Haircuts

Gary Gorton and Andrew Metrick

"When confidence is lost, liquidity dries up." The authors investigate the meaning of "confidence" and "liquidity" in the context of the recent financial crisis, which they maintain is a manifestation of an age-old problem with private money creation: banking panics. The authors explain this problem and provide some evidence with respect to the recent crisis. (JEL G1, E3)

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> It is commonly stated that the outbreak of a crisis is due to a lack of confidence—as if the lack of confidence was not itself the very thing which needs to be explained.
>
> —Edwin Seligman (1908, p. xi)

Markets with heavy trading are often described as "liquid" markets. The financial crisis of 2007-09 was a banking panic in the **sale and repurchase agreement** (repo) market, a highly liquid market that shrank dramatically when the "depositors" withdrew their money, as we explain later (see Gorton, 2010, and Gorton and Metrick, 2009).[1] The average daily trading volume in the repo market was about $7.11 trillion in 2008, compared with the New York Stock Exchange, where the average daily trading volume in 2008 was around $80 billion.[2]

Repos are considered part of the money supply—like demand deposits or private bank notes before the Civil War[3]—and, like other forms of money, they involve trillions of dollars in exchanges without extensive due diligence. As with past U.S. banking panics, the core of the recent financial crisis was a problem of private money creation, which has always been difficult. In banking crises private markets fail to function; "liquidity dries up" because of a "loss of confidence." In this paper, we investigate this liquidity problem in the context of the recent financial crisis and provide evidence for our explanation.

Traditional banking is centered on creating demand deposits (checking accounts), which are part of the money supply. Demand deposits are a form of debt that allows the depositor the right to withdraw cash at any time (i.e., the deposits have a very short maturity); they are backed by the assets of the bank, including reserves and

[1] Terms in **bold** may be unfamiliar to some readers and are defined in the glossary.

[2] On the repo markets, see Securities Industry and Financial Markets Association (SIFMA, 2008, p. 9), and on the stock market, see "Daily NYSE Group Volume in NYSE Listed" (www.nyxdata.com/nysedata/asp/factbook/viewer_edition.asp?mode=table&key=3002&category=3). The SIFMA number includes repo and reverse repo; half of $7.11 trillion would be $3.56 trillion.

[3] It has long been recognized that repo is a form of money; it was counted in the Federal Reserve System's monetary aggregate M3, which was discontinued in mid-2006.

Gary Gorton is the Frederick Frank Class of 1954 Professor of Management and Finance at Yale University and a research associate for the National Bureau of Economic Research. Andrew Metrick is the deputy dean for faculty development, Theodore Nierenberg Professor of Corporate Governance, and faculty director of the Millstein Center for Corporate Governance at Yale University and a research associate for the National Bureau of Economic Research. The authors thank the many anonymous traders and capital markets participants willing to share their data and their suggestions. They also thank David Andolfatto and Roger Ibbotson for comments and Lei Xie for research assistance.

loans. Checks are in demand because they are easily transferable; and since they now are insured by the federal government, their value is never in question. Before the 1934 adoption of deposit insurance in the United States, demand deposits were designed to try to privately create confidence in their value. The idea was to create a medium of exchange—that is, a security that would be easily accepted in transactions, without the need for extensive and costly due diligence on the bank's part. With a successful design, checks could be used with confidence in their value without extensive due diligence. The traditional problem with demand deposits was that sometimes this confidence quickly disappeared. The 1930s saw many banking panics, events in which depositors ran en masse to their banks and demanded cash for their checking accounts. Banks, having lent the money, had illiquid loans and could not honor the demands of their depositors: The banking system was insolvent. This problem is exactly what deposit insurance solved.

In our paper, we focus on this specific type of private money—repos—which, as we explain below, are a kind of money used by institutional investors and nonfinancial firms that need a way to safely store cash, earn some interest, and have ready access to the cash should the need arise. In a repo transaction a "depositor" deposits money at a financial institution and receives collateral, valued at market prices. The transaction is short term, so the depositor can "withdraw" the money at any time. The deposit is backed by the bonds received as collateral from the institution where the money is deposited. Overcollateralization can occur if the market value of the bonds received exceeds the deposit. For example, if $90 million is deposited and $100 million of bonds is received as collateral, then there is a "**haircut**" or initial margin of 10 percent. This haircut is akin to bank capital or a reserve fund as the 10 percent is junior in seniority to the depositor's 90 percent claim.

Historically, securities that function as money have certain specific properties. These securities are debt that is short term and backed by diversified portfolios. Gorton and Pennacchi (1990) and Dang, Gorton, and Holmström (2010a) have described the production of this type of debt as the creation of information-insensitive securities. "Information insensitivity" means that the securities are immune from adverse selection when traded. This property defines a liquid market: Trading can occur quickly without loss to insiders. In a liquid market, no agent finds it profitable to produce private information about these securities. In short, you can trade and not be taken advantage of. However, if an economic shock is large enough, then debt that was information-insensitive becomes information-sensitive. This creates a loss of confidence, a fear of adverse selection that reduces liquidity. In this paper, we further investigate some of the details of this argument.

