Economic Policy Paper 10-5
Federal Reserve Bank of Minneapolis

Damage Control?
Analyzing Policies to Repair Credit Markets

October 2010

V. V. Chari
Ali Shourideh
Ariel Zetlin-Jones

University of Minnesota
Federal Reserve Bank of Minneapolis

ABSTRACT
During the recent financial crisis, the volume of new loan issuances dropped sharply in the secondary loan market. U.S. policymakers responded with a variety of proposals aimed at restoring normal market function, including purchase of assets at above-market prices and reducing the costs of holding loans to maturity.

We develop a model of the secondary loan market to analyze the effectiveness of these proposals. In this model, the market's primary function is to allocate loans to originators or secondary owners that have a comparative advantage in managing them. Because loan originators are better informed than potential purchasers about their loan quality, the markets suffer from adverse selection.

The model finds that interaction of adverse selection and reputational incentives creates fragile economic outcomes. In particular, it generates sudden collapses in new issuance volume due to small changes in collateral value similar to the fluctuations and credit inefficiencies seen empirically during the financial crisis.

We use the model to analyze programs that were proposed and in some cases implemented by policymakers to address loan market dysfunction and find that they do little to resolve the market's inherent adverse selection problem. We conclude that, unfortunately, these policies were (or would have been) most likely ineffective, and possibly even counterproductive.

Damage Control?

Analyzing Policies to Repair Credit Markets[1]

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Introduction

The "secondary loan" market was the focus of much attention during the recent financial crisis. This market—where companies that originate loans sell them to other firms, often packaged as asset-backed securities—appeared to freeze up at the start of the crisis. Potential buyers seemed to lose confidence in the quality of the underlying assets being offered by loan originators. In short, the market was broken.

Policymakers launched several initiatives aimed at unfreezing the market, most prominently the Term Asset-Backed Securities Loan Facility (TALF); several other policies were proposed but not implemented. In retrospect, the advocates of these policies have suggested that they were largely successful in restoring health to damaged secondary loan markets.

In this paper, we analyze the ability of such policies to solve the secondary loan market problems and find that, on the contrary, they *do not* appear to have been responsible for resolving the underlying dysfunction. While these credit markets are unquestionably operating better now than previously, the reasons for their improved function remain unproven. We hint at policies with greater potential for addressing future episodes of such dysfunction, should they occur, but stress that these policies remain untested in both theory and practice.

The paper begins with a brief description of the market situation and policy response. We then lay out some of the economic theory that illuminates dysfunction in credit markets, highlighting two concepts in particular: adverse selection and reputational incentives.

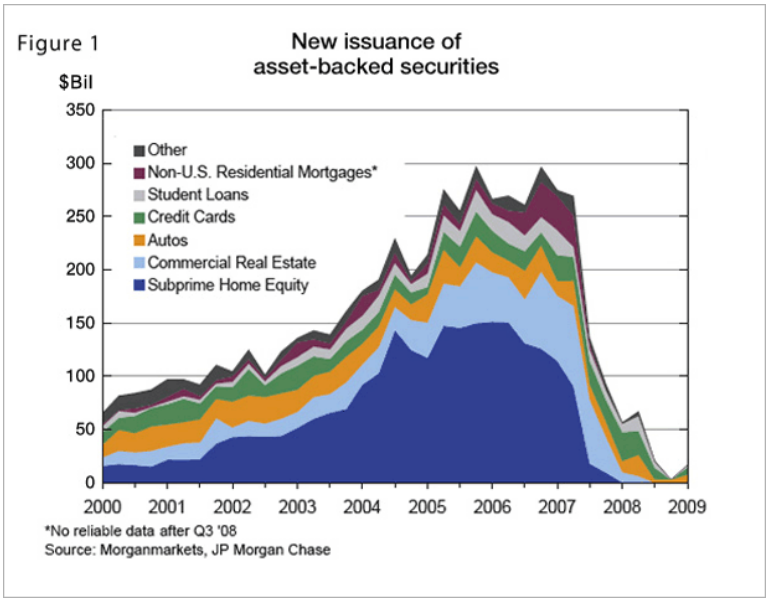
We then proceed with a short description of our economic model based on these concepts, followed by policy exercises that use this model to analyze whether the programs proposed, and in some cases initiated, could actually improve function in secondary loan markets.

