Securitization, Shadow Banking, and Financial Fragility

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Many of the most dramatic and memorable moments of the recent financial crisis involved the failures or near-failures of some of the nation's biggest financial institutions: Bear Stearns, Lehman Brothers, and AIG, to name a few. And much of the subsequent policy response has been shaped by a desire to either avert such failures in the future—e.g., by imposing higher capital requirements on systemically important financial firms—or to lessen the adverse consequences of failures if they do occur—e.g. by improving the methods available to resolve large institutions in distress.

Yet from the perspective of credit creation and impact on the rest of the economy, one of the most damaging aspects of the crisis was not just the problems of these big firms, but also the *collapse of an entire market*, namely the market for asset-backed securities, or ABS. For example, the market for so-called "traditional" or "consumer" ABS, those based on credit-card, auto, and student loans, averaged between $50 and $70 billion of new issuance per quarter in the years leading up to the crisis (total issuance for the calendar year 2007 was $238 billion). However, in the last quarter of 2008, following the bankruptcy of Lehman, total issues in this category fell to just over $2 billion. Given that banks were suffering their own problems and not easily able to step into the breach, the disappearance of this market represented a major contraction in the supply of credit to consumers, and may well have played a central role in the steep drop in aggregate consumption that occurred at this time. The traditional ABS market only began to rebound in mid-2009, with the implementation of the Federal Reserve's Term Asset-Backed Lending Facility, or TALF, which made tens of billions of dollars of Fed loans available on attractive terms to investors seeking to buy newly-issued consumer ABS.

In what follows, I explore the role that the ABS market plays in the broader process of credit creation, focusing on four sets of issues. First, I describe how the market works—how pools of loans (e.g., mortgages, credit-card loans, auto loans) are packaged and structured into asset-backed securities, and how investors such as hedge funds, pension funds and broker-dealer firms finance the acquisition of these ABS.

Second, I outline the economic forces that drive securitization; these include both an efficiency-enhancing element of risk-sharing, and a less desirable element of banks trying to circumvent regulatory capital requirements. Third, I discuss the factors that appear to have contributed to the market's fragility during the crisis period. And finally, I suggest some policy reforms that might be helpful in mitigating this fragility going forward.

How Securitization Works

Suppose you buy a new car, and take out a $10,000 loan to finance the purchase. This loan could come from a bank, or from the financing arm of an auto company. After the loan is made, the lender has two options: it can hold on to the loan it has originated, or it can securitize it and thereby sell it off. The first step in the securitization process, known as *pooling*, is for the lender to gather your loan together with tens of thousands of other loans like it—from other cars sold around the country at about the same time—and assemble all of these loans together into a trust. All the cash payments coming from all of the designated loans from that point forward go into the trust.

The second step in the process is *tranching*. Tranching involves designating different classes of claimants on the cashflows to the trust, some of whom are given higher priority than others. Said differently, tranching is a recipe that spells out who loses money and under what conditions if some of the loans that make up the pool go bad. To be concrete, consider a simplified example where the pool consists of ten loans of $10,000 apiece, all of which come due at the same time. Each borrower can either pay off their loan in its entirety, or default and pay nothing. One structure would be to divide the pool into ten layers, or tranches, each of which is owed $10,000. The most junior, or lowest-priority tranche—call it T1—would only get its money back if all ten loans were repaid; if even a single loan went bad, T1 would see its investment wiped out. Thus T1 stands at the bottom of the pecking order, and is a very risky security. The second most junior tranche, T2, gets its money back if nine or more of the loans are repaid, or equivalently, gets wiped out if there are two or more defaults. At the top of the hierarchy stands the most senior tranche T10, which is very well-protected, and only loses if all ten of the loans in the trust go bad.

