characteristics} + \text{Fixed effects}),$$

where we use the number of FWPs and the choice of multiple FWPs as measures for FWP Usage, and the logarithm sum of alphabet and numeric token size of textual FWPs (Log(Textual

FWP)) and the logarithm sum of alphabet and numeric token size of loan tape FWPs (Log(loan tape FWP)) as measures of FWP content, respectively. We apply the Poisson regression to the number of FWPs, the logistic regression to the choice of multiple FWPs, and OLS regressions to the FWP content in our analysis. We include an extensive list of mortgage deal characteristics, regional and macroeconomic variables, issuance semester, and lead underwriter fixed effects. The results are reported in Table VII.

Table VII about here

We find that deals with more FWPs and larger token sizes of textual and loan-tape FWPs are associated with larger collateral balance, lower average FICO score, higher average LTV, and a higher percentage of low-documentation loans. These characteristics likely make the offering process more difficult and necessitate more written communication between issuers and investors. The FICO score is the most important piece of hard information in mortgage securitization and lower FICO scores pose a challenge for RMBS issuers.

We also find that more reputable issuers use more FWPs. This is consistent with more reputable issuers being able to signal more effectively. The number of tranches is negatively related to the use of multiple FWPs and the token size of textual and loan tape FWPs. To the extent that the number of tranches represents the complexity of structured products, this suggests that RMBS issuers may use product complexity as a substitute for FWPs.

In general, these results suggest that when underlying loan pool quality is lower, the written communication between issuers and investors (in numeric and textual format) increases.

V. Concluding Remarks

We provide the first empirical evidence of cheap-talk signaling in the issuance process of RMBS, a major asset class which played a key role in 2008 financial crisis. Using the framework of analyzing a separating equilibrium with signaling, we find that the asset quality underlying RMBS deals is sorted by the usage of FWPs in that the deals with more FWPs

are associated with higher subsequent losses ex post and higher uncertain text usage in the Risk Factor section of final issuance documents ex ante. We find that institutional investors who are attentive to such risks have lower holdings in the deals with more FWPs, suggesting investors understand the sorting of asset quality. We further demonstrate the tradeoff faced by issuers who use FWPs in that their mortgage types are more difficult to securitize, the condition for incentive compatibility.

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Appendix A: An incomplete list of SEC charged cases

- J.P. Morgan Securities – SEC charged the firm with misleading investors in offerings of residential mortgage-backed securities. J.P. Morgan Securities agreed to pay $296.9 million to settle the SEC's charges. (11/16/12)
  The SEC alleges that J.P. Morgan misstated information about the delinquency status of mortgage loans that provided collateral for an RMBS offering in which it was the underwriter.

- Credit Suisse Securities (USA) – SEC charged the firm with misleading investors in offering of residential mortgage-backed securities. Credit Suisse agreed to pay $120 million to settle the SEC's charges. (11/16/12)
  Credit Suisse misled investors by falsely claiming that "all First Payment Default Risk" was removed from its RMBS, and at the same time limiting the number of FPD loans that were put back to the originator.

- Bank of America – SEC charged Bank of America and two subsidiaries with defrauding investors in an offering of residential mortgage-backed securities by failing to disclose key risks and misrepresenting facts about the underlying mortgages. (8/6/13)
  As part of the global settlement, Bank of America agreed to resolve the SEC's original case by paying disgorgement of $109.22 million, prejudgment interest of $6.62 million, and a penalty of $109.22 million. The settlement is subject to court approval. (8/21/14)

- RBS Securities – SEC charged the Royal Bank of Scotland subsidiary with misleading investors in a subprime RMBS offering. RBS agreed to settle the charges and pay $150 million for the benefit of harmed investors. (11/7/13)
  RBS told investors the loans backing the offering were "generally in accordance with" the lender's underwriting guidelines, which consider the value of the home relative to the mortgage and the borrower's ability to repay the loan. RBS knew or should have known that was false because due diligence before the offering showed that almost 30% of the loans underlying the offering did not meet the underwriting guidelines.

