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Pledgeability and Asset Prices: Evidence from the Chinese Corporate Bond Markets

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ABSTRACT

We provide causal evidence on the value of asset pledgeability by exploiting a unique feature of Chinese corporate bond markets: bonds with identical fundamentals are traded on two segmented markets with different rules for repo transactions. Using a policy shock that rendered AA+ and AA bonds ineligible for repo on one market only, we compare how bond prices changed across markets and rating classes around this event. When the haircut increases from 0% to 100%, bond yields increase by 39 bps to 85 bps. These estimates help us infer the magnitude of the shadow cost of capital in China.

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IT HAS LONG BEEN RECOGNIZED THAT ASSET prices depend not only on fundamental cash flows, but also on liquidity factors that are broadly related to the frictions prevalent in modern financial markets (Duffie (2010)). Among these liquidity considerations, asset pledgeability, or the ability of an asset to serve as collateral and help reduce financing costs, has arguably received the most attention because of its central role in the research of borrowing constraints in macroeconomics and finance (see, e.g., Kiyotaki and Moore (1997), Gromb and Vayanos (2002)).

In a setting in which collateral helps reduce the costs of borrowing for financially constrained investors, Gârleanu and Pedersen (2011) show that pledgeable assets carry a convenience yield. We refer to this convenience yield as the *pledgeability premium*. This premium is the product of asset pledgeability, which is inversely related to the haircut that an asset faces, and the per-unit value of pledgeability (or simply the value of pledgeability for brevity), which is the shadow value of relaxing marginal investors' collateral constraints. The goal of our paper is to offer an empirical estimate of the value of pledgeability.

We focus on bonds, which, besides their involvement in spot transactions, are often used in repurchase agreements, or repos. Repos are essentially collateralized loans—except repos are exempt from an automatic stay in the event of bankruptcy (Adrian et al. (2013))—with the assets in the transaction serving as the collateral. Lenders often set a *haircut* over the market price of the collateral bond to determine the amount of credit extended; the smaller the haircut, the greater the pledgeability of the bond.

Although the theoretical mechanisms through which pledgeability boosts asset values are relatively clear, it is difficult to measure this effect empirically. Asset pledgeability is endogenous and thus, in general, depends on asset fundamentals, market frictions, and the interactions between the two.

We overcome this endogeneity issue by exploiting a policy shock on asset pledgeability together with a set of unique institutional features in the Chinese bond markets. Two bond markets co-exist in China, namely, the over-the-counter (OTC) interbank market and the centralized exchange market. While commercial banks can trade only in the interbank market and retail investors only in the exchange market, nonbank financial institutions (NBFIs), which include mutual funds, insurance companies, and securities firms, are active investors in both markets. Our study focuses on dual-listed enterprise bonds, market segmentation imply that the prices of a given bond can differ between the two markets.

Our main empirical strategy is to exploit these cross-market valuation differences for dual-listed bonds. Specifically, for the same bond with simultaneous transactions on the two markets, we define the "exchange premium" as the yield on the interbank market minus that on the exchange market. Given NBFIs are common marginal investors who apply the same pricing kernel in the two markets, any (unobservable) fundamentals should affect the pricing of the bond on the two markets in the same way. As a result, the exchange premium isolates the pricing effects of the remaining nonfundamental factors, including cross-market differences in pledgeability and potentially other liquidity factors.

To further isolate the value of pledgeability, we exploit a policy shock that significantly changed the pledgeability for a set of bonds on the exchange market. After hours on December 8, 2014, the exchange suddenly announced that enterprise bonds with ratings below AAA would no longer be accepted as repo collateral; in Section I we provide further institutional background on this shock. Particularly relevant to our study, this policy applied to the exchange market only. However, it only changed the pledgeability of bonds rated AA+ and AA on the exchange, with AAA bonds unaffected and AA− bonds already ineligible for repo before the policy shock. AA+ and AA bonds' haircuts on the interbank market, however, were largely unchanged. These factors, together with the fact that the exchange sets haircuts based largely on ratings before the policy shock, makes the rating-based policy shock a strong instrument for haircut changes and allows us to identify the value of pledgeability.

One potential concern with our identification strategy is that the policy shock could induce fire sales of the treated bonds on the exchange market, which would reduce their exchange premia. We emphasize two features of our empirical setting that help address this concern. First, this policy only applied to bonds that had not been used as collateral at the time of its announcement. In other words, there was no forced deleveraging pressure for investors who had taken a levered position in the affected bonds, as regulators wanted to minimize the policy's impact on market stability. This unique institutional feature makes our policy shock well-suited to studying the value of pledgeability by limiting any temporary price pressure due to forced fire sales.

Second, our empirical design is robust to potential panic selling by retail investors in the exchange market. As shown in the theoretical framework developed in Section II.B, NBFIs would respond to such behavior from retail investors by adjusting their holdings to restore their Euler equations in both markets. Therefore, the difference in prices across the two markets in equilibrium only reflects the value of pledgeability to the common marginal investors.

We show that the treatment group (AA+ and AA bonds) shared a similar trend in exchange premia as the control group (AAA and AA− bonds) before the December 2014 shock. After the policy shock, the raw exchange premia of the treatment group fell, while that of the control group did not change. This pattern suggests that the rating-dependent pledgeability shock adversely affected the exchange market prices of bonds with AA+ and AA ratings only. We highlight that our control group consists of both higher- (AAA) and lower-rated (AA−) bonds, a structure that further helps rule out many alternative fundamental-based explanations; typically, these alternative mechanisms lead to asset pricing reactions that are monotonic in asset quality, which is captured by credit ratings in our setting.

Using the rating-dependent policy shock as an instrument in a two-stage least squares (2SLS) regression, we find that raising the haircut from 0% to 100% leads to a 39 bps (0.39%) increase in the bond yield. This result provides an estimate of the value of pledgeability, that is, the shadow value in relaxing the financial constraints of NBFIs.

Although the exchange premia–based estimate helps address the issue of unobservable bond fundamentals, it could still underestimate the value of pledgeability. One leading concern is cross-market arbitrage; despite significant trading frictions, arbitrage forces will prevent the exchange premia of any dual-listed bond from drifting too far from zero, which could potentially bias the estimate of the value of pledgeability downward. The reason is that, in the absence of any arbitrage frictions, the exchange premium will always be zero regardless of haircut changes, resulting in an estimate of zero for the value of pledgeability. In addition, to the extent that the policy shock triggered a "flight-to-quality" event in the interbank market, such "flight-to-quality" would push up the interbank prices of AAA bonds relative to other bonds and hence reduce the exchange premia of AAA bonds following the shock. This economic force could also bias downward the estimate of the value of pledgeability when we use AAA-rated bonds as part of the control group.

We address this concern by providing an alternative instrumental variable (IV) estimate that likely overstates the price impact of changes in pledgeability; in this way, our two sets of IV estimates plausibly bound the magnitude of . Specifically, we compare the price changes of the treated bonds against those of the matched AAA bonds on the exchange market. These matched AAA bonds have similar haircuts and credit spreads in the pre-event sample as the treated AA+/AA bonds, but their pledgeability is not affected by the policy shock. The alternative IV estimate is likely to be upward biased, as these matched AAA bonds may have better unobservable fundamentals relative to the treated bonds, for example, the regulator has unfavorable private information on AA+/AA bonds. The resulting IV (over)estimate suggests that raising the haircut from 0% to 100% leads to a 85 bps increase in yield, compared to the exchange premia–based estimate of 39 bps. The range for the value of pledgeability provided by our two estimates is admittedly large. We provide preliminary evidence suggesting that the true value is likely closer to the exchange premia–based estimate of 39 bps, as the negative bias induced by cross-market arbitrage is likely small.

