Haircuts[+]

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Abstract

When "confidence" is lost, "liquidity dries up." We investigate the meaning of "confidence" and "liquidity" in the context of the current financial crisis. The financial crisis is a manifestation of an age-old problem with private money creation: banking panics. We explain this and provide some evidence with respect to the current crisis.

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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. " (Seligman (1908), p. xi)

1. Introduction

The financial crisis 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 below (see Gorton (2010) and Gorton and Metrick (2009)).[1] Markets where there is a lot of trade are often described as "liquid" markets. The repo market had an average daily trading volume of about $2.3 trillion in 2008, compared to the NYSE Group that had an average daily trading volume of around $80 billion in 2008.[2] Repo is a form of money, like demand deposits (or private bank notes before the Civil War).[3] Like other forms of money, in repo trillions of dollars exchanges without any extensive due diligence. But, there have always been difficulties creating private money (like bank notes or demand deposits) and this time around was no different. Like the banking panics in U.S. history, at the core of the current financial crisis is a problem with private money creation. In banking crises these markets fail to function; it is said that "liquidity dries up" because of a "loss of confidence." In this paper we investigate what this means in the context of the financial crisis. We explain the problem and provide some evidence for our explanation.

Traditional banking is centered on creating demand deposits (checking accounts), which are a form of money. Demand deposits are a form of debt which allows the depositor the right to withdraw cash at any time (i.e., they are very short maturity); they are backed by the assets of the bank, including reserves and loans. There is a demand for checks because they are easily transferable and since now they are insured by the government, their value is never in question. Prior to the 1934 adoption of deposit insurance in the U.S., 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. If the design was successful, checks could be used with confidence in their value without extensive due diligence. The traditional problem with demand deposits was that sometimes this confidence disappeared. There were banking panics, events in which depositors ran en masse to their banks and demanded cash for their checking accounts. Banks, having lent the money out, had illiquid loans, and could not honor the demands of their depositors: the banking system was insolvent. This is the problem that deposit insurance stopped.

The private money that is our focus in this paper is sale and repurchase agreements ("repo") which, as we explain below, are a kind of money for institutional investors and nonfinancial firms which 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. There

[1] Terms in **bold** may be unfamiliar to some readers and are defined in the Glossary at the end.
[2] On the repo markets see SIFMA (2008) and on the stock market see: http://www.nyxdata.com/nysedata/asp/factbook/viewer_edition.asp?mode=table&key=3002&category=3 .
[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.

may be overcollateralization if the market value of the bonds received exceeds the deposit. For example, if $90 million is deposited and $100 million of bonds are received as collateral, then there is a "**haircut**" or initial margin of 10 percent. This is akin to bank capital or a reserve fund as the 10 percent is junior in seniority to the depositor's 90 percent claim. So, as mentioned above, repo is similar to demand deposits in important ways, and consequently was counted in the Federal Reserve System's monetary aggregate M3 (since discontinued).

Historically, securities that function as money have certain specific properties. These securities are debt; they are short-term, and they are 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 trading. This is what is meant by 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 is the loss of confidence. When this loss of confidence occurs, fear of adverse selection reduces liquidity. In this paper we further investigate some of the details of this argument.

2. Panics in U.S. History

In U.S. history periodic banking panics have been the norm. This history can offer some useful insights for understanding the current crisis. For example, during the U.S. National Banking Era, 1863-1913, there were seven nation-wide 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 thought of as completely safe. Upon learning of the coming downturn depositors ran to their banks to withdraw cash, concerned that banks would fail in the coming recession. In the 19th century the shock 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 is insolvent because it cannot honor these contractual demands with respect to demand deposits; the money has been lent out and cannot be recalled and the loans cannot be sold. The banking system is illiquid, and consequently is insolvent when a panic occurs. 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.