PANICS IN U.S. HISTORY

In U.S. history, periodic banking panics have been the norm. These panics can offer some useful insights for understanding the recent crisis. For example, during the U.S. national banking era (1863-1913), there were seven nationwide banking panics.[4] And, of course, there was the Great Depression in the 1930s. A banking panic starts at the peak of the business cycle when macroeconomic information signals a coming recession. The signal or economic shock causes concerns about the value of demand deposits that previously were considered completely safe. Upon learning of the coming downturn, depositors run to their banks to withdraw cash, concerned that banks will fail in the coming recession. In the nineteenth century, the news that arrived was an unexpected increase in the liabilities of failed businesses, a leading indicator of recession. See Gorton (1988) and Calomiris and Gorton (1991).

Faced with massive demands for cash, the banking system becomes insolvent because it cannot honor these contractual demands with respect to demand deposits. The money has been lent and cannot be recalled, and the loans cannot be sold. There is no private agent capable of buying the assets of the banking system at a price that allows banks to honor their contractual demands. This is the essence of a systemic event.

[4] There were also panics before the Civil War, notably in 1837 and 1857.

The information that the nineteenth-century depositors received was aggregate information, not bank-specific information about individual banks. People knew only that a recession was coming and that some banks were likely to fail; but no one knew which banks. So, the precautionary action of withdrawing funds from all banks was rational. The information shock about the coming recession was large enough to cause a panic.

Banks try to produce securities that are useful for transacting—namely, bank debt such as demand deposits. But during a bank panic, people lose confidence in the value of bank debt. Bank debt that was previously considered "safe" becomes suspect. In this context, "safe" means two related things. First, the value of the bank debt does not change much: A ten-dollar check is pretty much always worth ten dollars. Second, it does not benefit anyone to produce private information about the value of the bank debt and speculate on that information.

During the national banking era, there was no central bank to act as a lender of last resort. So, what happened during bank panics? During the nineteenth and early twentieth centuries, the banks themselves developed increasingly sophisticated ways to respond to panics. The response was centered on private bank clearinghouses. Originally organized as an efficient way to clear checks, these coalitions or clubs of banks evolved into much more. Clearinghouses tried to recreate the information-insensitivity of demand deposits by increasing the diversity of the portfolio backing demand deposits. First, in response to a panic, banks would jointly suspend convertibility of deposits into currency. Coincident with this move, clearinghouse member banks joined to form a new entity overseen by the clearinghouse committee. The clearinghouse would also cease the publication of individual bank accounting information (which banks were normally required by the clearinghouse to publish in the local newspapers) and would instead publish only the aggregate information of all the members. Finally, the clearinghouse issued new money called "clearinghouse loan certificates" directly to the public in small denominations (see Gorton, 1985, and Gorton and Mullineaux, 1987). The certificates were *joint* liabilities of the clearinghouse members—not of any individual bank—and provided a kind of deposit insurance. The clearinghouse loan certificate was a remarkable innovation that resulted from individual private banks finding a way to essentially become a single institution, responsible for each other's obligations during a panic and issuing a hand-to-hand currency.

SECURITIZED BANKING AND REPOS AS MONEY

The limits on the amount protected by deposit insurance make bank accounts inadequate for large depositors, such as institutional investors or nonfinancial firms. These investors and firms need a short-term, safe, interest-bearing place to store money. A repo is a financial contract used by market participants to meet short- and long-term liquidity needs. Repo transactions have two parties: essentially the bank (or borrower) and another party, the depositor (or lender). The depositor deposits money, and in exchange for the cash, the bank provides bonds as collateral to back the deposit. The depositor earns interest—the repo rate. Repos are typically short-term, often overnight transactions, so the money can be withdrawn easily by not renewing or "rolling" the repo.

Because FDIC insurance does not cover repos, the safety of the bank (typically a dealer bank) is insured privately with the collateral, which is valued at market prices. Depositors take delivery of the collateral so it is in their possession. The depositor in the repo is protected (in principle) from the bank's failure because he can sell the collateral in the market to recover the value of the deposit. That is, the nondefaulting party can unilaterally terminate the repo and sell the collateral if the bank becomes insolvent or keep the money if the depositor becomes insolvent. In other words, repo transactions are excluded from the U.S. bankruptcy code.[5]

[5] Repos are exempt from the automatic stay provision of the bankruptcy code and aggrieved parties do not have to enter Chapter 11 to try to recover the value. The nondefaulting party to a repurchase can unilaterally terminate the transaction and sell the collateral or keep the cash, depending on which side of the repo they are on. See, e.g., Schroeder (1996).