In our framework, the value of pledgeability reflects the shadow value of relaxing financial constraints for NBFIs. Equating shadow value with shadow cost faced by NBFIs, and accounting for the fact that financial constraints may not be always binding, we find that our estimates of ranging between 39 bps and 85 bps correspond to a shadow cost of capital of 1.1% to 2.4%. We discuss the economic magnitude in the broad context of the international financial market in the literature review.

Literature review. Equilibrium asset pricing with financial constraints is an active research field. Gârleanu and Pedersen (2011) consider a general equilibrium model with two assets that have identical cash flows but may differ in their margins/haircuts, and tie their equilibrium pricing differences (bases) to margin differences modulated by the shadow cost of capital. Their model provides the closest theoretical framework to our empirical study.[1]

There is no doubt that margin constraints or haircuts are endogenously determined by aggregate conditions in financial markets as well as by asset characteristics. Influential theoretical contributions include Fostel and Geanakoplos (2008) and Geanakoplos (2010), who show that riskless lending arises endogenously due to heterogeneous beliefs; extensions include Simsek (2013) and He and Xiong (2012), among others. Brunnermeier and Pedersen (2009) relate the haircut of assets to a value-at-risk constraint and highlight the downward spiral in a general equilibrium model with endogenous leverage constraints.

Our paper contributes to the literature that connects pledgeability to asset prices. Related empirical studies include Gorton and Metrick (2012), Copeland, Martin, and Walker (2014), and Krishnamurthy, Nagel, and Orlov (2014), among others, with a focus on the failure of the law of one price and its connections to margin constraints and liquidity.[2] Using a policy shock that hits different dealers in a heterogeneous way, Macchiavelli and Zhou (2022) demonstrate

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[1] An early theoretical contribution includes Detemple and Murthy (1997), who study the role of the short-sale constraint, which is intrinsically linked to margin requirements or haircuts in equilibrium. Other general equilibrium models with financial constraints include Basak and Cuoco (1998), Gromb and Vayanos (2002), Danielsson, Shin, and Zigrand (2001), He and Krishnamurthy (2013), Chabakauri (2015), and Rampini and Viswanathan (2019). For recent empirical studies on intermediary asset pricing, see Adrian, Etula, and Muir (2014), He, Kelly, and Manela (2017), and He, Khorrami, and Song (2022). More generally, equilibrium asset pricing terms can also be endogenously determined in a framework with OTC search markets (Duffie, Gârleanu, and Pedersen (2005), He and Milbradt (2014), Chen et al. (2018), among others), of which the Chinese interbank market is one. Based on this framework, Vayanos and Wang (2007) and Vayanos and Weill (2008) study the premia of on-the-run Treasuries as a symptom of the failure of the law of one price. Previous studies also document empirically how price dispersion arises in OTC municipal and corporate bond markets due to dealers' market power (Green, Hollifield, and Schürhoff (2007a, 2007b)), bond characteristics (Harris and Piwowar (2006)), selling pressure (Feldhütter (2012)), and more recently, trading networks (Di Maggio, Kermani, and Song (2017), Hendershott et al. (2020), Li and Schürhoff (2019)).

[2] Examples include Longstaff (2004) and Lewis, Longstaff, and Petrasek (2021), who document the premium of Treasury securities over agency or corporate bonds that are guaranteed by the U.S. government; Krishnamurthy (2002), who documents the on-the-run Treasury premium; and Bai and Collin-Dufresne (2019), Choi, Shachar, and Shin (2019), and Siriwardane (2019), who study the credit default swap (CDS)-bond basis, which is the pricing difference between a corporate bond and its synthetic replicate (buying Treasury and selling CDS). In a recent study, Ai et al. (2020) examine the link between pledgeability and asset pricing in the U.S. equity market. Zevelev (2021) exploits a constitutional amendment in Texas to identify the impact of collateral service flows on house prices.

that a dealer's funding liquidity causally affects the liquidity that the dealer provides to the market. Our identification strategy of exploiting price variations across two markets has a similar flavor to theirs.

The value of pledgeability that we estimate in the Chinese bond markets, which ranges from 39 bps to 85 bps, is somewhat higher than the value found in other major markets. We take these comparisons with caution since the value of pledgeability depends on the shadow value of relaxing the funding constraint, which can vary over time and across countries. Ashcraft, Gârleanu, and Pedersen (2011) empirically examine the price impact of reducing the haircuts of some eligible mortgage-backed securities by exploring one of the Term Asset-Backed Securities Loan Facility (TALF) programs in March 2009, arguably the worst time during the Great Financial Crisis. Based on market reactions of bonds that were rejected by the program (which may carry additional information beyond pledgeability), they find that an increase in the haircut from 0% to 100% would result in an increase in bond yields of 28 bps to 52 bps. Pelizzon et al. (2019) also find a somewhat smaller estimate—13 bps to 59 bps decrease in yields for a 100% drop in haircut—by exploiting the haircut reduction resulting from a corporate bond's inclusion in the European Central Bank's eligible list of collateral for its open market operations.[3] Our paper is distinct because the Chinese enterprise bonds that we consider are dual listed and our setting has two control groups, one with higher credit quality than the treatment group and another with lower credit quality. These features allow us to identify the causal effect of asset pledgeability on asset prices by ruling out the impact of changes in (unobservable) asset fundamentals that are often correlated with changes in asset pledgeability.

Finally, our paper also contributes to the burgeoning literature on the Chinese bond markets, which includes Fan and Zhang (2007), Ang, Bai, and Zhou (2023), Wang and Xu (2019), Chen, He, and Liu (2020), Geng and Pan (2021), and Ding, Xiong, and Zhang (2022). In a closely related paper, Fang, Wang, and Wu (2021) study the effect of nonconventional monetary policy, that is, the expansion of the collateral eligibility list from government bonds and AAA corporate bonds to corporate bonds with ratings above AA− for the Medium-term Lending Facility (MLF, a frequently used lending program by People's Bank of China, or PBoC) on June 1, 2018. Because the MLF haircuts of these newly eligible bonds are unobservable, we cannot directly compare their policy-induced price changes to our estimated value of pledgeability.[4]

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[3] We have scaled the estimated effect by Ashcraft, Gârleanu, and Pedersen (2011) proportionally. For instance, the lower bound effect of rejection by the TALF is estimated to be around 20 bps, but because the TALF rejection essentially raised the bond haircut by 75% (from 25% to 100%), the effect of a 100% increase in haircut should be around 28 bps. Similarly, we have also scaled the lower and upper bounds of the estimates using the haircut schedule of assets eligible for use as collateral in Eurosystem market operations in Pelizzon et al. (2019), who find that the average yield reaction is 11 bps to 24 bps for lendable bonds and 30 bps to 50 bps for nonlendable bonds.

[4] Asset pledgeability also matters for the stock market in China, for example, Bian et al. (2021) document the role of leveraged margin trading in the 2015 crash of the Chinese stock market. Complementary to our angle of rating-dependent pledgeability, Liu et al. (2019) find that retail

The rest of the paper is organized as follows. Section I describes the institutional details relevant to our empirical investigations. In Section II, we outline the data utilized and the economic framework that underpins our estimations. Market responses to the policy shock are documented in Section III. Our 2SLS estimation results, estimations using an alternative matched control group, and additional discussions are presented in Section IV. Section V concludes.

I. Institutional Background

This section Chinese bond markets that are relevant for our study. For more details on the history of the Chinese bond markets, see Amstad and He (2020).

A. Chinese Bond Markets and Dual-Listed Enterprise Bonds

Over the past decade, China has taken enormous strides to develop its bond markets as an integral part of financial reforms. Chinese bond market capitalization scaled by GDP rose from 35% in 2008 to almost 100% in 2019; in comparison, the U.S. bond market has remained slightly above 200% of U.S. GDP during the same period (Appendix Figure A1).