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

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

This is related to the function of money, discussed above. Banks try to produce securities that are useful for transacting, namely bank debt, like demand deposits. But, in a panic, people lose confidence in the value of bank debt. Bank debt that was previously viewed as "safe" becomes viewed with suspicion. 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. And, second, because of this it is not susceptible to adverse selection when it is used in transactions (traded in markets). That is, it does not pay 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 a panic? During the 19th century the banks themselves developed increasingly sophisticated ways to respond to panics. The response was centered on private bank clearinghouses. Originally organized to be 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, clearinghouse member banks joined together 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 newspapers) and would instead only publish 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). These were liabilities of the clearinghouse members *jointly* –not liabilities of any individual bank--and served the purpose of providing a kind of deposit insurance. The clearinghouse loan certificate was a remarkable innovation, resulting 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.

3. Securitized Banking and Repo as Money

The limits on the amount that deposit insurance will cover make bank accounts inadequate for large depositors, like institutional investors or nonfinancial firms. But, they also have a need for a short-term, safe, interest-bearing place to store money. A repurchase agreement (or "repo") is a financial contract used by market participants as a financing method to meet short and long-term liquidity needs. In a repo transaction there are 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. Repo is typically short-term, often overnight, so the money can be withdrawn easily by not renewing or "rolling" the repo.

Because there is no FDIC insurance, 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 they have it in their possession. The depositor is protected (in principle) from the failure of the bank being able to sell the collateral in the market to recover the value of the deposit. That is, the nondefaulting party can

unilaterally terminate the repo agreement and sell the collateral, or keep the money if the depositor becomes insolvent. In other words, repo transactions are excluded from the U.S. Bankruptcy Code.[5]

Another important feature of repo is that the bonds that the depositor receives as collateral can be "spent" in that they can be used as collateral in another, unrelated, transaction. For example, the bonds could be posted as collateral against a derivatives position. The reuse of collateral is called "**rehypothecation**." Rehypothecation means that there is a money velocity associated with the collateral.

In what follows "haircuts" will play an important role. To reiterate, here's the previous example. A large investor, for example, 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 has to finance the other $10 million in some other way, issuing new liabilities. Haircuts are determined by participants in the market and can change.

The similarities between repo and demand deposits are apparent, and indeed the Federal Reserve counted repo transactions as money in a monetary aggregate called M3. However, the Fed only counted the repo transactions that were done by the primary security dealers that trade with the Fed, not the entire market. M3 was discontinued on March 23, 2006.[6] See http://www.federalreserve.gov/releases/h6/discm3.htm .

Traditional banking is the taking of deposits (paying say 3 percent interest) and lending the money at, say, 6 percent interest. Repo works in 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).

The government collects data on the repo amounts done by the primary dealers. According to Fed data, primary dealers reported financing $4.5 trillion in fixed income securities with repo 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 to the total assets in the U.S. banking system of $10 trillion.[7] See Gorton (2010). Hördahl and King (2008) report that repo markets have doubled in size 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).

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[5] In other words, repurchase agreements are exempted from the automatic stay provision of the bankruptcy code and parties do not have to enter Chapter 11 to try to recover the value. The nondefaulting party to a repurchase See, e.g., Schroeder (1999).

[6] "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." See http://www.ny.frb.org/aboutthefed/fedpoint/fed49.html .

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

An important feature of the repo market is that the collateral was very often 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, i.e., 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. The **securitization** of non-mortgage loans is called **asset-backed securities** (ABS), while portfolios of residential mortgages are **residential mortgage-backed securities** (RMBS). Similarly, **commercial mortgage-backed securities** (CMBS) are claims on portfolios of commercial mortgages.