Another important feature of repos is that the bonds the depositor receives as collateral can be "spent"—they can be used as collateral in another, unrelated, transaction. For example, the bonds could be posted as collateral against a derivatives position. This reuse of collateral is called "**rehypothecation**." Rehypothecation means that there is a money velocity associated with the collateral. In other words, the same collateral can support multiple transactions, just as one dollar of cash can lead to a multiple of demand deposits at a bank. The collateral is functioning like cash.

In what follows, "haircuts" play an important role. To reiterate, the previous example involves a large investor who may deposit $100 million and receive bonds worth $100 million. This is a case of a zero haircut. If the depositor deposits only $90 million and takes $100 million (market value) of bonds as collateral, there is a 10 percent haircut. In that case, the bank must finance the other $10 million in some other way, issuing new liabilities. Haircuts are determined by participants in the market and can change.

Traditional banking is the taking of deposits (paying, say, 3 percent interest) and lending the money at a higher rate (say, 6 percent interest). Repos work the same way. Deposits are taken and the repo rate is paid—say, 3 percent. The collateral is provided to make the deposit safe, but the return on the collateral—say, 6 percent—accrues to the bank, not the depositor. The bond collateral takes the place of the loan. But as we will see below, the collateral is often securitized bonds (claims on portfolios of loans).

Despite the apparent similarities between repo and demand deposits,[6] the Fed counted only those repo transactions completed by the primary security dealers that trade with the Fed, not the entire market. These transactions are the only repos for which the government collects data.

According to Fed data, primary dealers reported financing $4.5 trillion in fixed-income securities with repos as of March 4, 2008. But there are no official statistics on the overall size of the repo market. However, it is likely to be about $12 trillion, compared with the total assets in the U.S. banking system of $10 trillion[7] (see Gorton, 2010). Hördahl and King (2008) report that the amount traded in repo markets has doubled since 2002, "with gross amounts outstanding at year-end 2007 of roughly $10 trillion in each of the U.S. and euro markets, and another $1 trillion in the UK repo market" (p. 37). They report that the U.S. repo market exceeded $10 trillion in mid-2008, including double counting. According to Hördahl and King (2008), "the (former) top U.S. investment banks funded roughly half of their assets using repo markets, with additional exposure due to off-balance sheet financing of their customers" (p. 39; also see King, 2008).

An important feature of the repo market is that the collateral often consisted of securitized bonds.[8] These are the liabilities of a **special purpose vehicle** (SPV), which finances a large portfolio of loans (e.g., home mortgages, auto loans, credit card receivables) by issuing tranches (bonds) in the capital markets. The tranches are based on seniority, but all tranches are investment grade. The sponsoring firm—the originator of the loans in the underlying portfolio—holds the equity residual, and there may be other credit enhancements to ensure that the tranches are investment grade (see Gorton and Souleles, 2006). While the internal structure of these transactions is complicated, the tranches were designed to, in effect, be information insensitive. This securitization of non-mortgage loans creates a group of assets called **asset-backed securities** (ABS), while portfolios of residential mortgages are **residential mortgage–backed securities** (RMBS). Similarly,

[6] Indeed, the Federal Reserve counted repo transactions as money in a monetary aggregate called M3. "M3 did not appear to convey any additional information about economic activity that was not already embodied in M2. Consequently, the Board judged that the costs of collecting the data and publishing M3 outweigh the benefits." M3 was discontinued on March 23, 2006. For more information, see "The Money Supply" (www.ny.frb.org/aboutthefed/fedpoint/fed49.html) and "Discontinuation of M3" (www.federalreserve.gov/releases/h6/discm3.htm).

[7] Triparty repos peaked at $2.8 trillion and are estimated to be between 10 and 15 percent of the overall repo market. This gives a range for repos between $18.7 trillion and $28 trillion.

[8] There was a shortage of collateral because collateral is needed for derivatives positions and clearing and settlement in addition to repos. Roughly 40 percent of U.S. debt of all types is held abroad and may not be available for use as collateral.

commercial mortgage–backed securities (CMBS) are claims on portfolios of commercial mortgages.

One asset class that was securitized was subprime mortgages. As explained by Gorton (2008), the product innovation with these mortgages was to structure the mortgages to effectively make the maturity two or three years. This structuring was accomplished with a fixed interest rate for the initial period, but with a significant rate increase at the "reset date," which essentially required the borrower to refinance the mortgage. With rising home prices, borrowers in the subprime market could build equity in their homes and would be able to refinance. For 2001 through 2006, subprime mortgage originations totaled about $2.5 trillion.[9] In 2005 and 2006, they totaled $1.2 trillion. A large portion of these later mortgages likely consisted of refinancings of previous mortgages. An important part of the subprime mortgage innovation was the financing method for the mortgages. In 2005 and 2006, about 80 percent of the subprime mortgages were financed through securitization—that is, the mortgages were sold in RMBS, which involves pooling thousands of mortgages and selling the pool to an SPV, which finances the purchase of the mortgage pool by issuing securities with different seniorities in the capital markets.