Enterprise bonds. There are three major categories of fixed-income securities in the Chinese bond markets based on issuing entities: government bonds, financial bonds, and nonfinancial corporate bonds.[5] Our paper focuses on enterprise bonds, a type of corporate bond that is issued mainly by nonlisted state-owned enterprises (SOEs) and regulated by the National Development and Reform Commission (NDRC). Enterprise bonds accounted for 25% of total corporate bonds outstanding by 2014 when the policy shock in question occurred.

Exchange and interbank markets and dual-listed enterprise bonds. Two distinct and largely segmented markets co-exist in contemporary Chinese bond markets: the OTC interbank market and the centralized exchange market. Our study focuses on dual-listed enterprise bonds, which are traded on both the exchange and interbank bond markets.

After its establishment in 1997, the interbank market was the only market in which enterprise bonds were issued and traded. In 2005, the NDRC granted

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investors play a significant role in explaining the pricing wedge between the interbank and exchange markets for the dual-listed bonds. Several papers also look at the implicit government guarantee in the Chinese bond markets. Among them, Liu, Lyu, and Yu (2017) investigate the role of implicit local government guarantees for municipal corporate bonds (MCBs), Jin, Wang, and Zhang (2023) study the first bond default by a central SOE in 2015 to estimate the real effects of implicit guarantees, and Huang, Huang, and Shao (2023) study the same question by looking at financial bonds issued by commercial banks.

[5] This classification follows Amstad and He (2020). Government bonds, which account for 55% of bonds outstanding in 2019, are issued by formal government agencies. Financial bonds (18% of bonds outstanding in 2019) are issued by financial institutions, and corporate bonds (25% of bonds outstanding in 2019) are issued by nonfinancial firms. Another widely used classification among practitioners in China groups financial bonds and corporate bonds together as “credit bonds,” as opposed to “interest rate” bonds, which are government bonds in the classification we use.

nonlisted SOEs access to the exchange market to expand the potential investor base. About 78% of enterprise bonds outstanding were dual-listed by the end of 2014 when the policy shock in question took place. At the same time, the interbank market, as opposed to the exchange market where the policy shock occurred, was still the "home" market for dual-listed enterprise bonds, with almost all enterprise bond issuances still initially placed in the interbank market: in 2014, 562 out of 568 newly issued dual-listed enterprise bonds were first listed on the interbank market (see Figure IA.1 in the Internet Appendix for the depository amount and issuance of dual-listed enterprise bonds by market).[6]

Default risk. During our mid-2014 to mid-2015 sample period, default risk for Chinese enterprise bonds as a whole was negligible, simply because enterprise bonds are issued predominantly by SOEs with either larger size or stronger government guarantees. As we explain below in Section I.D, this fact implies that it is unlikely that the policy shock on December 8, 2014 was due to rising regulatory concerns about the default risk of enterprise bonds.

Although the first corporate bond default in China (by publicly traded non-SOE Shanghai Chaori Solar Engergy) took place in March 2014, credit spreads of enterprise bonds in our sample period remained at a level that is similar to that in 2010 when the practice of "rigid payment" was still widely expected in Chinese bond markets (Zhu (2016)). There was no dual-listed enterprise bond default until May 2016, almost one year after our sample period, when non-SOE Inner Mongolia Nailun failed to deliver its interest payment that month. Across both exchange and interbank markets, reactions to the first default of dual-listed enterprise bonds were largely muted. It was not until the U.S.-China trade war and Beijing's New Asset Management Rules hit the market in 2018 that default incidents and credit spreads started to climb in a noticeable way (see, e.g., Geng and Pan (2021), J.P. Morgan Asset Management (2018)).[7]

B. Exchange and Interbank Bond Markets in China

We now discuss institutional features of the two bond markets that are relevant to our study.

Trading protocols and liquidity. The Chinese interbank bond market, similar to those in developed economies like the United States, employs a quote-driven OTC trading protocol in which the terms of trade are finalized through

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[6] The Internet Appendix is available in the online version of this article on *The Journal of Finance* website.

[7] The RMB value of defaulted corporate bonds in China is RMB 1.3, 13.4, 39.5, and 38 billion from 2014 to 2017; it soared to RMB 127.8 and 147.8 billion in 2018 and 2019. Nevertheless, most defaults do not relate to enterprise bonds; during 2018 and 2019 the annualized default rate is only around 0.1% for enterprise bonds while this rate is much higher at 0.7% for all other types of corporate bonds. For comparison, the global counterpart during 2008 to 2017 is 1.8%, according to a 2017 report by Moody's (see Section 6.1 in Amstad and He (2020)). In a recent paper, Li and Ponticelli (2022) study the role of "specialized bankruptcy court," which sheds light on how China is addressing the recent increase in corporate defaults following a decade-long debt boom.

bilateral bargaining between relevant parties. In contrast, the trading protocol on the exchange market, which resides on the Shanghai and Shenzhen stock exchanges, is facilitated by an order-driven mechanism, with electronic order books aggregating orders from all participants who observe all these orders publicly. Matched trades are settled via the China Securities Depository & Clearing Corporation (CSDC), which provides depository and settlement services for the exchange market.

Both bond markets in China are quite active (see, e.g., Figure A2 in the Appendix). They differ in that the interbank market satisfies infrequent but large transaction needs (wholesale) while the exchange market accommodates frequent but small trades (retail). This feature is in sharp contrast to bond markets in the United States, where the exchange market attracts limited trading in corporate bonds (Biais and Green, 2019).[8]

Market participants and common institutional investors. The interbank market mainly serves institutional players, with participants including commercial banks, policy banks, pensions, and NBFIs such as mutual funds, insurance companies, and securities firms. In contrast, the exchange market hosts NBFIs, corporate investors, and high-net-worth retail investors with ample investment experience.

We emphasize that NBFIs, a group of sophisticated institutional investors, have access to and are marginal investors in both markets in China. For instance, almost all securities firms, one key set of NBFI investors, are active in both markets in terms of both trading and market making. There are many reasons for them to be active in both markets, an obvious one being their need to participate in the primary market distribution of different bonds in these two markets. We formalize this premise in Section II.B, where we discuss the theoretical framework for our study.

By the end of 2014, the aggregate holdings of NBFIs accounted for 76% and 57% of the enterprise bonds deposited on the exchange and interbank markets, respectively. These numbers are quite similar by mid-2014 and mid-2015 (see, e.g., Panel A of Figure IA.2 in the Internet Appendix). In contrast, retail investors hold about 0.6% of enterprise bonds on the exchange market, while commercial banks hold about 35% on the interbank market.

Limits to arbitrage. Despite having identical fundamentals, the two market prices of a dual-listed bond can differ, due to market frictions that prevent "textbook" cross-market arbitrage. The most significant friction relates to settlement delays. Suppose an investor wants to sell interbank market–acquired bonds on the exchange or use it in a repurchase agreement on the exchange. To do so, she needs to apply for a transfer of custody from the interbank market to the exchange market, which took more than five working days in 2014. A

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[8] Appendix Table AI provides a more detailed comparison of the secondary market liquidity in the two Chinese bond markets and in the U.S. corporate bond market. Market (il)liquidity is comparable between the interbank market and the exchange market in China based on the fraction of bonds that do not trade on a given day. Compared to the U.S. corporate bond market, China's bond markets are slightly less liquid based on nontrading days, but are more liquid in terms of turnover.

transfer in the opposite direction was slightly faster at two to three working days. Such delays expose an arbitrageur to significant price risk. Moreover, simultaneously buying and selling a large quantity of the same bond on the two markets is difficult due to market illiquidity.