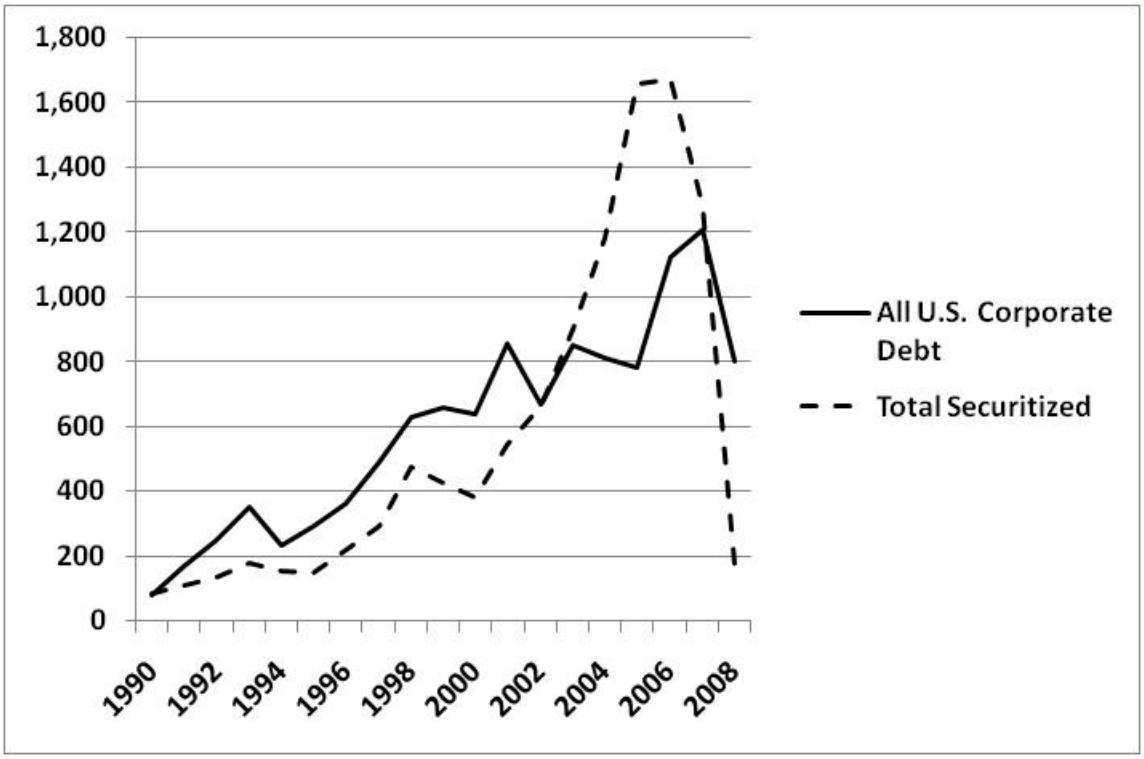
One of the asset classes that was securitized was subprime mortgages. As explained by Gorton (2008), the innovation was to structure the mortgage to effectively make the maturity two or three years. This was accomplished with a fixed initial period interest rate, but then at the "reset date" having the rate rise significantly, essentially requiring the borrower to refinance the mortgage. With rising home prices, borrowers would build equity in their homes and would be able to refinance. In the years 2001-2006, about $2.5 trillion of subprime mortgages were originated.[9] In 2005 and 2006, a total of $1.2 trillion of subprime mortgages were originated, a large portion of which was likely refinancings of previous mortgages. An important part of the subprime mortgage innovation was how the mortgages were financed. In 2005 and 2006, about 80 percent of the subprime mortgages were financed via securitization, that is, the mortgages were sold in residential mortgage-backed securities (RMBS), which involves pooling thousands of mortgages together, selling the pool to a special purpose vehicle which finance their purchase by issuing securities with different seniority (called "tranches") in the capital markets.

Securitization is a very important sector of U.S. capital markets, as the figure below shows. Shown are the issuance amounts, annually, 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 to be discussed shortly.

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

[9] See Inside Mortgage Finance, The 2007 Mortgage Market Statistical Annual, Key Data (2006), Joint Economic Committee (October 2007).

Figure 1: U.S. Corporate Debt and Securitization Issuance ($ billions)



Source: Thomson Reuters

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

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

4. Repo Haircuts: Trying to Re-Create 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 subprime to E-coli: there doesn't have to be a lot of it for everyone to fear eating certain foods and avoid those 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). Unlike food the subprime mortgage-related assets could not be recalled. In the pre-Fed era, depositors knew that not all

banks were going to fail in the recession. But, they did not know which banks were more likely to fail, and so they ran on all banks. In this section we provide some evidence on the run on repo.