As the example suggests, the senior-most tranches of securitizations are likely to be of high credit quality. That is, they only experience losses under rare circumstances, when a large fraction of the loans in the underlying pool are hit with defaults. One reflection of this is that these senior-most tranches are typically rated AAA by the rating agencies. This in turn makes them attractive investments for institutional investors who are looking for safe places to put their money, but who are either unable or unwilling to expend the resources required to do loan-level due diligence. Such institutions may not have the expertise to evaluate individual applicants for auto loans, but given the reduction in credit risk associated with the process of pooling and tranching, may be comfortable buying the senior tranches of auto-loan securitizations even after relatively little investigative effort.

While the subprime crisis has called into question the whole idea of turning risky loans into apparently near-riskless AAA-rated asset-backed securities—a process many have dubbed "alchemy"—it should be noted that the flaw is not so much with the basic concept of securitization, which has been around for a long time, but rather with the reckless and excessively complex way in which it was applied to subprime mortgage loans. Loosely speaking, the problem in the subprime sphere was not that the most senior T10-like tranches of subprime pools were rated AAA, it was that the many of the less well-protected tranches (say the T3s) ultimately were as well, though only after a series of machinations that were less than transparent to most market participants.[1]

Figure 1 provides some perspective on this point. It plots quarterly issuance of ABS over the period 2000-2009, broken into two categories. The first category, "traditional" ABS, is comprised of securitizations based on consumer credit: auto, credit-card and student loans. The striking thing about this series is how stable it is in the several years prior to the crisis; one gets the sense of a market that has functioned steadily and unremarkably, with only modest trend growth, for a long period of time. The second category, "non-traditional" ABS, includes securitizations based on subprime mortgage loans, as well as second and third-generation *re-securitizations* where the collateral going into the trust is not a pool of actual loans, but rather a collection of tranches created out of earlier rounds of securitizations of subprime loans and other assets.[2] It is in this latter, more highly-engineered market where one sees the signs of a bubble, with the volume of

issuance growing explosively in the period 2003-2007, before completely collapsing during the crisis period.

Beyond pooling and tranching, a final important element in the securitization process is *maturity transformation*. Often, the investors who ultimately purchase ABS tranches do so by relying heavily on borrowed money, with much of this borrowing being very short-term in nature. In the period leading up to the crisis, one prominent example of this behavior came from entities known as "structured investment vehicles" (SIVs) or "conduits". These entities, which in many cases were affiliated with sponsoring commercial banks, held ABS tranches and financed these holdings by issuing commercial paper, which typically had a maturity of only days or weeks, and therefore had to be rolled over frequently. Another example came from the hedge funds and the broker-dealer firms (like Bear Stearns and Lehman Brothers) that financed their holdings of ABS with repurchase agreements (commonly known as "repo"), which is a form of overnight collateralized borrowing.

Collectively, the various investors who acquire ABS and finance them with short-term borrowing are often referred to as the *shadow banking system*. Just as traditional commercial banks invest in long-term loans and finance these loans by issuing short-term deposits, the shadow banking system invests in securities based on the same sorts of long-term loans (e.g., mortgages, or auto loans) and finances this investment by issuing short-term claims such as commercial paper or repo. So on the one hand, the shadow banking system can be said to be performing an economic function that looks much like that performed by the traditional banking system—it borrows on a short-term basis to fund longer-term loans; this is what is meant by maturity transformation.[3] On the other hand, it does not face the same set of regulations, since the institutions involved are generally not banks per se. And it does not benefit from the same safety net. For example, unlike bank deposits, the short-term financing used by shadow banks is not federally insured. Nor do shadow-banking players typically have the right to borrow from the Federal Reserve's discount window.

This is not to say that all investors who hold ABS finance these holdings with short-term borrowing. Anecdotally, pension funds and insurance companies tend to hold these securities on an unlevered basis, i.e., without borrowing against them. Remarkably,

however, little is known about the relative magnitudes. In particular, as far as I am aware, there are no good empirical estimates that speak to the following question: "what fraction of the AAA-rated ABS in a given loan category (e.g. credit cards) are owned by investors who finance their holdings of these securities primarily with short-term debt?" This is an important question, because as argued below, the heavy use of short-term debt financing by ABS investors is likely to be a key contributor to the fragility of the market.