Limits to arbitrage explain why the prices of the same bond may differ across the two markets. We argue that the differences in pledgeability on the two "repo" markets are a major factor causing the prices to differ in the first place, which we explain in more detail in Section III.B.

C. Repos on the Exchange and the Interbank Market

As a form of collateralized borrowing with the security serving as collateral, repurchase agreements—or simply repos—are quite active on both the exchange and interbank markets. We now explain different repo transactions mechanisms on these two markets.

Repos on the interbank market. In a repo transaction on the Chinese interbank market, a seller (the borrower) contacts a buyer (the lender) and the two parties reach an agreement on the terms of trade based on bilateral bargaining.[9] As explained in Section I.B, the interbank market is dominated by large institutions with institution-specific funding needs and constraints, and hence each repo contract tends to be highly customized, including the specification of collateral, the repo rate, and the method of delivery. These terms reflect the risks of the underlying securities and that of the counterparty, and large state-owned commercial banks are typically in an advantageous position.

The China Foreign Exchange Trade System (CFETS) reports daily aggregate transaction volume and volume-weighted repo rates for the interbank market, but there is no such aggregate information on haircuts. While lacking access to trade-level repo data on the interbank market, we obtain proprietary information on average interbank haircuts for enterprise bonds before and after the policy shock in question based on transactions conducted by an anonymous major financial institution in China (see Section III.A).

Repos on the exchange market. For repos on the exchange market, the exchange not only facilitates transactions, but also acts as the CCP for all repo buyers and sellers. Unlike the third-party agent in tri-party repos in the United States, the CCP guarantees that obligations are met to all nondefaulting parties regardless of whether obligations to the CCP have been met. This market mechanism is similar to some CCP-based European electronic platforms (see, e.g., Mancini, Ronaldo, and Wrampelmeyer (2016)).

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[9] Two types of repo transactions are available for China's interbank market participants: pledged repo, where bonds are used as a pledge of rights, and outright repo, where bonds are sold to a reverse repo party. Unlike the United States where outright repos are more popular, in China pledged repos account for the majority of interbank repo transactions (94.2% in our one-year sample period), so that the collateral takers cannot reuse the collateral for another repo transaction. In the context of our paper, if collateral cannot be reused (rehypothecated), this should effectively decrease the supply of collateral and raise the premium earned by pledgeable assets in equilibrium, as shown by the theoretical analysis in Bottazzi, Luque, and Páscoa (2012).

On a daily basis, the CSDC unilaterally sets the collateral pool, that is, the list of securities eligible as collateral, and their conversion rates (CR), which is the borrowed amount quoted as a fraction of the face value of the security. As an example, imagine that the CSDC sets the conversion rates for Treasuries and AAA corporate bonds to be 1 and 0.9, respectively. Then an investor posting one unit of each bond as collateral, each with face value of 100 RMB, will be able to borrow $190 = 100 \times 1 + 100 \times 0.9$ RMB from the exchange.

Given a bond with face value FV and market price P, one can translate its conversion rate CR into the haircut using the formula

$$1 - \text{haircut} \quad \cdot P = CR \cdot FV \Rightarrow \text{haircut} = 1 - \frac{FV \cdot CR}{P}. \tag{1}$$

The haircut is negatively correlated with the conversion rate; a haircut of 100% implies zero pledgeability for that security. Essentially, all eligible securities become completely fungible after adjusting for their respective conversion rates. This feature is necessary for the exchange market, which relies on standardization to function. Even though repo lenders and borrowers have limited information about each other and the actual composition of the collateral pool as the exchange does not publish such information, counterparty risk is negligible due to the exchange's implicit government backing. Finally, the repo rates at various maturities are set by the market via a central limit order book aggregating all bids and asks from repo sellers (borrowers) and buyers (lenders) in continuous double auctions. One-day repo transactions account for about 90% of total exchange market repo transactions.

D. The Policy Shock in the Exchange Market

To identify the effects of changes in pledgeability on bond pricing, we exploit a policy shock on the exchange market. In a nutshell, after market closing on December 8, 2014, the exchange suspended the repo eligibility of all enterprise bonds rated below AAA. In this section, we describe the background and nature of the policy shock.

The local government debt problem. The background of this policy shock is related to the local government debt problem in China (Chen, He, and Liu (2020)). In 2009, Beijing responded to the 2007/08 global financial crisis with a RMB four trillion stimulus package in which local government financing vehicles (LGFVs, which are local SOEs) funded heavy infrastructure investment mainly through loans extended by commercial banks. Three to five years later, the back-to-normal credit policy forced LGFVs to turn to the bond market and aggressively issue MCBs, mainly in the form of dual-listed enterprise bonds by that time.[10] As a result, the enterprise bond market became flooded with

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[10] An MCB, also known as an Urban Construction Investment Bond or Chengtou Bond, is a perfect example of the mixture between planning and market in the contemporary Chinese economy. In a strictly legal sense, MCBs are issued by LGFVs, which are regular corporations, yet MCBs are viewed by the market as being implicitly backed by the corresponding local government. As shown

Table I
Sample Coverage

This table reports the sample coverage by rating. Panel A presents the number of bonds for the dual-listed enterprise bond sample, the simultaneous trading sample, and the simultaneous trading sample with MCB only. Panel B presents the dual-listed enterprise bond sample coverage over all enterprise bonds. Panel C presents the enterprise bond sample coverage over all corporate bonds. Sample coverage measures in Panels B and C include number of bonds, notional RMB value, number of nonzero trading days, and RMB trading volume.

Panel A: Dual-Listed Sample and Simultaneous-Trading Sample

	All	AAA	AA+	AA	AA−
$N_{dual-listed}$	1,912	234	578	981	119
$N_{simultaneous}$	1,028	83	318	536	91
$N^{mcb}_{simultaneous}$	894	49	279	490	76

Panel B: Dual-Listed Sample Relative to All Enterprise Bonds

	All	AAA	AA+	AA	AA−
Number of bonds	81.7%	60.5%	82.5%	87.8%	88.1%
Notional value	78.3%	59.2%	83.6%	88.5%	90.1%
Days with trades	92.1%	83.3%	92.2%	93.0%	97.2%
RMB trading volume	82.7%	55.1%	78.8%	90.9%	90.6%

Panel C: Enterprise Bonds Relative to All Corporate Bonds

	All	AAA	AA+	AA	AA−
Number of bonds	28.0%	21.6%	38.8%	48.8%	5.5%
Notional value	26.5%	18.8%	37.6%	56.4%	5.5%
Days with trades	41.5%	25.5%	53.0%	57.9%	19.7%
RMB trading volume	26.7%	13.1%	29.8%	66.8%	4.6%

MCBs; the share of MCB-type enterprise bonds rose from 30% in 2010 to 67% by the end of 2014, and 87% of enterprise bonds that enter our final sample are MCBs (Panel A, Table I).

Increasingly concerned about local government debt problems, the Central Economic Work Conference in 2014, China's highest-profile annual meeting that convenes in Beijing each January to set the national agenda for economic development, added "controlling local government debts" as one of its major agenda items for that year. This prompted many follow-up policies, such as a pilot program started in May 2014 that allowed a number of local governments to issue municipal bonds, and on October 2, 2014 the State Council of China promulgated the influential and directive guideline Document No. 43 (hereafter, Doc. 43). In a nutshell, Doc. 43 outlined the legal framework for local government debts, aiming to gradually replace MCBs with standard

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in Chen, He, and Liu (2020), LGFVs issue MCBs to refinance maturing bank loans and continue ongoing infrastructure projects over the 2012 to 2015 period, fueling the shadow banking sector in China.