- Morgan Stanley – SEC charged three firm entities with misleading investors about the delinquency status of mortgage loans underlying two subprime residential mortgage-backed securities securitizations that the firms underwrote, sponsored, and issued. Morgan Stanley agreed to settle the charges by paying $275 million to be returned to harmed investors. (7/24/14)

Appendix B: Variable definitions

- Cumulative net loss: Historical percentages of cumulative loss on the underlying loans comprising the entire collateral that backs the deal
- No. of FWPs: Number of free writing prospectuses prior to the deal issuance date
- Multiple FWPs: Equals 1 if no. of FWPs is greater than 1; 0 otherwise
- Log(Textual FWP): The logarithm of 1 plus the sum of the number of alphabet and numeric tokens for all the textual FWPs within a deal
- Log(loan tape FWP): The logarithm of 1 plus the sum of the number of alphabet and numeric tokens for all the loan tape FWPs within a deal
- UncProp: Number of uncertain words in a deal's final prospectus supplement
- UncRiskFactor: Number of uncertain words in a deal's Risk Factor section of the final prospectus supplement
- UncCertificate: Number of uncertain words in a deal's Description of Certificate section of the final prospectus supplement
- UncMortgagePool: Number of uncertain words in a deal's Mortgage Pool section of the final prospectus supplement
- UncSummary: Number of uncertain words in a deal's Summary section of the final prospectus supplement
- Original collateral balance: The original balance of the underlying loans comprising the entire collateral
- High reputation: Equals 1 if the deal has an underwriter IPO reputation score greater than or equal to 8 (from Professor Jay Ritter's website); 0 otherwise
- No. of tranches: Number of securities in a deal
- FICO: Weighted average original credit score of the underlying loans
- Low documentation: percent of underlying loans with limited, as distinguished from full, documentation
- LTV: Original loan to value percentage of the loan

- Adjustable rate mortgage: The percent of the adjustable rate mortgage loans
- Negative amortization: Equals 1 if the deal consists of mortgages with negative amortization features; 0 otherwise
- Purchase loans: The percent of the Loan Purpose (the reason for the loan) for Purchase
- Single family: percent of Single Family Mortgaged Properties, the type of properties against which the loans were written
- Owner occupied: percent of the Occupancy (the purpose of the property) for Owner Occupied
- Second lien: percentage of the loans comprising the collateral that are second lien
- Housing price change: the average house price change from the deal issuance quarter to the end of 2010 for each deal using the state-level Federal Housing Finance Agency's (FHFA) seasonally adjusted quarterly house price index. The weighted average for each deal is taken over the top five states by their mortgage balance assuming the remaining 46 states have equal representation.

Appendix C: Example FWPs (First Franklin Mortgage Loan Trust 2006-FF4)

- FWP size: 25 KB (20060222)
  Link: http://www.sec.gov/Archives/edgar/data/807641/000091412106000390/0000914121-06-000390.txt
  Content: Basic summary statistics for collateral analysis

- FWP size: 372 KB (20060302)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000515/0000914121-06-000515.txt
  Content: Structural and collateral term sheet (including some selected mortgage pool data)

- FWP size: 491 KB (20060302)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000517/0000914121-06-000517.txt
  Content: More summary statistics on the underlying loans

- FWP size: 296 KB (20060303)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000531/0000914121-06-000531.txt
  Content: Updated structural and collateral term sheet (with modified deal structure such as amount and characteristics of certain class of certificates)

- FWP size: 7 MB (20060308)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000573/0000914121-06-000573.txt
  Content: Detailed loan level data

- FWP size: 9 MB (20060309)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000585/0000914121-06-000585.txt
  Content: Updated loan level data

- FWP size: 363 KB (20060323)
  Link: http://www.sec.gov/Archives/edgar/data/1353977/000091412106000795/0000914121-06-000795.txt
  Content: Summary statistics of loan characteristics by loan types

Appendix D: Extracting the content of prospectus supplement

We rely on the "Table of Contents" in the prospectus supplement to locate the starting and ending positions of each section. The four sections that we focus on are as follows:

- Summary
- Risk Factors
- Description of Certificates
- The Mortgage Pool

To arrive at the above common section names, we first extract all the section names and cluster them by frequency, then we go through all the names manually to consolidate the section names. Therefore, in an individual prospectus supplement, the section name may take a slightly different form than the one presented above. For example, "The Mortgage Pool" could also appear in the following names: "Description of the mortgage pool", "Description of the mortgage pools", "The mortgage pools", "Mortgage pool characteristics", and "Information about the mortgage pool". The "Description of Certificates" could also appear as: "Description of the certificates", "The offered certificates", "Offered certificates", "Definitive certificates", "General description of certificates", "Description of the securities", and "Description of securities".