We conclude that, unfortunately, these policies were (or would have been) most likely ineffective, and possibly even counterproductive, and we suggest options that may be more successful in addressing future market crises of this sort. Such considerations are not mere academic concerns. This analysis has direct bearing on proposals that the newly enacted Financial Stability Oversight Council may consider in designing regulations for the so-called shadow banking system. It also should help policymakers in addressing future financial crises of a similar sort, if and when they occur.

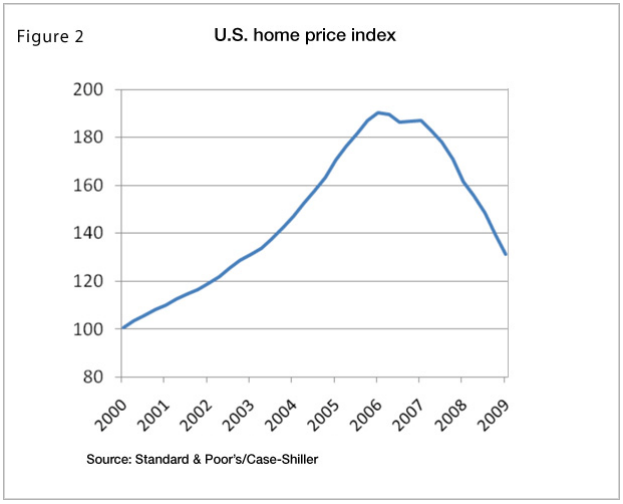
[1] This policy paper is based on: Chari, V. V., Ali Shourideh and Ariel Zetlin-Jones. 2010. Adverse Selection, Reputation and Sudden Collapses in Secondary Loan Markets. NBER Working Paper 16080.

Failing markets

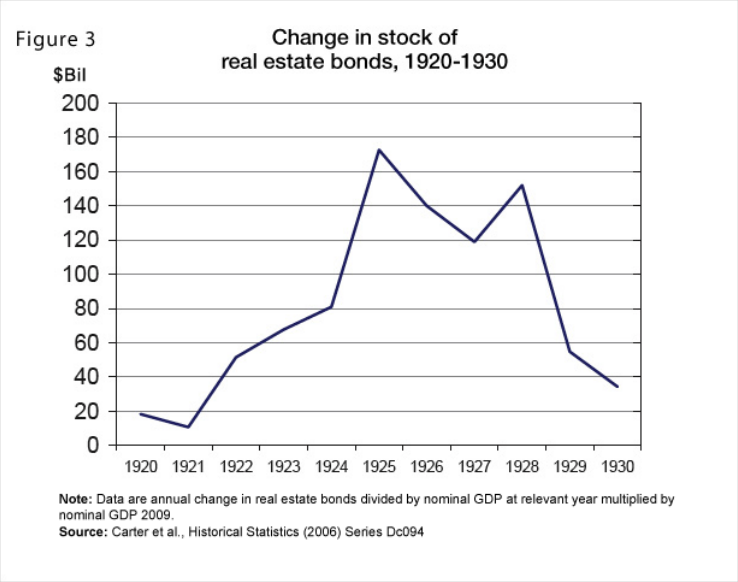
In the fall of 2007, the total volume of new issuances of asset-backed securities fell abruptly after an almost uninterrupted climb since early 2000; by the fourth quarter of 2008, new issuances of ABS had virtually halted. Figure 1 depicts this trend displaying the volume of new issuances of securities backed by assets for various categories, from student loans to subprime home equity, between 2000 and 2009. The consistent rise for almost all ABS categories continued from first quarter 2000 to fourth quarter 2006, climbing from about $50 billion to roughly $300 billion over that span. By third quarter 2007, the total fell to $100 billion, and then to near zero by the end of 2008. (Similar patterns, not illustrated here, have been documented for syndicated loans—that is, very large loans arranged jointly by several lenders for a single borrower.)