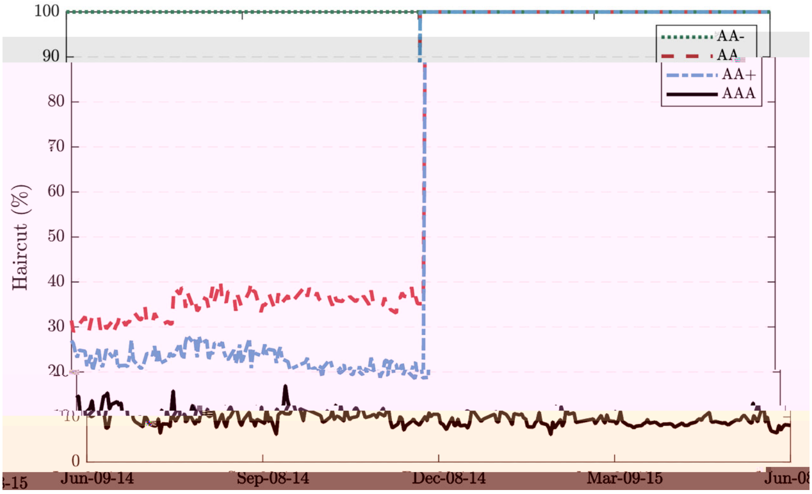

Figure 1. Average repo haircut on the exchange market. This figure plots the average daily haircut on the exchange market for dual-listed enterprise bonds in each of the four rating categories. The sample period is June 9, 2014 to June 8, 2015.

municipal bonds and to reclassify existing MCBs to bonds with/without full government support.

The CSDC and the policy shock. Under the broad agenda of "reining in local government debt," various layers of Chinese financial regulators, including the CSDC, had been coordinating to support Beijing even *before* the release of Doc. 43. MCBs were popular on the exchange market, due to their low perceived credit risk and relatively high pledgeability, due to transparent conversion rates published by the CSDC. Starting in May 2014, the CSDC disqualified a small list of AA+ and AA bonds as collateral for repo transactions on the exchange market; see Section II.A for details. It is important to note that the CSDC retained great discretion in deciding the exact composition of these blacklists. Not surprisingly, these small-scale and often idiosyncratic regulatory moves triggered little market-wide response from financial investors; see Section III.A for their market reactions.

To curb the demand of MCBs in a more effective way, the CSDC decided to slash the conversion rates for all enterprise bonds with ratings below AAA. After hours on December 8, 2014, the CSDC issued "Circular on Relevant Measures for Strengthening Risk Management of Enterprise Bond Repo" to immediately disqualify sub-AAA enterprise bonds from being used as collateral in repo transactions in both the Shanghai and Shenzhen exchanges. In this document, the CSDC raised concerns about the risk of enterprise bonds that were mainly issued by local governments, echoing Doc. 43 issued two months earlier by the State Council of China.

As shown in Figure 1, the policy change led to immediate and significant increases in the haircuts for AA+ and AA enterprise bonds on the exchange. In contrast, the average haircut for AAA bonds on the exchange remained steady. Since AA− bonds were already ineligible as repo collateral on the exchange six months before the event, their haircuts were also unaffected by the new policy.

This sudden move by the CSDC, which affected about 80% of enterprise bonds, surprised exchange market investors to a large extent. Widely known as the "Zhong-Zheng-Deng" event among Chinese investors, bond market participants viewed this policy tightening as a "black swan" event, as they had instead expected a tightening in the competing interbank market instead around that time.[11] We analyze market reactions in Section III.A, but as an initial piece of preliminary supporting evidence, we do not observe any bond rating changes in our sample during the [−1, 0] month window, suggesting that market participants did not "expect" this policy shock that targeted on rating directly.

Another unique feature of this policy is worth emphasizing. To minimize the potential negative market impact, regulators drafted the policy change on December 8, 2014 in such a way that it only applied to bonds that had not been used as collateral yet; roughly one third of the outstanding enterprise bonds were pledged as collateral at the time of the policy shock. In other words, there was no immediate deleveraging pressure for investors who had already taken a leveraged position in these affected bonds, although the secondary market spot prices for the affected bonds are expected to have decreased immediately due to their fully eliminated pledgeability. This makes our policy shock particularly suitable to study the value of pledgeability as it is free from temporary fire sale pressure due to forced deleveraging. It is worth noting that a more general form of "fire sale," which reflects certain portfolio rebalancing activities in response to shocks, could still occur. For example, an investor might sell affected bond holdings given their lower pledgeability, or her bond holdings more broadly if she interprets the policy shock as a signal of weaker fundamentals. The first channel is what this paper tries to capture (see Section II.B). With respect to the second channel, as we explain in the next section, by exploiting dual-listed bonds, our estimation strategy is not affected by such fundamental shocks.

II. Data and Economic Framework

In this section, we describe the data and then lay out our theoretical framework. Guided by the theory, we examine the empirical properties of the exchange premium, which is defined as the price gap for dual-listed enterprise bonds on the exchange and interbank markets.

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[11] It is well-documented that the local government debt problem is rooted in commercial banks (Bai, Hsieh, and Song (2016), Chen, He, and Liu (2020)), which are active only in the interbank market. Recall that almost all enterprise bond issuances were initially placed in the interbank market which was still the "home" market for enterprise bonds (Section I.A). Indeed, just one week before the policy shock we study, the National Association of Financial Market Institutional Investors (NAFMII, the regulator of the interbank market) issued a notice on December 1, 2014 pressing MCB underwriters to strictly abide by Doc. 43.

A. Data and Variable Construction

We obtain enterprise bond characteristics and exchange-market trading data from Wind Information Co. (WIND). Data on interbank market trading are from CFETS, the interbank market's trading platform. Our sample period is June 9, 2014 to June 8, 2015, a 12-month window around the event date. During this sample period, our dual-listed enterprise bond sample covers 82.7% of the total trading volume of all enterprise bonds (78.3% in terms of outstanding notional), or 22.0% of the total volume of all corporate bonds (20.8% in terms of outstanding notional). Table I summarizes our sample coverage.

For each bond-day observation, we obtain the conversion rates quoted by the exchange and convert them into haircuts based on equation (1). We use the RMB volume-weighted average clean prices to calculate enterprise bond yields, which are winsorized at the 0.5% and 99.5% levels. The credit spreads of the enterprise bonds are calculated relative to the matched China Development Bank (CDB) bond yields following the procedure of Ang, Bai, and Zhou (2023) and Liu, Lyu, and Yu (2017).[12]

Bond rating information comes from WIND. Rating agencies provide ratings at the bond as well as issuer level. Our study focuses on four rating categories: AAA, AA+, AA, and AA−, with the AA− category including AA− and below.[13] Following the industry standard, we take the lowest rating if a bond receives multiple ratings (Amstad and He (2020)). As mentioned in Section I.D, a small list of AA+ and AA bonds had been disqualified as collateral for repo transactions on the exchange market before the December 8, 2014 policy shock. To the extent that we link ratings to pledgeability, we reclassify these AA+ and AA bonds to be grouped with AA− ratings. More specifically, on May 29, 2014, the CSDC disqualified a bond's repo eligibility if its *issuer* rating was below AA or had an AA issuer rating but *a negative outlook*, with some degree of discretion determined by the CSDC. The CSDC issued five lists of affected bonds that were disqualified due to low issuer ratings. From all five of these lists, a total of 109 enterprise bonds (84.4% of them MCBs) were disqualified as collateral for repo transactions even though their bond ratings were AA or above. We hand collected such information based on the detailed CSDC announcements and adjusted bond ratings of these affected bonds to AA− after their first inclusion date. See Section A in the Appendix and Table AII for details.