Appendix E: Sample Risk Factor descriptions (First Franklin Mortgage Loan Trust 2006-FF4)

The following sentences are extracted from the Risk Factor section of First Franklin Mortgage Loan Trust 2006-FF4 (with "may" and "could" highlighted by us).

- Less stringent underwriting standards and the resultant potential for delinquencies on the mortgage **could** lead to losses on your certificates.

- The mortgage loans were made, in part, to borrowers who, for one reason or another, are not able, or do not wish, to obtain financing from traditional sources. These mortgage loans **may** be considered to be of a riskier nature than mortgage loans made by traditional sources of financing, so that the holders of the certificates **may** be deemed to be at greater risk of loss than if the mortgage loans were made to other types of borrowers.

- The underwriting standards used in the origination of the mortgage loans held by the trust are generally less stringent than those of Fannie Mae or Freddie Mac with respect to a borrower's credit history and in certain other respects. Mortgage loan borrowers **may** have an impaired or unsubstantiated credit history. As a result of this less stringent approach to underwriting, the mortgage loans purchased by the trust **may** experience higher rates of delinquencies, defaults and foreclosures than mortgage loans underwritten in a manner which is more similar to the Fannie Mae and Freddie Mac guidelines.

- Increased use of new mortgage loan products by borrowers **may** result in decline in real estate values generally. In recent years, borrowers have increasingly financed their homes with new mortgage loan products, which in many cases have allowed them to purchase homes that they might otherwise have been unable to afford. Many of these new products feature low monthly payments during the initial years of the loan that can increase (in some cases, significantly) over the loan term. There is little historical data with respect to these new mortgage loan products. Consequently, as borrowers face potentially higher monthly payments for the remaining terms of their loans, it is possible that, combined with other economic conditions such as increasing interest rates and deterioration of home values, borrower delinquencies and defaults **could** exceed anticipated levels. In that event, the certificates, and your investment in the certificates, **may** not perform as you anticipate.

Table I
Characteristics of FWP content

This table presents the content characteristics of the two main types of FWPs: loan tape FWP (Panel A) and textual FWP (Panel B). A token is a structure representing a lexeme that explicitly indicates its categorization for the purpose of parsing. To obtain tokens from a FWP document, we first parse the document to strip off various html tags, then we break the remaining document into tokens by any white space. We define a token as a numeric token if the first character is a number (0 to 9). Similarly, we define a token as an alphabet token if the first character is a letter (a to z or A to Z). We classify an FWP as a loan tape FWP if it is dominated by numeric tokens and as a textual FWP if it is dominated by alphabet tokens.

Panel A: Content characteristics of loan tape FWP

N=794 (loan tape FWP)	Mean	St. Dev.	Q1	Median	Q3
No. of alphabet tokens	379,006	376,664	128,205	269,461	507,007
No. of numeric tokens	820,367	670,928	366,878	642,897	1,078,382
Alphabet-number ratio	0.50	0.38	0.28	0.41	0.61

Panel B: Content characteristics of Textual FWP

N=2055 (Textual FWP)	Mean	St. Dev.	Q1	Median	Q3
No. of alphabet tokens	300,890	302,020	56,752	169,712	566,700
No. of numeric tokens	23,099	23,382	3,962	14,811	36,777
Alphabet-number ratio	51	681	3	12	58

Table II
Summary statistics and correlation matrix

Panel A of this table presents the summary statistics on FWP variables and other deal characteristics defined in the Appendix B. The statistics reported include N (number of observations), Mean, Std. Dev. (standard deviation), the k^{th} percentile (Pk for $k = 5, 25, 50, 75, 95$) of each variable. Panel B reports the correlation matrix. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