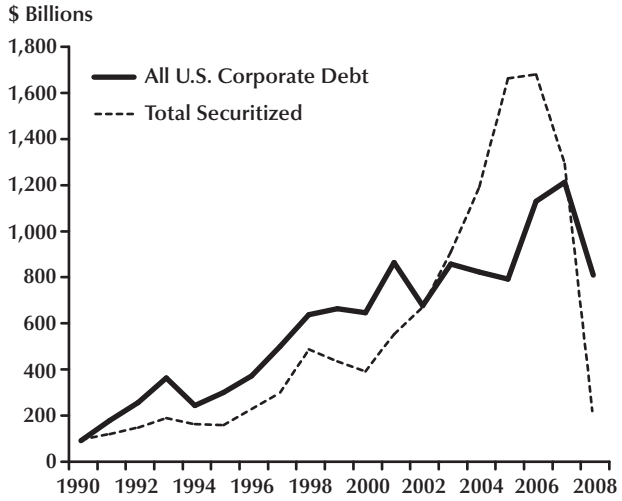
Securitization is an important sector of U.S. capital markets. Figure 1 shows the annual issuance amounts of all U.S. corporate debt (investment-grade and below–investment-grade) and all private securitization issuance. The effects of the crisis are also apparent, a manifestation of the loss of confidence discussed later.

Gorton and Metrick (2009) label institutions that finance their portfolios of securitized bonds through repos as "securitized banks" to distinguish them from the traditional depository institutions, which are regulated. Securitized banks were largely the old investment banks. To conduct repo business, these firms had to hold portfolios of assets that could be used as collateral. As explained previously, the collateral is like the loan in traditional banking.

[9] See Inside Mortgage Finance (2006) and Joint Economic Committee (October 2007).

Figure 1

U.S. Corporate Debt and Securitization Issuance ($ billions)



SOURCE: Thomson Reuters.

We now turn to the question of the vulnerability of securitized banks to runs.

REPO HAIRCUTS: TRYING TO RECREATE INFORMATION INSENSITIVITY AND, HENCE, LIQUIDITY

How could problems with subprime mortgages have caused a global financial crisis? Subprime mortgages were mostly securitized (about 80 percent were financed this way), but the amounts were not large enough to cause a systemic event. Gorton (2010) likens the subprime situation to an *E. coli* outbreak: Even a small outbreak in very specific foods can frighten many people into avoiding a wide array of similar foods. The problem with subprime, as with *E. coli*, was that no one knew where the risks actually were, so there was no certainty about which counterparties would fail. (And, unlike food, subprime mortgages cannot be recalled.) In the pre-Fed era, depositors knew that not all banks would fail in

a recession. But they did not know which banks were more likely to fail, and so there were runs on *all* banks. In this section we provide some analysis of the run on repos.

When a sufficiently bad economic shock occurs, debt cannot be traded without creating adverse selection or the fear of adverse selection. As discussed later, the dynamics of the recent crisis appear to be somewhat different from the panics of the nineteenth and early twentieth centuries. In analyzing the recent crisis, we see that it started small, grew, and was prolonged. It is hard to pin down the initial shock. Certain things were known: (i) Subprime mortgages were deteriorating during the first half of 2007, (ii) the house price bubble had burst, and (iii) some of the subprime mortgage originators were in trouble. The accumulation and aggregation of this information seems to have led to the start of the panic, which then worsened as more news arrived and the crisis exploded with the Lehman Brothers failure. But this scenario is conjecture and a subject for further research.

In the recent crisis, repo depositors did not know which securitized banks were most likely to fail (or whether the Fed would let them fail). More specifically, the concern was not directly about the bank defaulting, because repos are collateralized, but about the ability to recover the collateral value when sold in the market if the bank did default. Gorton (2010) and Gorton and Metrick (2009) argue that the financial crisis of 2007-08 was a banking *panic*. The panic corresponds to increasing repo haircuts, which caused massive deleveraging. The collapse of the repo market was the systemic event.

The panic corresponds to information-insensitive securities becoming information-sensitive, thereby creating a loss of confidence. Information "sensitive" means that traders then have an incentive to produce information. If that happens, then trade is reduced because of a fear of adverse selection. Liquidity dries up. One way to partially overcome this problem is for traders to recreate information-insensitive securities by taking a senior tranche of the original bond. In the repo market this concretely corresponds to a haircut. The bank taking the deposit must overcollateralize the deposit. And this implies that the bank must hold more equity in the collateral.