We further exclude bonds that (i) were issued after the policy event to rule out the possibility that issuers may engage in rating shopping (for AAA ratings), (ii) experienced rating changes after the event to reduce contamination

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[12] The CDB yield curves are commonly used as the risk-free benchmark by the bond market participants in China due to its state-backing, non-tax-exempt status (unlike Treasuries), and superior liquidity. We first compute the implied prices of the CDB bonds with matching cash flows, that is, the net present value of the same cash flows as promised by an enterprise bond discounted at the CDB bonds' zero-coupon rates, and then calculate the matching CDB yields. All of our empirical results are robust to using Treasury yields instead of CDB yields.

[13] Bonds with ratings below AA− are extremely rare in China during our sample period; on the day of the policy shock there was only one bond rated A+ out of the full sample of 1,613 enterprise bonds.

caused by (potentially endogenous) changes in post-event rating grouping, and (iii) had matured before the event date. These three filters affected our sample slightly, removing 32, 41, and 4 bond-day observations for 15, 6, and 2 unique bonds, respectively.

As the main empirical object, we construct “exchange premium” as the yield difference for the same bond between the two markets. Specifically, the exchange premium measure, $EXpremium_{ijt}$, is defined as the cross-market difference in the yields for bond i from rating category j on day t,

$$EXpremium_{ijt} = yield_{ijt}^{IB} - yield_{ijt}^{EX}, \tag{2}$$

where $j \in \{\text{AAA, AA+, AA, AA−}\}$. A positive exchange premium means the price of a bond is higher on the exchange than on the interba90.6(he)]TJETBT-0.000299999

Table II

Summary Statistics

This table reports summary statistics for the simultaneous trading sample from June 9, 2014 to June 8, 2015. The table presents number of observations, mean, standard deviation, 10th percentile, median, and 90th percentile. Panel A presents summary statistics for key variables. Panel B presents summary statistics for exchange premia by rating. Panel C presents summary statistics for haircuts by rating.

Panel A: All Variables						
	N	Mean	*SD*	P10	Median	P90
EX premium	10,235	−0.04	0.48	−0.63	−0.02	0.50
EX premium$_{pre}$	5,069	0.07	0.40	−0.39	0.04	0.55
EX premium$_{post}$	5,166	−0.15	0.53	−0.76	−0.12	0.42
Haircut	10,235	68.64	38.01	15.77	100.00	100.00
Haircut$_{pre}$	5,069	42.32	32.60	8.12	30.90	100.00
Haircut$_{post}$	5,166	94.48	21.74	100.00	100.00	100.00
Conversion	10,235	33.24	40.37	0.00	0.00	88.00
Conversion$_{pre}$	5,069	61.22	34.79	0.00	73.00	97.00
Conversion$_{post}$	5,166	5.79	22.81	0.00	0.00	0.00
IB spread	10,235	2.41	0.79	1.42	2.44	3.40
EX spread	10,235	2.45	0.86	1.34	2.51	3.48
Matched spread	9,940	0.55	0.68	−0.15	0.47	1.38
Matched spread$_{pre}$	2,227	0.06	0.16	−0.13	0.04	0.27
Matched spread$_{post}$	7,713	0.69	0.71	−0.16	0.70	1.49
Matched spread$_{AA+}$	7,570	0.54	0.67	−0.14	0.46	1.37
Matched spread$_{AA}$	2,370	0.56	0.71	−0.16	0.48	1.43
$p^{high-low}$	10,235	0.44	1.44	−0.21	0.00	1.83
Maturity	10,235	5.10	1.61	2.97	5.26	6.72
Turnover	10,235	0.08	0.08	0.02	0.05	0.17
Market price	10,235	104.97	5.76	100.36	105.36	110.72
Volatility	10,235	0.02	0.02	0.00	0.01	0.04
CDB$_{spot}$	10,235	0.04	0.01	0.04	0.04	0.05
Term spread	10,235	0.01	0.00	0.00	0.00	0.01
GC001−SHIBOR	10,235	0.02	0.04	−0.00	0.01	0.06
Ret$_{stock}$	10,235	0.00	0.02	−0.01	0.00	0.02
Panel B: Exchange Premia by Rating (%)						
AAA	477	0.10	0.37	−0.37	0.03	0.59
AA+	3,077	0.01	0.48	−0.55	0.01	0.55
AA	5,162	−0.09	0.50	−0.71	−0.05	0.47
AA−	1,519	−0.02	0.45	−0.49	−0.01	0.47
Panel C: Haircuts by Rating (%)						
AAA	477	11.26	10.03	5.48	6.81	26.28
AA+	3,077	62.32	40.58	7.44	100.00	100.00
AA	5,162	68.49	35.46	29.81	100.00	100.00
AA−	1,519	100.00	0.00	100.00	100.00	100.00

B. The Economic Framework

Suppose a one-period corporate bond i with unit face value has rating j and random payoff $Y_{i,t+1}$ at time $t+1$ (maturity). It is traded on two markets indexed by $m \in \{EX, IB\}$, but market segmentation prevents investors from buying this bond on one market and selling it on the other, a point we come back to shortly. Let h^m_{ijt} and p^m_{ijt} be the haircut per unit of face value and the price of the bond in market m at time t, respectively. We discuss the possibility of investor-dependent haircuts later in footnote .

Consider any marginal investor in market m, denoted by $I_m \in \mathsf{I}_m$, where I_m is the set of all marginal investors in market m. The investor chooses optimal consumption and asset holdings while facing a collateral constraint. The Euler equation for this investor reads[15]

$$p^m_{ijt} = \underbrace{\mathsf{E}_t[M^{I_m}_{t+1} Y_{i,t+1}]}_{\text{fundamental value}} + \underbrace{\overbrace{{}^{I_m}_{t}}^{\text{value of pledgeability}} \times \overbrace{1 - h^m_{ijt}}^{\text{pledgeability units}}}_{\text{pledgeability premium}}. \tag{3}$$

The first term on the right-hand side of equation (3) is standard: $M^{I_m}_{t+1}$ is the pricing kernel for this marginal investor, which is determined by the ratio of marginal utility of consumption between $t+1$ and t; together, the first term captures the fundamental value of the bond from the perspective of the investor group I_m.

The second term on the right-hand side of equation (3), which is related to "specialness" in Duffie (1996), captures the pledgeability premium due to the collateral constraint. It is the product of the value of pledgeability ${}^{I_m}_{t}$ and the bond's degree of pledgeability $1 - h^m_{ijt}$, that is, the amount financed per unit of face value. The value of pledgeability ${}^{I_m}_{t}$, which represents the shadow value of relaxing the collateral constraint, is the Lagrange multiplier associated with the collateral constraint scaled by the marginal utility of the investor at time t.

Several points are worth emphasizing. First, equation (3), which is based on a standard optimal portfolio decision, applies to both markets. Our framework therefore matches well with Chinese financial institutions that actively trade in both the exchange and interbank markets and are constantly engaged in asset allocation decisions with various layers of risk management mandates, for example, exposure to interest rate risk, dollar duration, and value-at-risk.

Second, our theoretical framework allows for multiple marginal investors in each market. As explained in Section I.B, different investors participate in the two largely segmented bond markets in China. Using the notation from

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[15] The investor chooses consumption c_t, collateralized borrowing B_t (or riskless saving if $B_t < 0$), and defaultable bond holding ${}^{m}_{ijt}$ in the two markets to maximize time-separable utility, $\mathsf{E}[\ {}^{\infty}_{t=0}\ {}^{t}u(c_t)]$. In each period, she faces a standard budget constraint plus a collateral constraint $B_t \leq \ {}_{m\in\{EX,IB\}}(1 - h^m_{ijt})\ {}^{m}_{ijt}$. The first-order condition with respect to ${}^{m}_{ijt}$, if the solution is interior, implies equation (3).

to haircuts as shown in equation (1), are tightly linked to securities' credit ratings. The CSDC adopted a formula for how the conversion rates were set, which involves the bond's credit rating, market price, and volatility. However, the CSDC also made clear that the formula was only suggestive. By including an opaque term called "discount factor," the CSDC effectively reserved discretion in setting the conversion rate for each bond.