If there is a sufficiently bad economic shock, then debt cannot be traded without creating adverse selection or the ear of adverse selection. As we will see below, the dynamics of the current crisis appear to be somewhat different than the panics of the 19th century. The current crisis starts small and grows; it is prolonged. It is hard to pin down the initial shock. It was known that subprime mortgages were deteriorating during the first half of 2007, that the house price bubble had burst, and that some of the subprime mortgage originators were in trouble. It seems that accumulation and aggregation of this information leads to the start of the panic, which then worsens as more news arrives, and finally explodes with the Lehman Brothers failure. But, this is conjecture and is a subject for further research.

In the current 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 repo is collateralized, but about being able to recover the collateral value when selling it in the market if the bank did default. Gorton (2010) and Gorton and Metrick (2009) argue that the financial crisis of 2007-2008 was a banking panic. The panic corresponds to repo haircuts increasing, causing massive deleveraging. The collapse of the repo market was the systemic event.

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

Keep in mind that the collateral offered in repo is valued at market prices. If the bonds become riskier, and their prices go down, then they would be valued at these lower prices. Furthermore, if there is more uncertainty about their price in the future, that 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 be haircut? And why should these haircuts go up? Our answer, following Dang, Gorton, and Holmström (2010a,b), is that a haircut amounts to a tranching of the collateral to recreate an information-insensitive security so that it is liquid. The risk that is relevant here is different than the risks we usually think about, which are related to the payoff on the security. A haircut addresses the risk that if the holder of the bond in repo, the depositor, has to sell a bond in the market to get the cash bank, he may face a better informed trader resulting in a loss (relative to the true value of the security). This risk is endogenous to the trading process. It is not the risk of loss due to default. 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, an increase in the initial margin or "haircut." The depositor deposits less than the market value of the bond, but has the bond as collateral. From the bank's point of view, the entity funding the bond, this means that for a bond worth $100, only an amount less than that can be borrowed, perhaps $95, i.e., a haircut of 5 percent. We examine this proposition in the cross section by looking at the haircuts over the

course of the crisis for different categories of structured products. In particular, we examine 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 were different for different asset classes, in particular, different categories of structured products, including asset-backed securities (ABS), residential mortgage-backed securities (RMBS), commercial mortgage-backed securities (CMBS), **collateralized loan obligations** (CLOs), and **collateralized debt obligations** (CDOs). Collateralized debt obligations (CDOs), are special purpose vehicles 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. In particular, ABS (asset-backed securities) CDOs purchased significant amounts of subprime RMBS bonds. See Gorton (2008).