A key point to remember is that the collateral offered in repos is valued at market prices. If the bonds become riskier and their prices go down, then they are valued at the lower prices. Furthermore, if their future price is uncertain, that added risk can be addressed with a higher repo rate. Repo rates can and did go up (see Gorton and Metrick, 2009). Why should repo collateral involve haircuts? And why should these haircuts go up? Our answer (following Dang, Gorton, and Holmström, 2010a,b) is that a haircut amounts to tranching the collateral to recreate an information-*in*sensitive security and thereby improve its liquidity.

The most relevant risk is not related to the usual worries about the payoff (i.e., possible risk) on the security but is endogenous to the *trading process*, separate from the risk of loss due to default. A haircut addresses the risk that if the holder of the bond in repo (the depositor) must sell a bond in the market to get the cash back, the trader to whom the bond is sold may be better informed, resulting in a loss (relative to the true value of the security). Consequently, the price cannot adjust to address this risk.

One way to protect against this endogenous adverse selection risk is to require overcollateralization—that is, to increase the haircut. The depositor deposits less than the market value of the bond but has the bond as collateral. For the bank—the entity funding the bond—this means that for a bond worth $100, only a lesser amount can be borrowed, perhaps $95 (i.e., a haircut of 5 percent). We examine this proposition in cross section by looking at the haircuts during the crisis for different categories of structured products, particularly examining whether the "closer" the security is to subprime the sooner and the higher the repo haircut on that collateral. The haircuts should be higher for asset classes that are more prone to be sensitive to subprime mortgage risk.

During the crisis, repo haircuts varied for different asset classes—in particular, different categories of structured products, including ABS, RMBS, CMBS, **collateralized loan obligations** (CLOs), and **collateralized debt obligations**

(CDOs). CDOs are SPVs that issue long-dated liabilities in the form of rated tranches in the capital markets and use the proceeds to purchase structured products for assets, especially ABS. CDOs purchased significant amounts of subprime RMBS bonds (see Gorton, 2008).

We examine haircut data from one broker-dealer engaging in repo transactions with other banks in the interbank market. Haircuts are a function of the default probabilities of the two parties to the transaction and the information sensitivity of the collateral (see Dang, Gorton, and Holmström, 2010b). So, haircuts are not uniform across asset classes. We cannot say that our data are representative because we do not have data from other banks, but the bank that provided the data to us anonymously is a large, well-known institution. We know of no other large datasets of haircuts.[10]

The data we examine are the interbank repo haircuts on the following asset classes, further characterized by their ratings: (1) A-AAA ABS (auto/credit cards/student loans); (2) AA-AAA RMBS/CMBS; (3) below-A RMBS/CMBS; (4) AA-AAA CLO; (5) unpriced ABS/MBS/all subprime; (6) AA-AAA CDOs; (7) unpriced CLOs/CDOs. "Unpriced" means that public pricing for the collateral is not listed on Reuters or Bloomberg. Of these categories, those numbered (1) through (4) are not subprime related; they do not contain subprime mortgages. We label this group "non–subprime related." The RMBS in categories (2) and (3) are prime mortgages, not subprime. Categories (5) through (7) are either directly subprime or contain subprime mortgages. CDOs, in particular, contain some subprime mortgages. We use all seven categories to construct an equally weighted average repo-haircut index for structured bonds.

In the pre-crisis period, haircuts were zero for all asset classes; this is consistent with the repo market being based on information-insensitive assets backing deposits. Figure 2 shows the haircuts for the non–subprime-related and subprime-related groups and the average of all the categories. This figure and the others that follow essentially document the unfolding of the bank panic. An increase in repo haircuts corresponds to the withdrawals from this banking system, leading to massive deleveraging (see Gorton, 2010, and Gorton and Metrick, 2009). A notable feature of this run is that there was not a *single* shock, leading to one jump in the haircuts, but a prolonged *series* of increases in haircuts during the crisis. These dynamics of the crisis are discussed further by Gorton, Metrick, and Xie (2010).