The Forces That Drive Securitization

The essence of securitization is that loans originated by banks ultimately end up getting packaged up and sold off to a variety of other end investors. What are the economic forces that encourage banks to off-load their loans in this way, as opposed to keeping them on their books? There are two broad stories that one can tell.

The first, more benign story is based on the principle of risk-sharing. When banks sell their loans into the securitization market, the risks associated with these loans can be distributed across a wider range of end investors, including pension funds, endowments, insurance companies, and hedge funds, rather than being concentrated entirely on the banks themselves. This improved risk-sharing represents a real economic efficiency, and lowers the ultimate cost of making the loans. Moreover, as noted above, the pooling and tranching process, if done properly, makes the senior tranches of asset-backed-securities relatively easy to evaluate even for non-specialized investors who don't have much ability to judge the credit quality of the individual loans that underlie these securities. So it is particularly conducive to the goal of expanding the buyer base.

According to this story, there is a close parallel between the securitization of consumer loans and mortgages on the one hand, and the natural transition that many growing companies make when they reach a certain level of size and reputation and start shifting their borrowing away from an exclusive reliance on banks, and towards the corporate bond market. In either case, if the securities in question (either ABS, or corporate bonds) are such that they can be easily evaluated by a broader set of investors, it makes sense to tap into this broader market, as opposed to relying exclusively on the banking sector for financing.

While this wholesome-sounding story undoubtedly captures some of what drives the securitization market, it is also incomplete. It has become apparent in recent years that another important driver of securitization activity is regulatory arbitrage—a purposeful attempt by banks to avoid the rules which dictate how much capital they are required to hold. Particular attention in this regard has focused on the bank-sponsored SIVs and conduits mentioned above, vehicles which held various types of ABS and financed these holdings largely with short-term commercial paper. What is striking about these shadow-banking vehicles is that many of them operated with strong guarantees from their sponsoring banks. And indeed, when the SIVs and conduits got into trouble, the banks honored their guarantees, stepping up and absorbing the losses.

This runs directly counter to the spirit of the risk-sharing story, since rather than widely distributing the risks associated with the ABS they created, in this case the banks ultimately retained them, albeit in an opaque off-balance-sheet fashion. The most obvious alternative explanation is that the banks were exploiting a regulatory loophole: if they held the loans directly on their balance sheets, they faced a regulatory capital requirement on these loans, but if the loans were securitized and parked in an off-balance-sheet vehicle (albeit one with essentially full recourse to the banks in the event of trouble) the regulatory capital requirement was much reduced.[4]

While this particular loophole will no doubt be closed going forward, the more general concern remains. Securitization and the shadow banking system enable bank-like maturity-transformation activities—specifically, the pairing of long-term assets with a short-term funding structure—to take place out of the reach of traditional banking regulation. To the extent that bank regulation is burdensome, this creates a powerful pressure for banking assets to be securitized and to migrate out of the formal banking system. Absent some form of harmonization that puts shadow banks and traditional banks on more of an equal regulatory footing, this pressure is likely to intensify as capital requirements on banks are raised in the wake of the crisis. I return to this point below.

Fragility of the Securitization Market During the Crisis

Figure 1 illustrates the complete meltdown of the ABS market during the financial crisis, with issuance in both the traditional consumer (auto, credit-card and student loans)

and non-traditional (subprime) categories falling to essentially zero. The non-traditional market started to come apart first, in August of 2007, as the extent of losses on subprime loans began to become more apparent. The traditional consumer market held up better for a time, but then also disappeared in the wake of the failure of Lehman Brothers in September 2008.

While less spectacular from a quantitative perspective, the decline of the traditional consumer ABS market is in many ways the more challenging phenomenon to explain. The demise of the subprime-related ABS market can be thought of as the deflating of a classic bubble, in the sense that we now know that many of the loans involved were so poorly underwritten that they should never have been made in the first place. Thus at some level it is not surprising that, when market participants finally began to understand this point, the issuance of new subprime loans would dry up.