As shown in columns (1) and (2) of Table III, rating dummies explain 90% of the total variation in conversion rates, while a kitchen sink regression—including market prices, volatilities, and other bond/issuer characteristics—raises the R^2 only to 91%. There are many reasons why the CSDC relies primarily on credit ratings in setting conversion rates, chief among which are third-party objectiveness in credit risk assessment and poor secondary market liquidity. For the purpose of our study, the fact that bond haircuts largely depend on credit ratings implies that the policy shock that explicitly targeted AA+ and AA bonds will result in significant changes in exchange haircuts across bonds, that is, a strong first stage for the policy shock as an IV for the changes in exchange-market haircuts.

Exchange premia. Equation (4) suggests that, with common fundamentals, exchange premia should primarily reflect the differences in pledgeability premia in the two markets, after controlling for other nonfundamental factors, such as trade size and frequency. As shown in Table III, in both specifications (haircuts only in column (3) or including ratings and other potential determinants in column (4)) exchange premia are negatively related to the exchange haircuts at the 1% significance level. This is consistent with exchange premia being driven by pledgeability, a premise that forms the basis of our economic framework in Section II.B.

Column (4) in Table III shows that bonds with higher prices, MCBs, shorter maturity, and higher turnover have larger exchange premia before the shock. It is reassuring that column (4) demonstrates that once we include exchange-market haircuts and relevant characteristics variables, ratings no longer possess additional explanatory power relative to the benchmark AAA group. Because we are exploiting a policy shock that directly targets bond ratings, one particular concern may be that our specification misses some omitted variables that significantly affect exchange premia and yet are captured by the categorical rating variables. Column (2) suggests that this is not the case.

III. The Policy Shock and Exchange Premia

The policy shock serves as the IV in our paper to estimate the value of pledgeability. In this section, we document the market reactions of exchange premia to the policy shock, together with those for other policy events.

A. Market Reactions to the Policy Shock

We first present evidence on market reactions that support the premise that the policy shock on December 8, 2014 is unexpected. We also compare them to

Table III

Determinants of Conversion Rates and Exchange Premia

This table reports regression results of dual-listed enterprise bonds' exchange market conversion rates (columns (1) and (2)) and exchange premia (columns (3) and (4)) on rating dummies and control variables. Age is the number of years for the issuer's first bond issuance, Nbond is the number of bonds issued by the issuer, and OTR is a dummy variable for on-the-run bond of the issuer. The sample period is June 9, 2014 to December 8, 2014. Heteroskedasticity-consistent standard errors clustered by week are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively. The standard error for AA− in column (1) is undefined because the conversion rates of AA− bonds are always zero.

	Conversion Rates		Exchange Premia	
	(1)	(2)	(3)	(4)
Haircut			−0.22***	−0.27***
			(0.03)	(0.05)
Dummy$_{AAA}$	89.40***	−40.76		
	(1.35)	(25.23)		
Dummy$_{AA+}$	79.40***	−49.10*		0.00
	(1.06)	(25.54)		(0.05)
Dummy$_{AA}$	66.92***	−60.20**		−0.04
	(0.72)	(25.29)		(0.05)
Dummy$_{AA-}$	0.00	−124.94***		0.04
	(−)	(24.76)		(0.08)
Market price		0.95***		0.02***
		(0.20)		(0.00)
Volatility		−20.36		−0.10
		(23.80)		(0.89)
MCB		−3.29**		0.10**
		(1.39)		(0.04)
Age		0.19		−0.02*
		(0.36)		(0.01)
Nbond		−0.34***		0.01**

the market reactions to a series of blacklisting announcements and the release of Doc. 43 before the policy shock.

Market reactions to the policy shock. What are the reactions from both markets? As a first pass, we examine the average credit spreads for all dual-listed enterprise bonds in four rating categories around the event, across two bond markets. Due to illiquidity, these credit spreads are based on observed transactions that are not necessarily matched with the same bonds; the evidence here should therefore be interpreted with caution. We use the simultaneous trading sample in Sections III.B and III.C, as well as in Section IV where we conduct our formal IV regression–based empirical analysis.

As shown in Panel A, row "Event 12/8," of Table IV, the average credit spreads for AA+ and AA bonds on the exchange market jumped up on the event date by 62 bps and 38 bps, respectively, both significant at the 1% level. This is in sharp contrast to the market reactions on the interbank market where the average credit spreads for AA+ and AA bonds actually *fell* by 8 bps and 9 bps on the event date. For AAA bonds, event-day average credit spreads fell in both the exchange and interbank markets by 15 bps and 24 bps, respectively, while credit spreads of AA− bonds rose on both markets by 61 bps and 24 bps. The exchange market reaction of AA− bonds (61 bps) is large at first glance. In a relative sense, this is about 20% of AA− bonds' credit spreads, comparable to that of AA bonds (17%) and much smaller than that of AA+ bonds (37%). However, this market reaction was temporary; in a longer [−3, 3]-day window the exchange market reaction of AA− bonds decreased to 31 bps. More importantly, in this longer [−3, 3]-day window the interbank market reaction caught up (40 bps), suggesting that the market reactions on AA− bonds were likely driven by investors adjusting their assessments of these bonds' fundamentals.

These market reactions are consistent with the premise that the policy shock hit AA+ and AA− bonds on the exchange market particularly hard. The last two columns highlight these different reactions across the treatment (AA+/AA) and control (AAA/AA−) groups in two bond markets: the relative increase in credit spreads for treated bonds on the exchange market is 55 bps (significant at the 1% level) larger than that in the interbank market, while the increase is 31 bps but insignificant for control bonds.

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Table IV

Market Reactions to the Policy Shock and Other Events

This table reports the average market reactions to the policy shock and other events. Average one-day post-announcement changes in credit spreads are reported in Panel A. Average haircuts of an anonymous major financial institution on the interbank market six/one months prior to and after the policy shock are reported in Panel B. The policy shock was on December 8, 2014, the release of Doc. 43 was on October 2, 2014, and the five announcements were made on May 29, 2014, June 27, 2014, August 1, 2014, September 5, 2014, and November 3, 2014, respectively. Due to the lack of trades on September 30, 2014 before the National Holiday (October 1, 2014 to October 7, 2014), trades in the two-day window before the holiday are used to calculate the pre-Doc. 43 credit spreads. The post-pre credit spread difference between the interbank and the exchange markets for treatment and control groups is presented in the last two columns and estimated in a regression on $post_t \times 1_{IB}$ that includes the $post_t$ dummy, the interbank market indicator 1_{IB}, and $rating_j \times post_t$ fixed effects. Heteroskedasticity-robust standard errors are reported in parentheses. *, **, and *** represent statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Market Reactions by Market and Rating (bps)

	EX				IB				IB−EX	
	AAA	AA+	AA	AA−	AAA	AA+	AA	AA−	AA+ & AA	AAA & AA−
Policy Shock	−14.69	61.61***	37.64***	60.52***	−24.33	−7.97	−9.12	23.87	−55.31***	−31.23
	(17.40)	(12.10)	(13.47)	(18.99)	(32.26)	(13.39)	(8.20)	(21.49)	(11.96)	(24.37)
Doc. 43	−17.97*	5.58	6.73	1.46	17.86	11.23	7.66	−11.29	4.24	8.49
	(10.51)	(9.07)	(12.25)	(11.75)	(19.33)	(12.35)	(9.46)	(23.93)	(10.99)	(17.98)
Five Blacklists	−0.41	3.27	4.55	8.21	−4.42	8.23	4.86	−19.15	1.75	−11.19
	(7.35)	(4.57)	(5.05)	(8.67)	(11.58)	(6.51)	(3.60)	(23.75)	(4.89)	(12.16)