Figure 2

Repo Haircuts on Different Categories of Structured Products

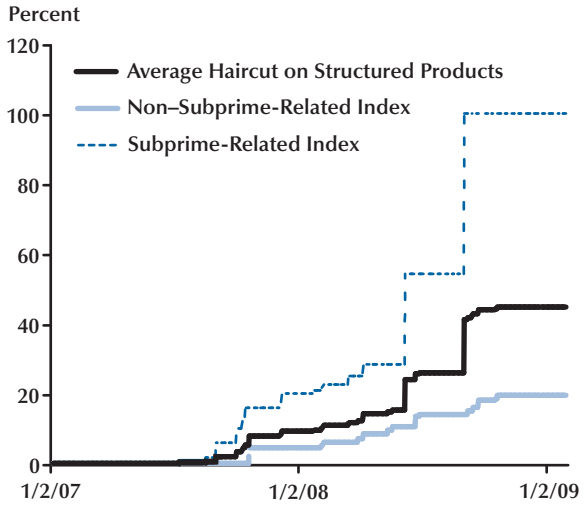


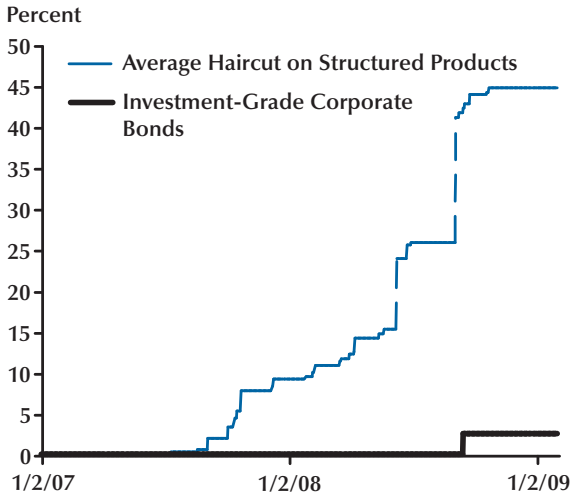
Figure 2 confirms that haircuts were higher on subprime-related asset classes. In fact, the haircut eventually went to 100 percent—that is, these assets were not acceptable as collateral in repo. The non–subprime-related asset classes reached a maximum of a 20 percent haircut.

To reiterate the argument, if these asset classes simply became financially riskier in the usual sense, then that would be reflected in their market prices, which are the starting basis for the collateral. So, that reasoning does not explain these haircuts. Instead, the haircuts are consistent with

[10] Except for another dataset that we have obtained of haircuts on collateral used for loans to hedge funds by one dealer bank. Holding the asset class and rating of the collateral constant, these haircuts are larger but follow the same pattern of increase over the crisis as discussed. The Bank for International Settlements (2010) has a small amount of survey-based data from June 2007 and June 2009.

Figure 3

Average Haircuts on Structured Products versus Investment-Grade Corporate Bonds



the idea that depositors want collateral that is "safe" in the very specific sense that it is immune to adverse selection and is hence liquid.

The panic portrayed in Figure 2 is the securitized-bank "run on repo." Each depositor imposes a haircut to protect against the possible effects of adverse selection. For the system as a whole, however, the implications are devastating. To understand the impact of this run on repo, take the estimate of the size of the repo market to be $10 trillion, the same size as the total assets in the regulated banking sector.[11] If the average haircut goes from zero (pre-crisis) to, say, an average of 20 percent during the crisis, then $2 trillion is the amount that the securitized banking system must find from other sources to fund its assets. Obviously, if the average haircut goes to 40 percent, then $4 trillion has to be raised. The only route available for these banks to make up the difference was asset sales, which caused a further downward movement in the prices of these asset classes, making them less usable as collateral, causing further sales, and so on. The securitized-bank system is then effectively insolvent, as was the banking system during the pre-Fed panics.

Figure 2 also displays a loss of confidence in the sense that the non–subprime-related group faced significant haircuts even though it had nothing to do with subprime mortgages. Its only fault is that it is also "securitized." The situation is similar to sales of bagged lettuce dropping when the Food and Drug Administration announces that there is *E. coli* in bagged spinach. To show this loss of confidence, we compare the average haircut on structured products with the haircut on corporate bonds (Figure 3).

All investment-grade corporate bonds were treated the same with regard to haircuts. Corporate bonds are clearly not claims on portfolios of loans as are structured securitized bonds; so, in that sense maybe they are riskier. The point here is that despite no contagious effect of subprime on corporate bonds, the bond haircuts did go from zero to a peak of 2½ percent.

The previous discussion addresses why haircuts increased. In the context of traditional finance, there is no explanation. Corporate debt is, in a way, a kind of haircut on the firm's assets. In fact, the idea of creating information-insensitive debt in this way is quite familiar. The distinction between information-sensitive and information-insensitive has a familiar counterpart—namely, the distinction between investment-grade debt and below–investment-grade debt. While investment-grade debt is not money, it is well-known that, by many measures such as spread and likelihood of default, there is a large gap between these two broad rating categories. This difference has been confirmed empirically. Studies of corporate bond returns and bond yield changes have mainly concluded that (i) investment-grade bonds behave like Treasury bonds—they react to (riskless) interest rate movements and (ii) below–investment-grade bonds (junk bonds) are more sensitive to stock returns—they react to information about the firm.[12] Corporate debt is not money, but the

[11] This is the number that most repo traders give as an estimate.

[12] Studies of the relation between stock and bond returns at the aggregate level include, e.g., Keim and Stambaugh (1986) and Fama and French (1989, 1993); at the portfolio and firm level, see, e.g., Blume, Keim, and Patel (1991) and Cornell and Green (1991); at the individual level, see, e.g., Kwan (1996a).