It is more surprising that ABS issuance related to auto, credit-card and student loans would be so hard hit, because there is much less reason to believe that these were bad loans to begin with—again, the superficial evidence in Figure 1 is not at all suggestive of a bubble in this part of the market. And indeed, *overall lending* in these categories did not completely vanish in the same way that it did in the subprime area; rather some fraction of this lending reverted back to being done in a non-securitized fashion by the banks, which suggests that the loans were still viewed as worth making. However, given the limited capacity of the banks, whose capital by this point was badly impaired, the inability to securitize and thereby offload some of their loans no doubt contributed to a sharp contraction in the overall supply of credit available to consumers.

So, if the underlying auto, credit-card and students loans were still worth making, what caused the market for ABS based on these loans to contract so sharply? A prominent emerging hypothesis is that there was effectively the analog of a widespread bank run on the shadow banking system.[5] Recall that many ABS investors finance their positions with short-term borrowing, either in the form of commercial paper or overnight repurchase agreements. In this sense, they are very much like banks, which finance long-term loans with short-term deposits. But unlike bank deposits, the short-term financing that supports the ABS market is not insured by the government. This makes the shadow banking system vulnerable to something that looks like a classic bank run from the days

before there was deposit insurance: as short-term lenders lose confidence and refuse to roll over their loans, investors in ABS are forced to liquidate some of their holdings to come up with cash. The liquidations in turn depress the price of these ABS via a "fire sale" effect. Moreover, as their prices fall and become more volatile, the ABS are viewed as less attractive collateral to short-term lenders, who therefore pull back even further, leading to another round of liquidations and price declines. Once underway, this vicious cycle is very difficult to arrest.

One concrete manifestation of the dramatic withdrawal of short-term lending to the ABS market comes from the behavior of what are called "haircuts" in repurchase agreements. When an investor borrows from the repo market to finance its holdings of ABS, it is required to post a margin, or downpayment. This is referred to as the haircut. Haircuts on ABS were extremely low prior to the crisis, on the order of 2%. What this means is that if, say a hedge fund wanted to acquire $1 billion of auto-linked ABS, it only needed to put up $20 million of its own capital as a downpayment. The other $980 million could be borrowed on an overnight basis in the repo market; in many cases the ultimate lenders of this short-term money were money-market mutual funds looking to find slightly higher-yielding short-term investments than, e.g., Treasury bills.

In the midst of the crisis, haircuts skyrocketed. Even haircuts on traditional consumer ABS—those not linked in any direct way to the housing and subprime problems—rose to over 50%.[6] From the perspective of the hedge fund holding $1 billion of auto-linked ABS, all of a sudden it could only borrow $500 million, and instead of having to post a $20 million downpayment, had to post a $500 million downpayment. If it did not have the cash on hand to do so, it would have been forced to liquidate its holdings. These forced liquidations, and the powerful impact they had on both the level and volatility of ABS prices, in turn justified the increased skittishness of the lenders in the repo market, since their protection was entirely predicated on the collateral value of the assets they were lending against.

The bank-run analogy offers what feels like a compelling account of the fragility of the securitization market. However, it would be premature to call it a fully empirically-validated explanation for why the market dried up so dramatically during the crisis. For one thing, as emphasized above, it is not known what fraction of ABS were

held by investors who financed themselves in a vulnerable bank-like way, i.e., largely with short-term debt. If the fraction turns out to have been, say, 40%, instead of 80%, this would obviously temper the force of the theory.

There is an alternative, more behavioral hypothesis for the fragility of the securitization market that does not rely on a predominance of short-term debt financing.[7] This alternative hypothesis begins with the observation that a large proportion of ABS tranches—both in the traditional and subprime sectors—were rated AAA. The AAA rating may have encouraged investors such as pension funds or insurance companies to think of these securities as essentially riskless, and therefore to treat them as being equivalent to Treasury bonds when constructing their portfolios. When the problems in the subprime area became apparent, this premise was utterly destroyed, and investors who were determined to allocate a fraction of their portfolios to safe assets realized that they had to dump their holdings of AAA-rated ABS, and buy actual Treasuries instead. Thus instead of a short-term-debt-driven bank run, we have what might be called a widespread buyer's strike. In this account, the mechanism of contagion from the subprime market to the traditional consumer ABS market is that the failures of the rating agencies with respect to subprime called into question their credibility more generally, so that any AAA-rated tranche of an ABS, be it linked to subprime or credit cards, was no longer considered to be a virtually riskless asset.