This collapse in new issuance volume coincided with a reduction in collateral values. The S&P/Case-Shiller U.S. home price index provides one clear example of this, with steady growth until late 2006 and abrupt decline throughout 2007. (See Figure 2 below.)



Other economists have suggested that a similar boom-bust cycle existed in the United States in the 1920s, and this is seen in Figure 3 below, derived from data on annual changes in publicly traded real estate bonds issued against single large commercial mortgages or pools of commercial and real estate mortgages.[2] Again, the trend is a steady climb from zero in 1919 to about $145 billion each year of the mid-1920s, followed by a collapse to roughly $50 billion issued in 1929. These large changes in stock of real estate bonds were likely associated with similar changes in the volume of new issuances.



The 2007-08 collapse in the market for such asset-backed securities was a cause for great concern among policymakers, who perceived it as an indication that the secondary loan market had become extremely inefficient. “Secondary markets have become highly illiquid, and are trading at prices below where they would be in normally functioning markets,” declared a U.S. Treasury Department fact sheet on March 23, 2009. Also in March 2009, the Federal Reserve Bank of New York asserted that “[n]ontraditional investors such as hedge funds, which may otherwise be willing to invest in [asset-backed] securities, have been unable to obtain funding from banks and dealers because of a general reluctance to lend.”

Policy response

These Treasury and Federal Reserve statements were drawn from documents concerning the proposed and/or adopted policy responses to the perceived market inefficiency. The Treasury Department proposed a Public-Private Partnership for purchasing assets held by distressed financial institutions, but this partnership was never implemented. The New York Fed proposed the TALF, which was quickly enacted.

[2] The data displayed in Figure 3 are scaled for comparability to recent ABS-issuance trends: Annual change in real estate bonds from the 1920s is divided by nominal GDP in each year, multiplied by nominal 2009 GDP.

Under TALF, the New York Fed was authorized to lend up to $200 billion on a nonrecourse basis (meaning that the lender can recover no more than the collateral pledged) to holders of AAA-rated ABS backed by new or recently originated consumer and small business loans. The intention was to increase credit availability and support economic activity by facilitating renewed issuances of consumer and business ABS at normal interest rate spreads. The New York Fed noted that as the ABS market came to a near-complete halt in October 2008, "interest rate spreads on AAA-rated tranches of ABS rose to levels well outside the range of historical experience, reflecting unusually high risk premiums."[3]

To the extent that the interest rate charged by the Federal Reserve under TALF was below market interest rates, this program, which terminated in June 2010, was effectively a subsidy for the private purchase of assets in the secondary loan market. To the extent that the Fed charged market interest rates, it is not clear why it could have been effective. These observations will be evaluated later in this paper.

Also, of course, the Federal Reserve System rapidly lowered its target for the federal funds rate from 5.25 percent in the summer of 2007 to 2 percent by April 2008, and it now stands between 0 and 0.25 percent. The Fed also engaged in massive purchases of assets, a policy referred to as "quantitative easing," which eventually lowered market interest rates in many related credit markets.

The Fed's assessment

Credit markets, including the secondary loan market, have indeed improved since their nadir in the fall of 2008, but the question of whether this improved function was (or could have been) due to implemented (or proposed) policies has not been closely scrutinized. The Federal Reserve, for its part, *does* believe that TALF was effective in restoring efficiency and normal levels of liquidity to dysfunctional markets.