Panel B: Haircuts on the Interbank Market (%)

Sample period	AAA	AA+	AA	AA−
June 9, 2014 to December 8, 2014	8.38	12.93	32.03	35.66
	(0.56)	(0.96)	(1.53)	(7.01)
December 9, 2014 to June 8, 2015	13.76	14.38	31.23	37.20
	(0.44)	(1.25)	(1.28)	(8.89)
November 9, 2014 to December 8, 2014	7.41	11.44	28.85	33.64
	(0.85)	(1.87)	(3.12)	(14.11)
December 9, 2014 to January 8, 2015	17.24	16.53	32.14	37.18
	(1.10)	(2.24)	(2.88)	(22.37)

for those bonds actually fell. The same exercise repeated for the five blacklist announcements, in Panel A, row “Five Blacklists,” of Table IV, shows small and insignificant market reactions on credit spreads.[16]

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[16] In this exercise, we exclude bonds that were directly affected by the announcements. For these affected bonds, on the exchange the market reaction is −12 bps (insignificant) for AA+ bonds and 20 bps (significant at the 5% level) for AA bonds, consistent with a lower pledgeability premium once blacklisted. It is difficult to calculate the interbank market reactions due to lack of liquidity. Detailed market reactions for each of the five announcements are reported in Internet Appendix Table IA.II, and results are similar for a wider event window (e.g., [−1, 1]-day window) in consideration of potential information leakage.

We emphasize that the exchange premia remained almost unchanged in response to both events. For instance, the last two columns in Panel A of Table IV report a small and insignificant one-day reaction of 4 bps (8 bps) for the exchange premia of AA+/AA (AAA/AA−) bonds following the release of Doc. 43. This is in stark contrast to the change in exchange premia observed for "Event 12/8," and is crucial to our empirical framework: unlike the December, 8 2014 policy shock that hit the "liquidity" of one market, Doc. 43 largely affected the fundamental of the asset—if there was any effect—and hence left exchange premia largely intact.

There are well-grounded reasons for the sharp contrast between the significant market reactions in response to the "Event 12/8" policy, which represents a regulatory measure that targeted one specific market, and the lack of reactions to the other events. With respect to Doc. 43, as mentioned in Section I.D, "local government debt" was a focal theme of the economic and political agenda in 2014, and therefore Chinese investors may have anticipated the release of Doc. 43. In addition, this document likely did not materially alter market expectations about implicit government support for existing MCBs.[17]

Regarding the lack of market reactions to the five blacklists, we stress that it is routine for various bureau-level regulators in China (e.g., the CSDC) to issue small-scale notices occasionally;[18] and there is quite a difference between blacklisting individual bonds with inferior issuer ratings, a practice that seems more idiosyncratic, and a sweeping ban of pledgeability for AA+ and AA− bonds, which is more systematic. The policy shock in our study was therefore likely to be unexpected, as supported by the sharp market reactions in the data.

Haircut reactions on the interbank market. In contrast to the dramatic changes in haircuts on the exchange, there were only relatively small changes in the interbank haircuts during the same period. Based on a sample of repo transactions conducted by an anonymous major financial institution in China, Panel B of Table IV reports the average haircuts for enterprise bonds on the interbank market during the one-month and six-month windows before and after December 8, 2014. Based on the six-month window that is the same as our estimation window, the average interbank haircuts for the AA+ and AA group were essentially unchanged. The average interbank haircut for the AAA group did rise more, from 8.4% to 13.8%, but this 5.4-percentage-point increase only amounts to a 5.9% reduction in the degree of pledgeability, which was

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[17] For the former view, recall that Chinese regulators started the pilot municipal bond program in May 2014 as mentioned in Section I.D. The latter view is supported by several contemporaneous industry research reports on the impact of Doc. 43, which argued that, at least in the short run, the emphasis on a stable transition meant that implicit government support for existing MCBs would likely continue. In fact, it took six more years (until October 2020) for the first MCB default—two private placement notes issued by Shenyang Shengjing—to finally take place.

[18] During the six-month pre-event period (June 9, 2014 to December 8, 2014), 35 circulars were issued by bureau-level (Ting-Ji in Chinese) financial market regulators in China, among which 11 were issued by CSDC. We do not see any significant market reaction across both markets on these circular announcement days.

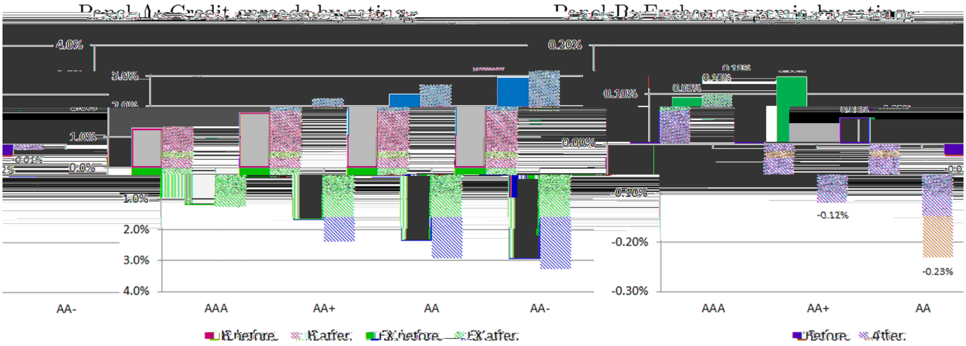

Figure 2. Exchange premia six months before and after the December 8, 2014 event. This figure plots the average credit spreads for each of the four rating categories on the interbank market and the exchange market (Panel A) and the average exchange premia (Panel B).

originally $1 - 8.4\% = 91.6\%$. In the one-month window, the tightening of collateralized funding in the interbank market is more evident, consistent with some temporary liquidity effects from the policy shock. For this reason, we examine the sensitivity of our estimates to the exclusion of the first post-event month. We discuss these issues in more detail in Section IV.B.1.

In addition, the release of Doc. 43 did not cause any changes in the interbank market haircut. According to the same proprietary data source that we use in Panel B of Table IV, the average interbank market haircut barely moved across all ratings for the one-month subperiod before and after Doc. 43: the average haircut of the four ratings (high to low) is 7.73%, 11.36%, 30.81%, and 30.32% for the one-month subperiod before the release of Doc. 43 on October 2, 2014, and is 8.15%, 13.13%, 30.54%, and 31.87% for the one-month subperiod after. Consistent with the market reactions of credit spreads, the lack of interbank haircut reactions following the release of Doc. 43 suggests that investors either anticipated the release of Doc. 43 or remained optimistic on the long-standing implicit guarantees at least for existing MCBs. To summarize, Doc. 43, if anything affecting enterprise bonds, should be a fundamental shock that hit both markets.

B. Exchange Premia across Ratings

We now examine the changes in exchange premia around the policy shock. Across four ratings, we first plot the average credit spreads on the two markets (Panel A of Figure 2) and the average exchange premia (Panel B of Figure 2) in the six-month window prior to the policy shock. We observe that AAA, AA+, and AA bonds enjoy positive exchange premia of 9 bps, 13 bps, and 5 bps, respectively, while there is a negative exchange premium, or in other words an exchange discount, of −2 bps for AA− bonds.

The pattern of average exchange premia across ratings is related to how pledgeability differs on the two markets. On the exchange, the pledgeability