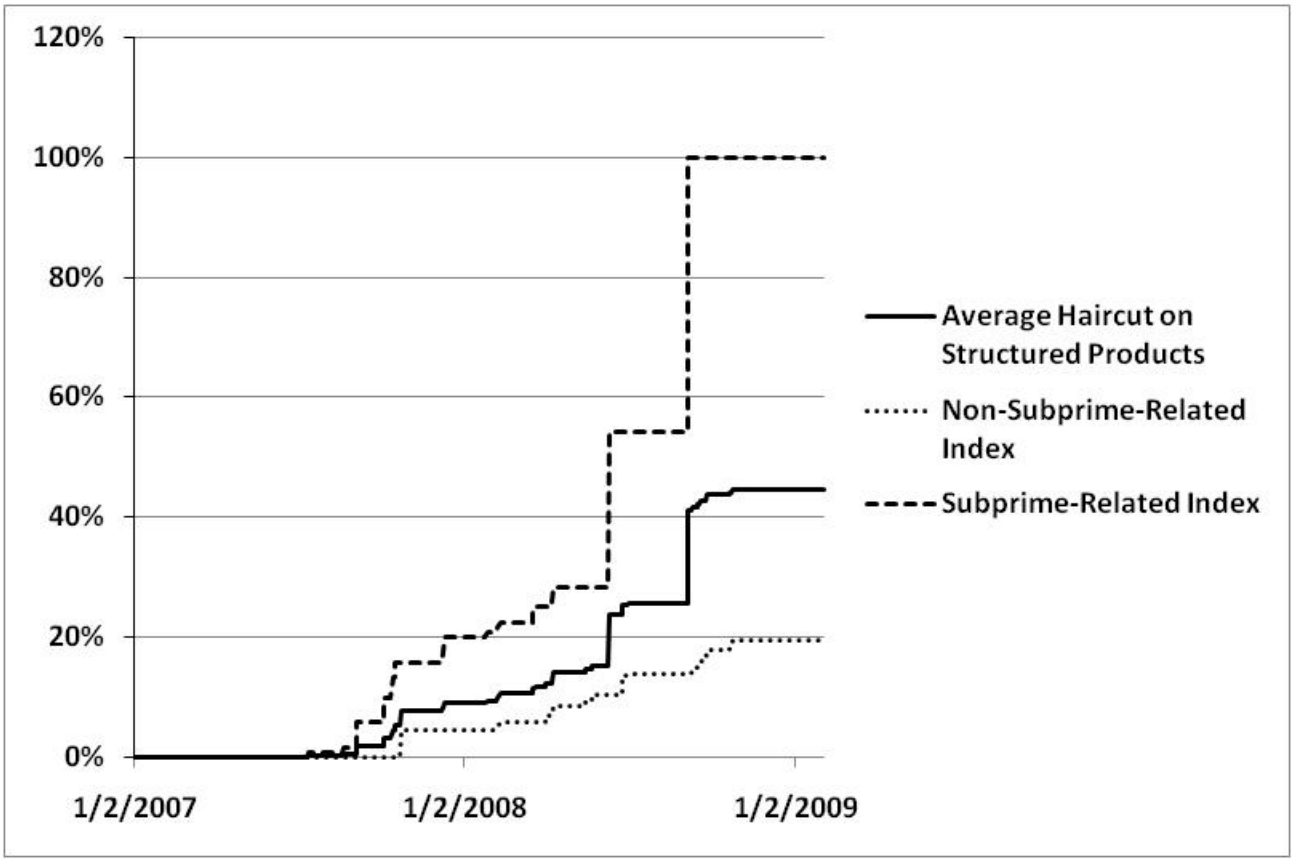
We will examine haircut data from one broker-dealer, facing other banks in the interbank market. Haircuts are a function of the default probabilities of the two parties to the transaction, as well as of the information-sensitivity of the collateral (see Dang, Gorton, and Holmström (2010b)). So, haircuts are not uniform across asset classes, for example. While we cannot say that the data we have are representative, because we do not have data from any other bank, the bank that provided the data to us anonymously is a large, well-known, institution. We know of no other data sets of haircuts.[10] The BIS (2010) contains a small amount of data from June 2007 and June 2009 based on a survey.

The data we will 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) < A RMBS/CMBS; (4) AA-AAA CLO; (5) Unpriced ABS/MBS/All Subprime; (6) AA-AAA CDOs; (7) Unpriced CLOs/CDOs. "Unpriced" means that the collateral does not have public pricing on Reuters or Bloomberg. Of these categories, those numbered (1) – (4) are not subprime-related; they do not contain subprime mortgages. We label this group "Non-Subprime-Related." The RMBS referred to in categories (2) and (3) are prime mortgages, not subprime. Categories (5) – (7) are either directly subprime or contain subprime. Collateralized debt obligations (CDOs), in particular, contain some subprime. Also, using all seven categories we also construct an equally weighted average repo-haircut index for structured bonds.