"Overall, the TALF performed impressively," said Brian Sack of the New York Fed in a June 2010 speech.[4] "The program contributed to a substantial improvement in conditions in the

[3] Federal Reserve Bank of New York. 2010. Term Asset-Backed Securities Loan Facility: Frequently Asked Questions. July 21. http://www.newyorkfed.org/markets/talf_faq.html

[4] Sack, Brian P. 2010. Reflections on the TALF and the Federal Reserve's Role as Liquidity Provider. Remarks at the New York Association for Business Economics. New York City, June 9. http://www.newyorkfed.org/newsevents/speeches/2010/sac100609.html Sack elaborated: "By providing liquidity and a backstop to limit losses to investors, the TALF contributed importantly to the revival of securitized credit markets. Secondary spreads narrowed significantly, and volatility moderated. Moreover, the improvements in the secondary market helped re-start the new-issue market. Issuance of non-mortgage asset-backed securities jumped to $35 billion in the first three months of TALF lending in 2009, after having slowed to less than $1 billion per month in late 2008."

See also: Robinson, Kenneth. 2009. TALF: Jump-Starting the Securitization Markets. *Economic Letter—Insights from the Federal Reserve Bank of Dallas* 4 (August), and Dudley, William C. 2009. A Preliminary Assessment of the TALF. Remarks at the Securities Industry and Financial Markets Association and Pension Real Estate Association's Public-Private Investment Program Summit. New York City, June 4.

securitized credit market, facilitating an increase in the availability of credit to households and businesses."

Sack acknowledged that other factors played a role in the increased efficiency of secondary loan markets: "To be sure, improvements in funding markets broadly and in the macroeconomic outlook during the course of the program clearly influenced the recovery of securitized credit markets." Nonetheless, he asserts that TALF "has been widely credited with helping to jumpstart those markets."

Theory on credit markets

Relying on anecdotal evidence is insufficient for rigorous policy evaluation. To better assess policy effectiveness, we must know what underlies function and dysfunction in credit markets; to do so, we developed a mathematical model based on economic theory. Economic research on credit markets generally, and asset-backed markets in particular, has developed rapidly in the wake of the recent financial crisis. But this leading-edge research is based on long-understood principles, including those of adverse selection and reputational incentives. Our model builds directly on these concepts, so a brief review of each is in order.

Adverse selection is the idea that in markets where buyers and sellers have different levels of (or asymmetric) information, some sellers—often those with goods of the highest quality—may exit the market. Much economic theory on this concept was sparked by economist George Akerlof's celebrated 1970 paper, "The Market for Lemons," which illustrated the idea with a used-car market.[5] Potential sellers of high-quality used cars are likely to leave the used-car market, he showed, because if buyers are unable to judge quality, they will pay no more than an average market price. In the absence of a mechanism to better inform buyers about quality or guarantee their purchases (through "lemon laws"), bad cars will push out better cars, and markets will collapse.

Adverse selection is highly germane to secondary loan markets because loan originators (those who initiate the mortgage or other loan contract with the borrower) know the quality of the assets underlying the loan (the home's market value, the borrower's creditworthiness) better than the potential secondary buyer. Indeed, Akerlof's article used credit markets as an additional example to illustrate the theory. There is therefore considerable potential for high-quality loans to exit the market, leaving behind only poor credit risks and bad underlying assets.

Since the mid-1980s, economists have studied adverse selection in asset markets and more recently in markets where assets are securitized. In our analysis, we assume that buyers of secondary loans have less information about loan quality, and there is substantial scholarship supporting this assumption. For example, a recent study by Downing et al. (2009) found that

[5] Akerlof, George A. 1970. The Market for "Lemons": Quality Uncertainty and the Market Mechanism. *Quarterly Journal of Economics* 84 (August), pp. 488-500.

loans which banks held on their own balance sheets yielded more on average than those which they securitized and sold, indicating that they kept the high-quality loans and sold the "lemons."[6]

Reputational incentive is the second central concept behind our analysis of secondary loan markets. Akerlof pointed out that certain practices and institutions have developed to counteract the effects of quality uncertainty: Guarantees, brand names, store chains and licenses certifying proficiency are examples. Each is a means of creating trust or confidence in quality of the good or service being sold, and might therefore defuse concerns about true value and adverse selection. Each, in short, seeks to build reputation.