Panel A: summary statistics	N	Mean	Std. Dev.	P5	P25	P50	P75	P95
Cumulative net loss (%)	1577	12.05	8.57	1.18	4.49	10.82	18.16	28.05
No. of FWPs	1743	1.63	1.82	0	0	1	3	5
Multiple FWPs (d)	1743	0.43	0.50	0	0	0	1	1
Log(Textual FWP)	1743	7.89	6.33	0	0	12.00	13.39	14.07
Log(loan tape FWP)	1743	4.58	6.58	0	0	0.00	13.37	14.80
Original collateral balance ($ Billion)	1743	0.87	0.52	0.28	0.49	0.76	1.10	1.87
High reputation (d)	1743	0.72	0.45	0	0	1	1	1
No. of tranches	1743	22.45	11.80	11	16	19	25	45
FICO	1743	693	44.08	613	666	705	724	747
Low documentation	1697	69.26	24.95	28.38	47.14	74.93	91.04	100
LTV (75% quartile)	1716	79.06	5.61	71	76	79	82	88
Adjustable rate mortgage	1743	60.13	38.49	0	0	68.75	100	100
Negative amortization (d)	1743	0.10	0.30	0	0	0	0	1
Purchase loans	1743	44.38	13.83	19.06	37.31	43.18	53.41	68.01
Single Family	1743	67.39	9.46	54.94	62.15	68.46	71.42	85.04
Owner occupied	1743	87.17	7.79	71.87	84.39	87.58	92.90	96.51
Second lien	1743	0.78	2.18	0	0	0	0	5.51

Panel B: correlation	Cumulative net loss	No. of FWPs	Multiple FWPs	Log(Textual FWP)	Log(loan tape FWP)
No. of FWPs	0.41***				
Multiple FWPs	0.42***	0.78***			
Log(Textual FWP)	0.43***	0.69***	0.69***		
Log(loan tape FWP)	0.32***	0.62***	0.64***	0.36***	
Original collateral balance	0.21***	0.18***	0.15***	0.11***	0.15***
High reputation	0.09***	0.14***	0.08***	0.16***	0.05**
No. of tranches	-0.12***	-0.12***	-0.17***	-0.17***	-0.18***
FICO	-0.59***	-0.35***	-0.37***	-0.31***	-0.43***
Low documentation	0.13***	-0.03	-0.08***	-0.09***	-0.12***
LTV	0.51***	0.27***	0.28***	0.27***	0.27***
Adjustable rate mortgage	0.38***	0.15***	0.17***	0.13***	0.17***
Negative amortization	0.06**	-0.04*	-0.06***	-0.03	-0.09***
Purchase loans	-0.04*	-0.04*	-0.05**	-0.02	-0.04*
Single Family	0.03	0.17***	0.22***	0.18***	0.27***
Owner occupied	0.02	0.09***	0.12***	0.10***	0.16***
Second lien	0.41***	0.19***	0.24***	0.24***	0.21***

Table III
Securitized loan performance and FWPs

This table reports the results of how FWP content affects the cumulative net loss (the dependent variable) in the collateral loan mortgage pool of each private-label RMBS deal. The main independent variables of interest are No. of FWPs, Multiple FWPs, Log(Textual FWP), and Log(loan tape FWP). The other deal characteristic variables are defined in the Appendix B. We also control for the macroeconomic conditions including 10-year treasury rate, credit spread, and house prices change, from the deal issuance quarter to 2010 and weighted by the state representations in the deal. The t-statistics based on standard errors clustered at lead underwriter level are reported in the parentheses below each coefficient estimate. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