In the pre-crisis period, harircuts were zero for all the asset classes. This is consistent with the repo market being based on information-insensitive assets backing "deposits." The figure below shows the haircuts for the Non-Subprime-Related Group, the Subprime-Related Group, and the average of all the categories. This figure and the others to follow essentially document the unfolding of the 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 is that there was not a single shock, leading to one jump in the haircuts, but a series of steps up during the crisis. These dynamics of the crisis are discussed further by Gorton, Metrick, and Xie (2010).

[10] Except for another data set 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 we discuss here.

Figure 2: Repo Haircuts on Different Categories of Structured Products



The figure 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.

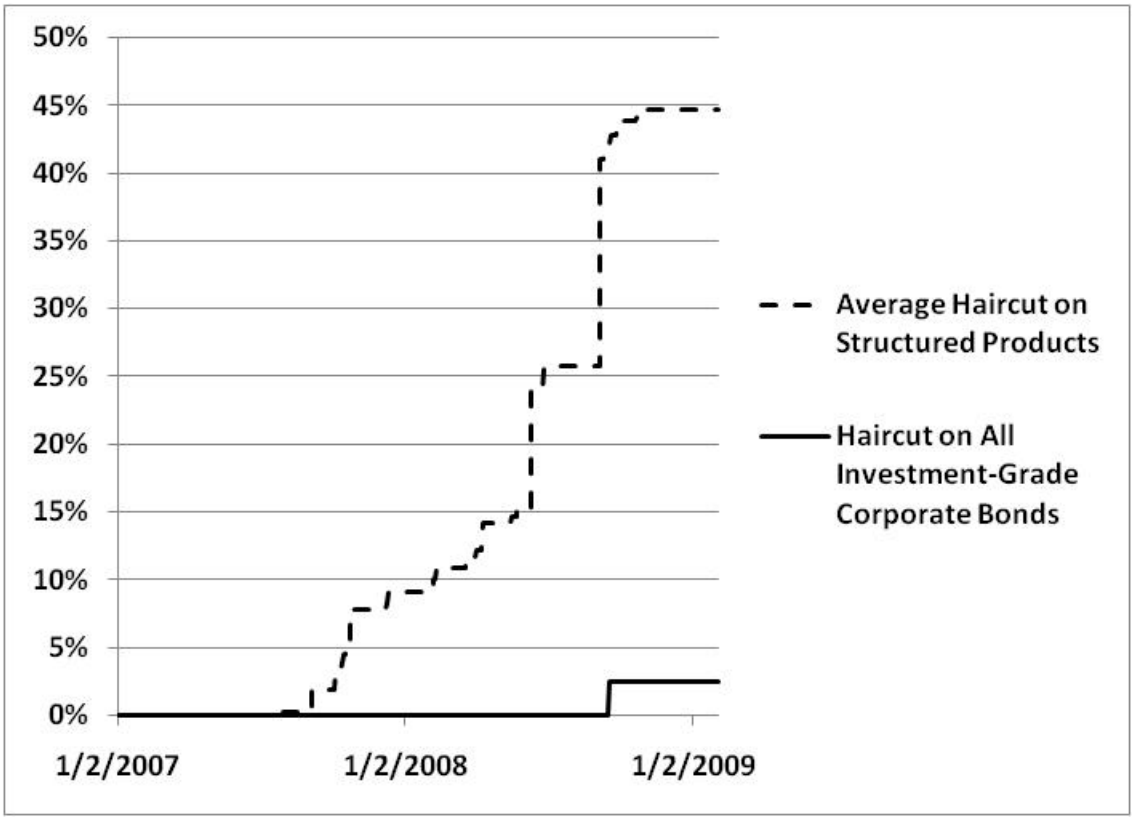
To reiterate the argument, if these asset classes simply became riskier in the usual finance sense, then that would be reflected in their market prices – which are the basis for the collateral to start with. So, that cannot be an explanation for these haircuts. Instead, the haircuts are consistent with 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 is the securitized-bank "run on repo." Each "depositor" imposes a haircut to protect himself against the possible effects of adverse selection. But, for the system as a whole 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 needs to 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.