Of course, the two theories are not mutually exclusive, and may interact in interesting ways. For example, what starts out as simply a strike on the part of unlevered buyers may evolve into a run-like phenomenon, since the buyer's strike puts downward pressure on ABS prices, making the position of short-term lenders more precarious, and thereby encouraging these lenders to withdraw from the market.

Policy Implications

To frame the policy issues with respect to securitization and the shadow banking system, it is useful to begin by emphasizing three key points. First, we are almost certainly heading in the direction of imposing significantly higher capital requirements on large banks. Second, while this is undoubtedly a valuable and much-needed reform, and one that holds the promise of making the banking sector itself more robust in future

episodes of financial volatility, it will also have the effect of encouraging more credit-creation activity to migrate away from the banks, and toward the shadow-banking sector, in an effort to evade the burdens associated with more stringent regulation. And third, we have seen that the shadow-banking sector can be a powerful source of fragility in its own right, one that can lead to damaging disruptions in the flow of credit to households and businesses. Thus it would be a mistake to go down a policy path that is heavily focused on insulating our large banks, while at the same time paying insufficient attention to potential vulnerabilities in the rest of the financial system. Rather, the goal should be a balanced approach that addresses all elements of the system in an integrated fashion.

What concrete steps might be taken in this regard? Here are three specific ideas for regulating the securitization and shadow banking markets. To be transparent about my own prejudices, I will label these three ideas *the good, the bad, and the maybe.*

1. *The good: regulation of haircuts in the ABS market.* To mitigate the incentives for regulatory evasion, and to help reduce the fragility of credit creation no matter where it takes place, a systematic effort must be made to impose similar capital standards on a given type of credit exposure, irrespective of who winds up ultimately holding the exposure—be it a bank, a broker-dealer firm, a hedge fund, or anybody else. This is not an easy task, but one tool that would help is broad-based regulation of haircuts (i.e., minimum margin requirements) on asset-backed securities.[8]

Consider the case where the exposure in question is a consumer loan. If this loan is made by a bank, it will be subject to a capital requirement; that is, the bank will have to put up some amount of equity against the loan, rather than borrowing all of the money. Now suppose instead that the loan is securitized by the bank, and becomes part of a consumer ABS whose tranches are distributed to various types of investors. The regulation I have in mind here would stipulate that whoever holds a tranche of the ABS would be required to post a minimum downpayment against that tranche—with the value of the haircut depending on the seniority of the tranche, the quality of the underlying collateral, and so forth.

For example, before the current crisis, market-determined haircuts on AAA-rated consumer ABS tranches were very low, in the neighborhood of 2%. With no further

regulation, they are likely to return to these levels as markets re-normalize. However, the new regulation might instead impose a minimum haircut requirement on AAA-rated consumer ABS of at least 10%, independent of market conditions. That is, anybody who invested in such a security would be required to post and subsequently maintain a 10% margin at all times. Such a requirement is nothing conceptually new, and should not be difficult to enforce; indeed it is closely analogous to the initial and maintenance margin requirements that are currently applicable to investors in common stocks.

If these haircut requirements are well-structured, they would have two important benefits. First, they could go a long way towards achieving harmonization across organizational forms, in that there would no longer be an obvious regulation-avoidance motive for moving the consumer loan off the balance sheet of the bank and into the shadow-banking sector. This is especially important as we move towards significant increases in the capital requirements imposed on banks. The goals of these higher bank-capital requirements are likely to be partially frustrated if they drive significant amounts of activity outside of the banking system.