In loan markets, trust is paramount, so those who seek to borrow or, by extension, to resell loans they've originated, have a strong incentive to establish a reputation of trustworthiness. These reputational incentives have been studied in a number of economic settings, from central banks to chain stores to predatory monopolists. In a 1989 analysis of debt markets, Diamond analyzed the reputational incentives that borrowers face in the markets where adverse selection is a problem.[7] "The value of a good reputation rises over time, as does the cost of a default," he argued. "If there is sufficient adverse selection, then a typical equilibrium path for a borrower … is to choose risky projects when 'young' and, if able to survive long enough without a default, to switch to safe projects from that point forward."

Generally speaking, the economic literature suggests that the existence of incentives to build a good reputation improves economic welfare—that is, equilibrium outcomes are better in models *with* reputational incentives than in models *without* them. But more recent work has suggested that in some settings, reputational incentives can result in worse outcomes. If participation in a market is optional for short-run players and if actions by long-run players that encourage participation by short-run players can be interpreted as a signal that the long-run player is "bad," then reputational incentives have bad economic consequences.

Like much game theory, that sounds quite abstract. To make it more concrete, the economists who have done this research use an example, as did Akerlof, from the automotive world.[8] Consider car mechanics who have a choice of whether to replace a car's engine (and charge the customer accordingly) *only* if it's necessary, or to replace it *regardless* of whether the engine is faulty. If customers can only gauge mechanic quality by whether their car runs well after the visit to the mechanic's shop, and bad mechanics increase profits by charging for repairs they don't perform, then even good mechanics have a pecuniary incentive to become bad—that is, to charge for unneeded repairs. So, reputational incentives, interacting with adverse selection, can lead to bad outcomes.

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[6] Downing, Chris, Dwight Jaffee and Nancy Wallace. 2009. Is the Market for Mortgage-Backed Securities a Market for Lemons? *Review of Financial Studies* 22 (7), 2257.

[7] Diamond, Douglas W. 1989. Reputation Acquisition in Debt Markets. *Journal of Political Economy* 97 (August), pp. 828-62.

[8] Ely, Jeffrey, and Juuso Välimäki. 2003. Bad Reputation." *Quarterly Journal of Economics* 118 (3), 785-814, and Ely, Jeffrey, Drew Fudenberg and David Levine 2008. When Is Reputation Bad? *Games and Economic Behavior* 63 (2), 498-526.

A model of secondary loan markets

The same, we found, is quite true in secondary loan markets: Our analysis demonstrates that reputational incentives can lead to poor outcomes in these markets when adverse selection is present. In particular, *our model of the secondary loan market demonstrates how adverse selection and reputation interact to yield abrupt collapses in loan volume, with increased inefficiency.* This "freeze" in the secondary loan market is precisely what policymakers perceived during the U.S. financial crisis of 2007-09 and sought to address with a variety of initiatives.

We begin with a very basic model—we call it our benchmark—which is *static:* There is just one round of transactions in the secondary loan market, rather than a series carried out over time. There are three types of actors or agents in this model: a loan originator (referred to as a "bank" in the following discussion), a set of buyers and a set of lenders. Banks have one loan apiece (a home mortgage, for example, or an asset-backed security). A bank with a high-risk loan is considered a low-quality bank; those with low-risk loans are high-quality banks. Banks are also sorted by their expense levels as either high-cost or low-cost.