The figure also displays a loss of confidence in the sense that the Non-Subprime-Related Group faced very significant haircuts even though it has nothing to do with subprime. It is simply also securitized. It is similar to sales of bagged lettuce dropping when the Food and Drug Administration announces that there E-coli in bagged spinach. To see this loss of confidence, let's compare the average haircut on structured products to the haircut on corporate bonds. This is done in Figure 3.

Figure 3: The Average Haircut on Structured Products versus Haircuts on Corporate Bonds



All investment-grade corporate bonds were treated the same with regard to haircuts. Corporate bonds are clearly not claims on portfolios of loans like structured securitized bonds are, so in that sense maybe they

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

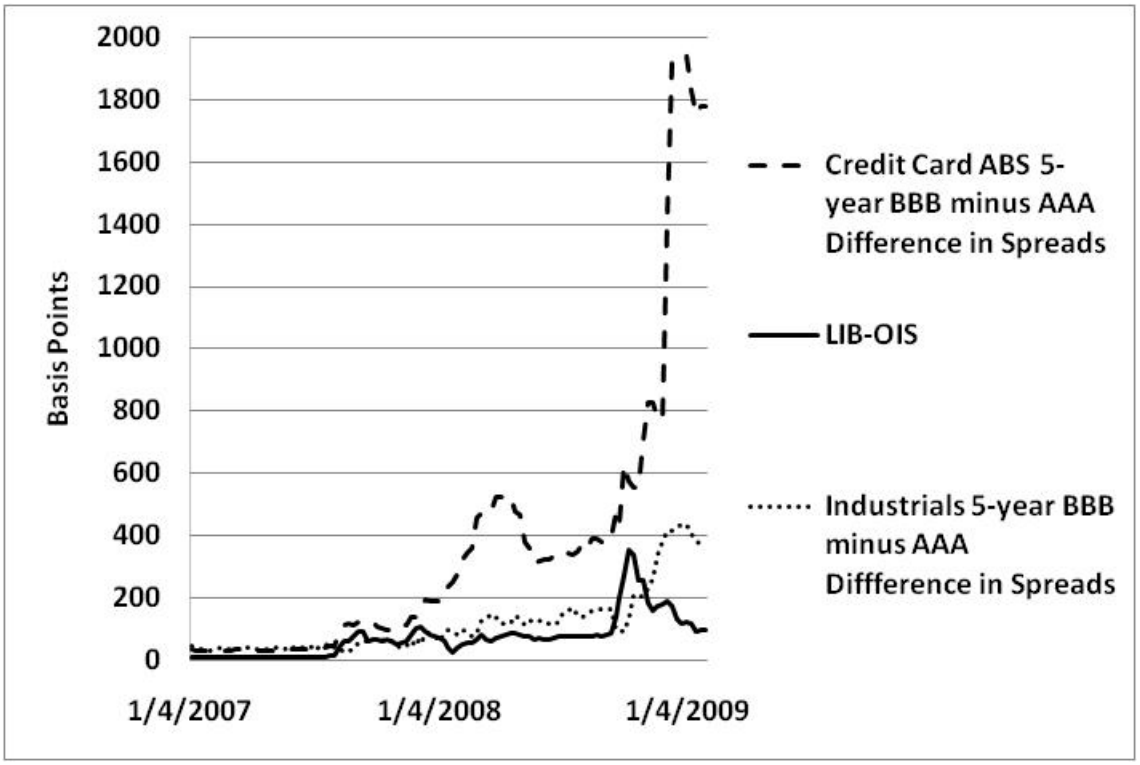
are riskier. But, the point is that there was no contagious affect of subprime on corporate bonds, although their haircuts did go from zero to a peak of two and half percent.