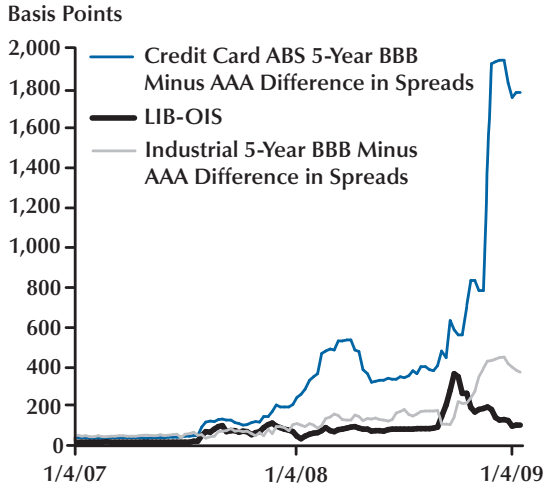
gap between investment grade and below–investment grade suggests an important informational line. Senior corporate debt has some features of the type of debt needed for transactions; it is an intermediate case. Kwan (1996b) writes: "It appears that AAA-rated bonds may have so little default risk relative to stocks that they are insensitive to information about the issuing firm."

The preceding analysis suggests that the line between information sensitivity and insensitivity has moved because of the subprime shock. Previously information-insensitive tranches are now sensitive. If this is the case, then we should see the effects in terms of prices or spreads. In other words, the spreads on some securitized asset class tranches should be much higher and remain higher. We can examine this issue by looking at what happened to the difference in spreads on different levels of seniority within the same asset class. We study the difference between the spread on the BBB-rated and the AAA-rated tranches of 5-year credit card ABS. We compare that with the spread difference between the BBB-rated industrial firm bond spread and the AAA-rated industrial firm bond spread at the 5-year horizon. The spread differences are expressed in **basis points**. (These are on-the-run bonds.) Finally, we look at the spread difference between the **LIBOR** and the **overnight index swap** rate. This last spread difference is a proxy for counterparty risk in the interbank market. The LIBOR minus OIS spread (LIB-OIS) should be zero to eliminate arbitrage profits (see Gorton and Metrick, 2009). But, if there is counterparty risk, it can become positive.

Figure 4 shows that the difference between BBB-rated industrial bond spreads and AAA-rated industrial bond spreads moved with the measure of counterparty risk: The spread was lower after the LIB-OIS came down. But this is not true for the credit card ABS spread differential between the BBB-rated and the AAA-rated tranches. This case suggests—but is clearly not definitive—that a kind of regime switch occurred whereby (in this example) the BBB-rated tranche of structured products became permanently information-sensitive.

Figure 4

Spread Differences by Asset Class (basis points)



DISCUSSION AND CONCLUSION

Increases in repo haircuts are withdrawals from securitized banks—that is, a bank run. When all investors act in the run and the haircuts become high enough, the securitized banking system cannot finance itself and is forced to sell assets, driving down asset prices. The assets become information-sensitive; liquidity dries up. As with the panics of the nineteenth and early twentieth centuries, the system is insolvent.

Liquidity requires symmetric information, which is easiest to achieve when everyone is ignorant. This determines the design of many securities, including the design of debt and securitization. The goal is to design securities such that it does not pay to speculate in these bonds. They are information-insensitive debt instruments. Then they are easy to trade; they are liquid. This idea (from Dang, Gorton, and Holmström, 2010a,b) is the basis of our study of some repo haircut data. When the asymmetric information about the holders of subprime risks became pressing, increasing haircuts provided a way to recreate (through retranching) information-insensitive debt. This situation applied mostly to subprime-

related asset classes but also occurred with non–subprime-related structured asset classes. The spreads seem to reflect the now information-sensitive status of formerly investment-grade tranches of ABS.

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GLOSSARY

Asset-Backed Securities (ABS): An asset-backed security is a bond backed by the cash flows from a pool of specified assets in a **special purpose vehicle** rather than the general credit of a corporation. The asset pools may be residential mortgages, in which case the asset-backed security is a **residential mortgage–backed security** (RMBS); commercial mortgages, in which case it is a **commercial mortgage–backed security** (CMBS); automobile loans, credit card receivables, student loans, aircraft leases, royalty payments, and many other asset classes. See Gorton and Souleles (2006).

Basis Point (bp): A basis point is one-hundredth of a percentage point (0.01 percent).

Collateralized Debt Obligations (CDOs): A CDO is a **special purpose vehicle** that buys a portfolio of fixed-income assets and finances the purchase of the portfolio by issuing different tranches of risk in the capital markets. These tranches are senior tranches rated Aaa/AAA, mezzanine tranches rated Aa/AA to Ba/BB, and equity tranches (unrated). ABS CDOs are CDOs with underlying portfolios consisting of **asset-backed securities** (ABS), including **residential mortgage–backed securities** (RMBS), and **commercial mortgage–backed securities** (CMBS).