Buyers offer to buy the banks' loans on the secondary market, and the primary decision of each bank is whether to hold onto its loan or to sell it to the buyer who offers the highest price. Lenders provide financing to banks that decide to hold onto their loans, receiving principal and interest at the going rate. In deciding which loan to purchase, buyers consider a bank's reputation, which is the lender's belief about the probability that the bank is high-quality.

Exploring the mathematical properties of this static benchmark model, we find that it produces an efficient allocation of loans. That is to say, with a single round of transactions between banks and buyers, loans will be allocated with complete economic efficiency to those parties with the highest comparative advantage. If a bank is a low-cost bank, it will hold its loan; if it is a high-cost bank, it will sell its loan to the highest bidder.

A dynamic model

But the situation becomes more complex—and interesting—when we move to a more realistic *dynamic* scenario in which banks, buyers and lenders are able to evaluate one another's behavior in previous transactions before deciding what to do in the next round of transactions. This opens the door to concerns about reputation; because of asymmetric information—banks know more about the risk level of their loan than do potential buyers—there is potential for adverse selection. Banks with high-quality loans are more likely to hold rather than sell them, leaving a market full of low-quality (lemon) loans. But knowing that high-quality banks tend to stay out of the market, a bank with a low-quality loan might act strategically by holding onto its loan in one round to create a (false) reputation that it is a high-quality bank.

We find that unlike the static model, which resulted in a clear and unequivocally efficient outcome, this dynamic model with adverse selection and reputational incentives generates "fragile" outcomes, in two senses. The first type of fragility is that it isn't immediately clear whether reputation concerns will lead to good or bad results—in the jargon of economists, the model has "multiple equilibria"—so both outcomes are possible. The model's second fragility is

that small drops in collateral values can generate large and abrupt collapses in new issuances on the secondary loan market, collapses associated with increased inefficiency.

Thus, our dynamic model—with reputation concerns and also the adverse selection that occurs with asymmetric information—ends up providing a very good testing ground for real world policies that seek to mitigate dysfunction in secondary loan markets.

A deeper look at fragility

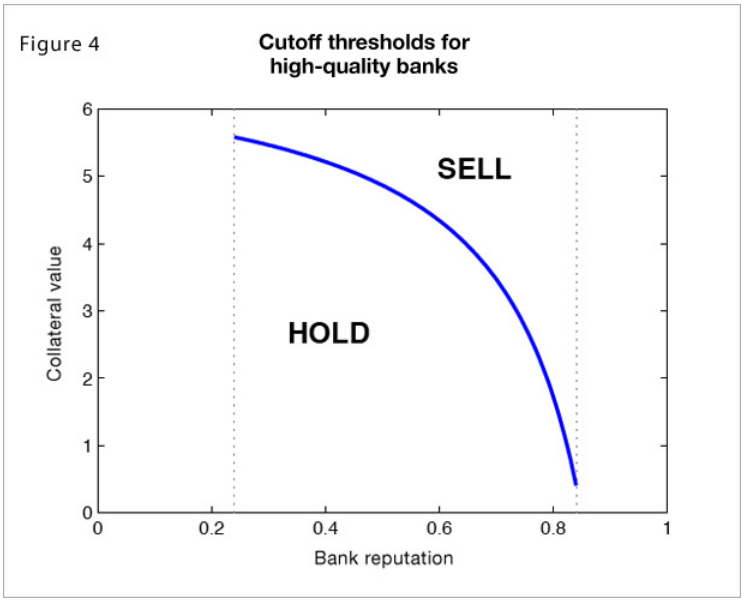
Concerns about reputation arise with repeated transactions because actors in the model economy can look to the past and make judgments about other actors before deciding whether to engage in another transaction, just as a customer would return to a store if previous purchases at that store seemed reasonably priced and of high quality. Knowing this, the store will try to offer products of good quality at reasonable prices, or at least try to convey that impression. In other words, it will attempt to build its reputation.