Second, for that portion of credit-creation activity that does end up residing in the shadow-banking sector, haircut regulation can help to dampen the bank-run-like crisis dynamics described above. The problem is that if haircuts start out at 2% before the crisis, and then jump to over 50% during the crisis, this creates a powerful forced-selling pressure on the owners of the ABS. If instead the haircuts are set at a more prudent value before the crisis—again, say 10%—so that investors are required to put up more of their own cash at the outset, this forced-selling mechanism, and the vicious spiral it unleashes, might be substantially attenuated.

2. *The bad: extension of the federal safety net to shadow banks.* Some observers have taken the analogy between the traditional commercial banking sector and the shadow banking system one step further, and have argued that, in order to prevent run-like panics in the latter, it should be covered by the same federal safety net as the former. This would entail giving shadow-bank entities access to the Federal Reserve's discount window, as well as possibly insuring some of their short-term debts. Thus when a specialized investment vehicle is set up to buy a portfolio of ABS financed largely with

short-term commercial paper borrowing, the commercial paper issued by the investment vehicle might be explicitly federally insured, much as some bank deposits are today. So instead of trying to lean against the private market's propensity to finance ABS with large amounts of short-term debt—as the above-described haircut regulation would do—this alternative approach amounts to embracing the use of such short-term financing, and trying to use government insurance to make the world safer in its presence.

What makes this policy unattractive is the moral hazard that it invites, as private actors seek to exploit government-provided insurance by using it to finance riskier-than-expected activities. This is particularly problematic when the insurance is attached to the kinds of highly-engineered financial products that were held by some shadow-banking investors prior to the current crisis—products for which the risks are often not easily understood or accurately measured ahead of time. For example, one can imagine a government insurer trying to come up with a formula for risk-based pricing of the insurance it provides to a specialized investment vehicle, in an effort to deter excessive risk-taking. But should we expect any such formula to do better than those of the rating agencies, who so spectacularly misjudged the risks embedded in complex ABS based on subprime mortgages? Indeed, one can argue that the mind-bending complexity of some of these structures emerged precisely as a means of gaming the rating-agency formulas. Thus, although a government insurance agency would not face the same overt conflicts of interest as the rating agencies, it seems reasonable to worry about how it would fare when pitted against Wall Street's best financial engineers.

With this bit of pessimism in mind, I would argue that in order to be willing to entertain the idea of expanding the safety net, one would have to believe that the short-term debt claims created by the shadow-banking sector are of substantial social value—so much so that sustaining them with moral-hazard-prone insurance, rather than trying to constrain them with haircut regulation, is a first-order imperative. And at this point, I don't think that we have nearly enough empirical evidence to meet this burden of proof. Hence I would be strongly inclined to steer clear of any expansion of the safety net.

3. *The maybe: limiting the creation of "pseudo-riskless" securities.* As discussed above, an alternative theory for the fragility of the ABS market during the crisis is that,

even absent short-term debt financing of ABS positions, the proliferation of so many "pseudo-riskless" securities is inherently a dangerous activity. By pseudo-riskless, I mean AAA-rated securities that appear so safe in good times that investors are lulled into a sense of complacency whereby they treat these securities as being equivalent to truly riskless Treasuries—only to discover in a crisis that this was a false equivalence, which leads them to panic and dump their holdings of the AAA-rated securities.[9]

If one takes this point of view, it is tempting to think about ways to constrain the production of those ABS tranches that can be represented to investors as being near-riskless. One way to do this might be to require the credit-rating agencies to use a coarser set of ratings when evaluating ABS than when they evaluate corporate bond issues. For example, instead of a finely-tuned scale that goes from AAA to AA+, to AA, to AA-, to A+, etc., all the way down to CCC, the ratings for ABS might be restricted to one of three broad buckets: A, B or C.[10] While this admittedly has a bit of the feel of deploying the language police, it might prevent any ABS tranche from being thought of as near-riskless, since even the highest rating category would now encompass securities with a wide range of credit qualities.