Collateralized Loan Obligations (CLOs): A CLO is a **special purpose vehicle** that buys a portfolio of bank loans and finances the purchase of the portfolio by issuing different tranches of risk in the capital markets. These tranches are senior tranches rated Aaa/AAA, mezzanine tranches rated Aa/AA to Ba/BB, and equity tranches (unrated).

Commercial Mortgage–Backed Securities (CMBS): See asset-backed securities, above.

Haircut or **Initial Margin**: The percentage by which an asset's market value is reduced for the purpose of calculating the amount of overcollateralization of the repo agreement.

LIBOR: The London Interbank Offered Rate (LIBOR) is a series of interest rates, of different maturities and currencies, at which banks offer to lend funds to each other. These rates are calculated by the British Bankers' Association as the averages of quotes contributed by a panel of banks and are announced at 11:00 AM local time in England. This is called the rate "fixing." Quotes are ranked, and the top and bottom quartiles are discarded. The LIBOR is fixed for 15 different maturities (from overnight to one year) and in 10 international currencies. Similar fixing arrangements exist in many markets around the world. See Gyntelberg and Wooldridge (2008).

Overnight Index Swap (OIS): An OIS is a fixed/floating interest rate swap in which the floating leg of the swap is tied to a published index of a daily overnight rate reference. The term can range from one week to two years—and sometimes more. At maturity, the two parties agree to exchange the difference between the interest accrued at the agreed fixed rate and interest accrued through geometric averaging of the floating index rate on the agreed notional amount. This means that the floating rate calculation replicates the accrual on an amount (principal plus interest) rolled at the index rate every business day over the term of the swap. If cash can be borrowed by the swap receiver on the same maturity as the swap and at the same rate and lent back every day in the market at the index rate, the cash payoff at maturity will exactly match the swap payout: The OIS acts as a perfect hedge for a cash instrument. Since indices are generally constructed on the basis of the average of actual transactions, the index is generally achievable by borrowers and lenders. Economically, receiving the fixed rate in an OIS is like lending cash. Paying the fixed rate in an OIS is like borrowing cash. Settlement occurs net on the earliest practical date. There is no exchange of principal. The index rate used is typically the weighted average rate for overnight transactions as published by the central bank (e.g., the effective federal funds rate).

Rehypothecation: "Hypothecate" means to pledge collateral. Rehypothecation is the practice of reusing (or repledging) collateral received in one transaction with an unrelated third party in an unrelated transaction. See Singh and Aitken (2009) and Johnson (1997).

Residential Mortgage–Backed Securities (RMBS): See asset-backed securities.

Sale and Repurchase Agreement (repo): A sale and repurchase agreement (known as a "repo" for short) is a sale of a security combined with an agreement to repurchase the same security at a specified price at the end of the contract. Economically, a repo is a secured or collateralized loan—that is, a loan of cash against a security as collateral. From the point of view of the borrower of the cash (who is putting up the security as collateral), it is a reverse repurchase agreement, or "reverse repo." The collateral pledged by the borrower toward the repo sometimes has a haircut (or initial margin) applied, which means the collateral is valued at slightly less than market value. This haircut reflects the perceived underlying risk of the collateral and protects the lender against a change in its value. Haircuts vary for different asset classes and ratings.

Securitization: The process of financing by segregating specified cash flows from loans originated by a firm (the "sponsor") and selling claims specifically linked to these specified cash flows. This is accomplished by setting up another company, called a **special purpose vehicle** or special purpose entity, and then selling the specified cash flows to this company, which purchases the rights to the cash flows by issuing (rated) securities into the capital market. The sponsor services the cash flows—that is, it makes sure that the cash flows are arriving and so on.

Special Purpose Vehicle (SPV): An SPV or special purpose entity (SPE) is a legal entity that has been set up for a specific, limited purpose by another entity, the sponsoring firm. An SPV can take the form of a corporation, trust, partnership, or a limited liability company. The SPV may be a subsidiary of the sponsoring firm or it may be an "orphan" SPV—one that is not consolidated with the sponsoring firm for tax, accounting, or legal purposes (or it may be consolidated for some purposes but not others). An SPV can carry out only some specific purpose, circumscribed activity, or a series of such transactions. The SPV is not an operating company in the usual sense. It is more of a completely rules-based company in that there is no managerial discretion needed. It has no employees or physical location. An essential feature of an SPV is that it must be "bankruptcy remote"—that is, the SPV can never become legally bankrupt. The most straightforward way to achieve this stipulation is for the SPV to waive its right to file a voluntary bankruptcy petition, but this is legally unenforceable. The only way to completely eliminate the risk of either voluntary or involuntary bankruptcy is to create the SPV in a legal form ineligible as a debtor under the U.S. bankruptcy code. See Gorton and Souleles (2006).