Similarly, a bank in our model will—in deciding whether to sell or hold its loan—bear in mind the effect of its action on its reputation. But our model demonstrates that it isn't clear cut whether that reputational concern will result in good outcomes or bad. The dynamic model produces two mathematically correct solutions—equilibria—one good and one bad.

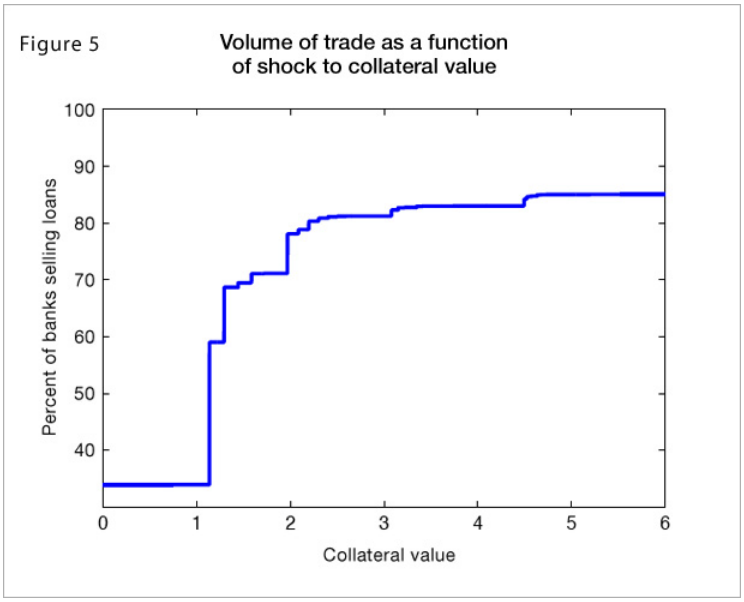
In the good outcome that we call the "positive reputational equilibrium," high-quality loan originators have incentives to *sell* their loans at a current loss because they want to improve their reputation so that they can obtain higher prices in the future. In the bad outcome, the "negative reputational equilibrium," loan originators who sell are perceived to have low-quality loans. That perception convinces banks with high-quality loans to *hold* onto them even if it isn't profitable to do so. In this second outcome, then, the volume of loan issuances is smaller than in the good outcome, and (under specified conditions) market efficiency suffers.

The second type of fragility in this model economy is superficially similar to the first: A small change in a fundamental economic value—in this case, loan collateral—can generate a dramatic change in an aggregate market value: an abrupt collapse in loan issuances on the secondary market. This result is, of course, remarkably akin to the real world outcome during the recent financial crisis, and that helps form the base for our policy analysis.

The model's ability to generate the latter type of fragility can be seen in the following two graphs. The first graph below (Figure 4) depicts the sell/hold decision threshold for high-quality banks (those with low-risk loans). According to the model's mathematics, the curve represents the cut-off line for a bank in judging whether to sell a loan, depending on the market value of its collateral. At a collateral value of 4, banks with reputation levels below roughly 0.65 hold their loans and those with higher reputations sell. This means that if collateral values fall from 5 to 4, a large segment of banks—those with reputation levels roughly between 0.4 and 0.65, will decide to withdraw from the secondary loan market. Put otherwise, the graph illustrates that as collateral value falls, the adverse selection problem worsens, and only the lowest-quality banks (with highest-risk loans) remain in the market.



The second graph (Figure 5) displays the volume of lending trade, the fraction of all banks that sell their loans, as a function of collateral value. This shows that as the market value of a loan's collateral (its default value) decreases from 1.3 to 1.1, the volume of trade collapses by half, from 60 percent of banks selling their loans on the secondary market to just 30 percent. (We also found that this second type of fragility doesn't depend on whether the market is in the positive or negative reputational equilibrium. The secondary loan market can collapse regardless.)



Was policy effective?