	(1)	(2)	(3)	(4)	(5)
No. of FWPs	0.61***				
	(6.25)				
Multiple FWPs		2.14***			
		(4.28)			
Log(Textual FWP)			0.22***		0.22***
			(6.15)		(5.80)
Log(loan tape FWP)				0.06	0.01
				(1.25)	(0.20)
Original collateral balance	-0.43	-0.36	-0.36	-0.27	-0.37
	(-1.26)	(-1.01)	(-1.10)	(-0.73)	(-1.04)
High reputation	0.44	0.52	0.36	0.61	0.35
	(0.63)	(0.73)	(0.42)	(0.84)	(0.42)
No. of tranches	0.07**	0.07**	0.07**	0.07*	0.07**
	(2.11)	(2.17)	(2.28)	(1.99)	(2.30)
Low documentation	0.06***	0.06***	0.06***	0.06***	0.06***
	(4.33)	(4.42)	(4.75)	(4.19)	(4.72)
FICO	-0.10***	-0.10***	-0.10***	-0.11***	-0.10***
	(-7.57)	(-7.92)	(-8.76)	(-7.45)	(-8.21)
LTV	0.24***	0.24***	0.24***	0.25***	0.24***
	(3.92)	(4.02)	(3.98)	(3.91)	(4.04)
Adjustable rate mortgage	0.02***	0.02***	0.02***	0.02**	0.02***
	(2.99)	(2.92)	(3.43)	(2.72)	(3.41)
Negative amortization	0.90	1.07	0.71	1.05	0.71
	(1.28)	(1.49)	(1.06)	(1.38)	(1.08)
Purchase loans	0.12***	0.13***	0.12***	0.13***	0.12***
	(5.43)	(5.37)	(5.46)	(5.23)	(5.33)
Single family	-0.03	-0.03*	-0.03	-0.03	-0.03*
	(-1.59)	(-1.85)	(-1.70)	(-1.31)	(-1.89)

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Table III – Continued

	(1)	(2)	(3)	(4)	(5)
Owner occupied	-0.06***	-0.06***	-0.06***	-0.06***	-0.06***
	(-3.18)	(-3.43)	(-3.31)	(-3.24)	(-3.30)
Second lien	0.87***	0.86***	0.83***	0.89***	0.83***
	(4.51)	(4.72)	(4.62)	(4.53)	(4.60)
House prices change	-0.30***	-0.30***	-0.30***	-0.29***	-0.30***
	(-5.46)	(-5.65)	(-5.79)	(-4.97)	(-5.72)
Credit spread	-4.20	-4.48	-4.93	-3.95	-4.86
	(-1.11)	(-1.18)	(-1.39)	(-1.04)	(-1.42)
10 Year Treasury	-0.47	-0.43	-0.47	-0.35	-0.47
	(-0.82)	(-0.73)	(-0.81)	(-0.58)	(-0.81)
Adj. R^2	0.688	0.687	0.694	0.677	0.694
N	1450	1450	1450	1450	1450
Lead underwriter FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes

Table IV
Institutional investor initial holdings and FWPs

This table reports the results of analyzing whether mutual fund and insurance company initial holdings of RMBS are related to FWPs. The dependent variable is the initial holdings by each investor in each deal, reported within two-quarters of the issuance dates (due to the quarterly frequency of eMAXX data). All the other variables are defined as in previous tables. The t-statistics based on standard errors clustered at lead-underwriter-level are reported in the parentheses below each coefficient estimate. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

	Panel A: Mutual fund Holdings				
	(1)	(2)	(3)	(4)	(5)
No. of FWPs	-0.05***				
	(-4.06)				
Multiple FWPs		-0.13***			
		(-3.24)			
Log(Textual FWP)			-0.09***		-0.07***
			(-4.90)		(-3.55)
Log(loan tape FWP)				-0.08***	-0.04
				(-3.42)	(-1.57)
Adjusted R^2	0.577	0.577	0.577	0.577	0.585
Observations	10873	10873	10873	10873	10873
	Panel B: Insurance company holdings				
	(6)	(7)	(8)	(9)	(10)
No. of FWPs	-0.04				
	(-1.52)				
Multiple FWPs		0.08			
		(0.98)			
Log(Textual FWP)			0.01		0.01
			(0.26)		(0.31)
Log(loan tape FWP)				-0.00	-0.01
				(-0.13)	(-0.23)
Adjusted R^2	0.402	0.402	0.402	0.402	0.402
Observations	7449	7449	7449	7449	7449
Deal Characteristics	Yes	Yes	Yes	Yes	Yes
Fund, Semester, Lead UW FEs	Yes	Yes	Yes	Yes	Yes

Table V
Final prospectus supplement content and FWPs

This table reports the results of analyzing the determinants of the final prospectus supplement content, with a particular focus on how FWP content relates to the uncertain word usage in the final prospectus supplement and its four key sections. The dependent variable is the number of uncertain words in final prospectus supplement (UncProp) in column (1), in Risk Factors section (UncRiskFactor) in column (2), in Description of Certificates section (UncCertificate) in column (3), in The Mortgage Pool (UncMortgagePool) section in column (4), and in Summary section (UncSummary) in column (5). All the other variables are defined in previous tables and in the Appendix B. The t-statistics based on standard errors clustered at lead-underwriter-level are reported in the parentheses below each coefficient estimate. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