The discussion above addressed the question of why haircuts should increase. 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 drawn 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 there is a large gap – by many measures (e.g., spread, likelihood of default)—between these two broad rating categories. This has been confirmed empirically. Studies of corporate bond returns and bond yield changes have mainly concluded that investment-grade bonds behave like Treasury bonds, reacting to (riskless) interest rate movements, while below investment-grade bonds (junk bonds) are more sensitive to stock returns, reacting to information about the firm.[12] Corporate debt is not money, but the gap between investment-grade and below investment-grade suggests an important informational line. Senior corporate debt has some features of the kind of debt that is 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 analysis above suggests that the line between information-insensitive and information-sensitive has moved due to 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 by looking at what has happened to the difference in spreads on different levels of seniority for the same asset class. We will look at the difference between the spread on the BBB tranche and the AAA tranche of 5-year credit card ABS. We will compare that to the difference in spread 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 will look at the spread difference between **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 by no arbitrage. See Gorton and Metrick (2009). But, if there is counterparty risk, it can become positive.

[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), and at the portfolio level they include, and firm level e.g., Blume, Keim, and Patel (1991), and Cornell and Green (1991); at the individual level, see, e.g., Kwan (1996).

Figure 4: Spread Differences by Asset Class (Basis Points)



The figure shows that the difference between BBB-rated industrial bond spreads and AAA-rated industrial bond spreads moves with the measure of counterparty risk, coming down when LIB-OIS came down. But, this is not true for the credit card ABS spread differential between the BBB-rated tranche and the AAA-rated tranche. This suggests – but is clearly not definitive – that there has been a kind of regime switch whereby (in this example) the BBB-rated tranche of structured products have become permanently information-sensitive.

5. Discussion

Increases in repo haircut are withdrawals from securitized banks, a bank run. When everyone does this 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. Like the panics of the 19th century, the system is insolvent.

Liquidity requires symmetric information, which is easiest to achieve when everyone is ignorant. This determines many securities' design including the design of debt and securitization. The idea is to design securities such that it doesn't pay to speculate in these bonds. They are information-insensitive. Then they are easy to trade; they are liquid. This idea (of Dang, Gorton, and Holmström (2010a,b)) is the basis of our look at some repo haircut data. When the asymmetric information about the location of subprime risks became pressing, increasing haircuts was a way to re-create, through re-tranching, information-

insensitive debt. This was most true for 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.

Glossary

Asset-Backed Securities (ABS): An asset-backed security is a bond which is 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 it is a **residential mortgage-backed security** (RMBS), commercial mortgages – 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%).

Collateralized Debt Obligations (CDOs): A CDO is a special purpose vehicle, which buys a portfolio of fixed income assets, and finances the purchase of the portfolio via 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 which have 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, which buys a portfolio of bank loans, and finances the purchase of the portfolio via 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 fund to each other. These rates are calculated by the British Bankers' Association as the averages of quotes contributed by a panel of banks and 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. LIBOR is fixed for 15 different maturities, from overnight to one year, and in ten international currencies. Similar fixing arrangements exist in many markets around the world. See Gyntelberg and Wooldridge (2008).

Overnight Index Swap (OIS): An Overnight Indexed Swap (OIS) is a fixed/floating interest rate swap where the floating leg of the swap is tied to a published index of a daily overnight rate reference. The term ranges from one week to two years (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 fed funds rate).

Rehypothecation: "Hypothecate" means to pledge collateral. Rehypothecation is the practice of re-using (or re-pledging) 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 Security (RMBS): See asset-backed securities, above.

Sale and Repurchase Agreements (**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 borrowers towards 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 are different 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** (SPV) 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, makes sure that the cash flows are arriving, etc.

Special Purpose Vehicle (SPV): An SPV or special purpose entity (SPE) is a legal entity which 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 may be consolidated for some purposes but not others). An SPV can only carry out some specific purpose, or circumscribed activity, or a series of such transactions. The SPV is not an operating company in the usual sense. It is more of a robot company in that it is a set of rules. It has no employees or physical location. An essential feature of an SPV is that it be "bankruptcy remote," that is, that the SPV never be able to become legally bankrupt. The most straightforward way to achieve this would be 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 that is ineligible to be a debtor under the U.S. Bankruptcy Code. See Gorton and Souleles (2006).

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