While building this complex model of the secondary loan market is rewarding from a research perspective, contributing to the academic literature on both reputation concerns and financial market behavior, we believe it also has substantial value in allowing for evaluation of proposed

and implemented policies that sought to address dysfunction in secondary loan markets. Rather than examining the details of these specific programs, we analyze two general policy types:

- Policies by which the government would purchase asset-backed securities at above-market value (similar to the TALF and to the Public-Private Partnership plan that was not enacted).

- Policies that decrease the costs of loans held to maturity (which include changes in the fed funds target rate and increased deposit insurance levels from the Federal Deposit Insurance Corp.).

Buying toxic ABS
When analyzed with our dynamic adverse selection model, policies under which the government would offer to purchase so-called toxic assets at prices above current market value would in all cases involve transfers to banks and imply that the government will make negative profits.

If prices offered to banks are below the level that prevails in our positive reputational equilibrium, market outcomes will not significantly change. Our model shows that banks with high-quality loans would enjoy no reputational gains by selling to government and would continue to stay out of the secondary market. Only banks with low-quality loans would sell to government, with no net benefit to the economy.

If, on the other hand, prices offered by government were sufficiently high, the purchase policy would leverage reputational incentives and could overcome adverse selection problems. Still, the government would, through its transfers to banks, lose money in this effort to unfreeze the market.

Lowering rates
We then look at policies of lowering interest rates so as to decrease costs of holding loans to maturity. If the government reduces current interest rates and leaves future rates unchanged, our model shows, the policy will aggravate the lemons problem in secondary loan markets by encouraging banks with high-quality loans to retain rather than sell their loans. If, on the other hand, the government leaves current rates unchanged but commits to reducing future rates, it can improve current allocations but will make later allocations less efficient by increasing banks' incentives for holding onto their loans. And, of course, in the future the government would face strong incentives not to hold to its earlier commitment to reduce rates and thereby increase allocation inefficiency.

Other policy options
An alternative policy that we analyze with the model is *forced asset sales*. Under this policy (not proposed), government would randomly select banks and require them to sell their loans. The policy would by force generate a pool of loans in secondary markets, just as requiring home mortgage owners to purchase home insurance ensures a wide risk pool. However, this standard solution to adverse selection problems would come at a cost of loan misallocation: In some instances, low-cost banks would be forced to sell their loans, reducing the market's overall efficiency in terms of comparative advantage.

Another alternative would be for the government to commit to purchasing assets in the future at prices contingent on signals about loan value. Our model shows that such a policy would support the positive reputational equilibrium, meaning that reputation concerns would overcome adverse selection problems and result in efficient market allocations. The feasibility of such a policy deserves further research, but would necessitate a model in which governments can commit but private parties cannot.

Conclusion

The volume of new loan issuances dropped sharply in the secondary loan market during the recent financial crisis, and U.S. policymakers responded with a variety of proposals aimed at restoring normal market function, including purchase of assets at above-market prices and reducing the costs of holding loans to maturity.

We have built a model of the secondary loan market in which its primary economic function is to allocate loans to those institutions—originators or secondary owners—that have a comparative advantage in holding and managing them. Because loan originators are better informed than potential purchasers about their loan quality, the markets suffer from adverse selection. We use a dynamic adverse selection model of the secondary loan market to determine whether reputational incentives improve or aggravate market outcomes.

Our model has fragile outcomes in the sense that it generates sudden collapses in new issuance volume due to small changes in collateral value. Such collateral drops and market collapses, associated with increased market inefficiency, resemble those seen empirically in late 2007 during the U.S. financial crisis.

We therefore use the model to analyze programs that were proposed and in some cases implemented by policymakers to address loan market dysfunction and find that they do little to resolve the market's inherent adverse selection problem. We conclude that, unfortunately, these policies were (or would have been) most likely ineffective, and possibly even counterproductive, and we suggest options that may be more successful in addressing future market crises of this sort. Such findings have direct bearing on proposals now under consideration vis-à-vis regulatory design for segments of the financial industry that are currently subject to little oversight and regulation.