	UncProp	UncRiskFactor	UncCertificate	UncMortgagePool	UncSummary
	(1)	(2)	(3)	(4)	(5)
Log(Textual FWP)	0.081*	0.033***	-0.013	-0.018***	0.005
	(1.75)	(3.74)	(-1.40)	(-2.88)	(1.17)
Log(loan tape FWP)	0.043	0.021**	0.033***	-0.001	-0.002
	(1.27)	(2.19)	(3.97)	(-0.16)	(-0.45)
Original collateral balance	0.982***	0.235***	0.155*	0.145**	0.117***
	(3.64)	(3.86)	(1.75)	(2.24)	(4.49)
High reputation	0.597**	0.209**	-0.277*	-0.036	0.017
	(2.07)	(2.36)	(-1.88)	(-0.34)	(0.30)
No. of tranches	0.080***	0.006	0.017***	0.004	0.004***
	(6.56)	(1.52)	(4.08)	(1.31)	(2.87)
Low documentation	0.017***	0.006***	0.002	-0.001	0.000
	(3.31)	(3.78)	(1.23)	(-0.68)	(0.61)
FICO	-0.034***	-0.007***	-0.005**	-0.005***	0.000
	(-5.65)	(-5.83)	(-2.44)	(-4.67)	(0.09)
LTV	0.075**	0.031***	0.014*	0.003	0.006
	(2.71)	(4.18)	(1.86)	(0.98)	(1.43)
Adjustable rate mortgage	0.012**	0.003*	0.000	0.002**	0.002***
	(2.60)	(2.05)	(0.16)	(2.53)	(3.81)
Negative amortization	-0.903	-0.164	-0.382	-0.176	0.115
	(-1.55)	(-0.88)	(-1.60)	(-1.35)	(0.81)
Purchase loans	-0.004	-0.003	-0.007*	-0.002	0.004***
	(-0.52)	(-0.79)	(-1.82)	(-0.55)	(7.62)
Single family	0.021	0.008**	-0.007	0.000	0.011***
	(1.22)	(2.15)	(-1.56)	(0.22)	(5.89)
Owner occupied	-0.055*	-0.010	-0.005	0.001	-0.006***
	(-1.77)	(-1.65)	(-0.73)	(0.26)	(-3.67)
Second lien	0.150	-0.018	-0.062*	0.021	-0.014
	(1.35)	(-0.63)	(-1.89)	(0.98)	(-1.69)
Adj. R^2	0.371	0.451	0.316	0.254	0.373
N	1382	1382	1382	1382	1382
Lead underwriter FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Macro variables	Yes	Yes	Yes	Yes	Yes

Table VI
Shuffling in final prospectus supplement content and FWPs

This table reports the results of analyzing whether there is any shuffling among the 4 sections in responding to FWP content. The setup and control variables are identical to Table V except that the dependent variables are the uncertain words in each section as a percentage of total uncertain words in the 4 sections. For example, PctRiskFactor=100×UncRiskFactor/Unc4Section, where Unc4Section is the sum of UncRiskFactor, UncCertificate, UncMortgagePool, and UncSummary. PctCertificate, PctMortgagePool, PctSummary are similarly defined. The t-statistics based on standard errors clustered at lead-underwriter-level are reported in the parentheses below each coefficient estimate. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