An alternative approach would be to leave the current ratings categories in place, but to impose on the creators of any ABS an upper limit on the amount of highly-rated securities that they could manufacture from any given underlying pool of loans. For example, one rule might be that only a maximum of 50% of the dollar value of tranches coming from any pool of consumer loans could ever seek a rating of AA or higher; all the other, subordinate tranches would have to have be targeted at lower ratings categories.

I put this last set of ideas in the "maybe" category because I view them as interesting and deserving of further thought, but I am not at this point confident that their virtues outweigh their potential for unintended consequences. On the one hand, they highlight the logical implications of taking a more behavioral perspective on the ABS market's fragility—of positing a world in which investors are overly prone to seek out pseudo-riskless investments, and in which financial innovators actively try to exploit this tendency. On the other hand, the specific proposals I have sketched raise some fairly obvious flags as well. For example, restricting the vocabulary available to the rating agencies may have meaningful effects in the short run, but over time it is easy to imagine

industry conventions evolving so as to work around any such restrictions. If so, it would be a mistake to place much long-run faith in this kind of approach.

In sum, the overarching goal of financial reform must be not just to fortify a set of large institutions, but rather to reduce the fragility of our *entire system* of credit creation. This system involves a complicated interplay between banks and non-banks, and between traditional forms of lending and securitization. Thus far, more effort has been devoted to the banking side of the equation. This is perhaps not surprising given the accumulated expertise of many of the regulators involved in the reform process. But the difficult issues associated with securitization and the shadow banking system demand equal attention.

Endnotes

[1] To be more precise, the riskier lower-rated tranches of subprime securitizations were themselves used as the raw material (in place of the original mortgage loans) to create second and third-generation *re-securitizations*. Many of the biggest problems in the crisis arose from the fact that large fractions of these re-securitized vehicles were also rated AAA, in spite of the dubious collateral supporting them. This is where the most extreme alchemy can be said to have taken place. For a discussion, see Joshua Coval, Jakub Jurek, and Erik Stafford (2009), "The Economics of Structured Finance," *Journal of Economic Perspectives*, 23: 3-25.

[2] The data in the figure come from Thompson SDC. It should be noted that while the "non-traditional" category includes securitizations based on subprime mortgage loans, it does not include securitizations based on prime mortgage loans, such as mortgage-backed securities guaranteed by the government-sponsored enterprises Fannie Mae and Freddie Mac. I am grateful to Sam Hanson, who put together the data and shared it with me.

[3] See Gary Gorton and Andrew Metrick (2009), "Securitized Banking and the Run on Repo," NBER Working Paper 15223.

[4] For a detailed study of this phenomenon, see Viral Acharya, Phillip Schnabl, and Gustavo Suarez (2010), "Securitization Without Risk Transfer," NBER Working Paper 15730.

[5] The bank-run hypothesis is articulated in Gorton and Metrick, as well as in Daniel Covitz, Nellie Liang, and Gustavo Suarez (2009), "The Anatomy of a Financial Crisis: The Evolution of Panic-Driven Runs in the Asset-Backed Commercial Paper Market," Working Paper, Board of Governors of the Federal Reserve.

[6] For more detail on the evolution of repo-market haircuts during the crisis period, see Gorton and Metrick.

[7] A version of this hypothesis is presented in Nicola Gennaioli, Andrei Shleifer and Robert Vishny (2010), "Financial Innovation and Financial Fragility," Harvard University Working Paper.

[8] Such haircut regulation is discussed in John Geanakoplos (2010), "The Leverage Cycle," Cowles Foundation Discussion Paper 1715R, and in Jeremy Stein (2010), "Monetary Policy as Financial-Stability Regulation," Harvard University Working Paper.

[9] Again, see Gennaioli, Shleifer and Vishny for a fuller elaboration of this argument.

[10] This scale is used by both Standard and Poor's and Fitch. The other major rating agency, Moody's, has a somewhat different alphanumeric convention, albeit with similarly fine-grained categories: Aaa, Aa1, Aa2, Aa3, A1, A2, etc.

Figure 1
Quarterly Issuance of Asset-Backed Securities, 2000-2009