	PctRiskFactor	PctCertificate	PctMortgagePool	PctSummary
	(1)	(2)	(3)	(4)
Log(Textual FWP)	0.274***	-0.077	-0.289***	0.092*
	(3.53)	(-1.01)	(-6.72)	(1.99)
Log(loan tape FWP)	0.066	0.150**	-0.068	-0.149*
	(0.68)	(2.17)	(-1.31)	(-2.00)
Original collateral balance	0.166	-1.072	0.706	0.200
	(0.19)	(-1.61)	(1.27)	(0.55)
High reputation	4.013**	-3.588***	-0.747	0.321
	(2.07)	(-3.50)	(-1.25)	(0.44)
No. of tranches	-0.036	0.056	-0.004	-0.016
	(-0.79)	(1.43)	(-0.13)	(-1.06)
Low documentation	0.020	0.002	-0.016	-0.006
	(1.07)	(0.07)	(-1.06)	(-0.45)
FICO	-0.025	0.018	-0.024***	0.031**
	(-1.20)	(0.91)	(-2.90)	(2.56)
LTV	0.179**	-0.131	-0.036	-0.012
	(2.19)	(-1.40)	(-1.00)	(-0.13)
Adjustable rate mortgage	0.018	-0.049***	0.019*	0.012
	(1.19)	(-4.18)	(2.05)	(1.39)
Negative amortization	1.019	-2.415	-1.102	2.498**
	(0.44)	(-1.42)	(-1.00)	(2.30)
Purchase loans	0.016	-0.062**	-0.022	0.069***
	(0.35)	(-2.33)	(-0.70)	(5.31)
Single family	0.112**	-0.230***	-0.011	0.129***
	(2.31)	(-4.21)	(-0.57)	(5.04)
Owner occupied	-0.127***	0.135***	0.036	-0.044
	(-2.79)	(2.89)	(0.87)	(-0.96)
Second lien	-0.046	-0.614*	0.452**	0.208
	(-0.16)	(-1.85)	(2.27)	(0.67)
Adj. R^2	0.287	0.319	0.227	0.157
N	1382	1382	1382	1382
Lead underwriter FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Macro variables	Yes	Yes	Yes	Yes

Table VII
Deal Characteristics and FWPs

This table presents the analysis on the determinants of the FWP content (i.e., Log(Textual FWP), Log(loan tape FWP), as well as FWP frequency). The number of FWPs is regressed on other explanatory variables using poisson regression. The Multiple FWPs is regressed on other explanatory variables using logistic regression. The dependent variables Log(Textual FWP) (or Log(loan tape FWP)) are regressed on other explanatory variables using OLS regressions. The independent variables include other deal characteristic variables that are defined in the Appendix B. We also control for the macroeconomic conditions including 10-year treasury rate, credit spread, and house price change, from the deal issuance quarter to 2010 and weighted by the state representations in the deal. The t-statistics based on standard errors clustered at lead-underwriter-level are reported in the parentheses below each coefficient estimate. Statistical significance levels of 1%, 5%, and 10% are indicated with ***, **, and * respectively.

	(1) No. of FWPs	(2) Multiple FWPs	(3) Log(Textual FWP)	(4) Log(loan tape FWP)
FICO	-0.007***	-0.013***	-0.035***	-0.048***
	(-5.98)	(-2.81)	(-3.23)	(-5.77)
LTV	0.021***	0.054**	0.064*	0.069
	(2.59)	(2.20)	(1.80)	(1.14)
Low documentation	0.004***	0.008	0.009	0.000
	(2.62)	(1.50)	(0.78)	(0.05)
Original collateral balance	0.280***	0.518***	0.700*	0.977**
	(7.06)	(3.17)	(1.88)	(2.20)
High reputation	0.395**	0.653**	1.329	0.582
	(2.47)	(2.20)	(1.65)	(1.48)
No. of tranches	-0.008	-0.023**	-0.045*	-0.035*
	(-1.58)	(-2.44)	(-2.00)	(-1.89)
Adjustable rate mortgage	0.002	0.007**	0.003	0.021***
	(1.59)	(2.38)	(0.43)	(2.96)
Negative amortization	-0.034	-0.446	1.085	-0.657
	(-0.13)	(-1.11)	(1.09)	(-0.59)
Purchase loans	0.003	0.007	0.047**	0.049*
	(1.08)	(0.63)	(2.44)	(2.02)
Single family	0.013**	0.042***	0.060**	0.124***
	(2.53)	(2.58)	(2.37)	(3.95)
Owner occupied	-0.004	-0.001	0.006	-0.024
	(-0.70)	(-0.06)	(0.20)	(-1.47)
Second lien	-0.016*	0.036	0.183	0.003
	(-1.76)	(0.92)	(1.45)	(0.02)
Adj./Pseudo R^2	0.167	0.248	0.316	0.366
N	1561	1561	1561	1561
Lead underwriter FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Macro variables	Yes	Yes	Yes	Yes