

Risk Analysis of Consumer Credit: Some Lessons Learned from the Financial Crisis
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William W. Lang¹

Welcome to this conference on Regulating Consumer Credit jointly sponsored by the *Journal of Economics and Business* and the Supervision, Regulation and Credit department of the Federal Reserve Bank of Philadelphia.

In my remarks this morning, I want to touch on the topic of quantitative risk analytics and their role in mitigating risks in the financial system. To elaborate on this issue, I will discuss some lessons learned from the failures to adequately identify risks in consumer credit markets prior to the crisis.

More effective use of advanced quantitative analysis to support supervisory goals has been a central objective of our Reserve Bank for over a decade and has since become a central focus of Federal Reserve System supervision in the aftermath of the financial crisis. This reflects the post-crisis reforms of supervision that emphasize a more data-driven and more multi-disciplinary approach to addressing risks in the financial system.

I hope to convince you of two central propositions:

1. Risks in the financial system are dynamic and evolve endogenously to avoid detection by existing risk measurement systems. Regulatory rule-making is generally a slow and cumbersome process, so while strong regulatory rules are essential they need to be combined with an effective and nimble supervisory process.
2. To be successful over the long-term, quantitative risk analytics must be effective at determining the most important unknowns that require direct investigation or additional data. That is, effective risk analytics should not only produce risk estimates but need to be effectively integrated into a more comprehensive supervisory decision making process.

To illustrate these points, I will focus on a couple of key questions related to the mortgage crisis: Why did industry executives and regulators fail to recognize the growing risks posed by mortgage market trends prior to the crisis? And furthermore, how does the answer to that question inform us about optimal methods for identifying and managing risk?

One common answer to the first question is simply that market participants were optimistic about consumer credit markets and in particular the mortgage market. This led financial firms and households to take long positions in the mortgage or housing market. When the housing market turned, these long positions turned to large and unexpected losses.

There is certainly a great deal of evidence that optimism was widespread. However, as I will discuss, while this explanation contains important elements of truth, it is a very partial truth. My focus in this talk will not be why optimism about consumer credit markets proved to be wrong. After the fact,

¹ The views expressed here do not necessarily reflect those of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.

everyone becomes a lot smarter, and pointing to *ex ante* misjudgments is a little like shooting fish in a barrel. Rather, I want to focus on how commonly held beliefs are often used to short-circuit deeper analysis and promote group think. In addition, I will talk about how risk analytics can provide an effective challenge to that type of group think.

There are a number of versions or components of the pre-crisis optimism explanation. Two of the most significant examples from this period are:

1. The view that consumer credit is not risky *per se* because it is made up of a large number of small loans
2. The belief that a national house price decline could not occur or the even more optimistic view that house prices would continue to rise rapidly

Let me discuss both of these issues one at a time.

When I began working on consumer credit issues as part of my supervisory responsibilities, I would routinely hear from senior executives and regulators that a large nationwide consumer credit portfolio could not be subject to substantial credit risk.² This rationale at first glance seems quite simple and intuitive. Consumer portfolios consist of a large number of small loans. While the outcome of any single loan might be uncertain and the average rate of default for the portfolio could be high, the uncertainty about the average default rate for the portfolio should be low. In other words, according to this view consumer credit risk is an actuarial problem and not subject to the significant uncertainties associated with a portfolio of a small number of large commercial loans.

In a 2004 paper with Tony Santomero,³ then President of the Federal Reserve Bank of Philadelphia, we tried to combat this view. We stated:

many practitioners in the retail lending area mistakenly believe that the law of large numbers implies that the distribution of retail outcomes will show little variability around the first moments of the distribution. . . . Theoretically, the law of large numbers implies that the idiosyncratic components of individual loan risk will be relatively unimportant, but it does not imply that movements away from the mean generated by systematic risk factors will be small.

The statement that consumer credit risk was small as a theoretical matter given the law of large numbers is simply an incorrect understanding of statistics. The risk for any particular portfolio could be small but that is an empirical question not a theoretical fact. The important point is that this proposition was used as an explanation for not spending significant resources on estimating tail risk for consumer portfolios.

The main issue of the Lang and Santomero paper I just quoted was to explain the following puzzle: Why were bank quantitative models of capital and tail risk developed largely for commercial credits while little work had been done on consumer portfolios? This fact was particularly puzzling since consumer

² There was a general understanding that consumer credit portfolios could be subject to non-credit risks including operational risk, compliance risk, legal risk and reputational risk.

³ Lang and Santomero (2004), "Risk Quantification Of Retail Credit: Current Practices and Future Challenges" in **Monetary Integration, Markets and Regulation Research in Banking and Finance**, V.4, 1–15, 2004, Elsevier Ltd.

credit lending is primarily driven by advanced quantitative analysis, whereas large commercial lending involves considerable idiosyncrasies and judgmental factors.

My point here is not that optimism about tail risk in consumer portfolios turned out to be wrong. In all processes with uncertainty, ex post some judgments will turn out to be better than others. Rather, the central point is that accepted wisdom or group think about consumer credit was often used as a rationale for less rigorous analysis in many cases and lack of attention to stress analysis even when it was done well.

Let me now turn to the optimism that house prices would not decline nationally or the even more optimistic notion that house prices would continue to rise rapidly. There is a great deal of evidence that house price appreciation expectations were generally optimistic right up to the mortgage crisis of 2007.

As an aside, when I refer to pre-crisis I am referring to the period prior to the summer of 2007. Much of the analysis of the crisis focuses on the Lehman bankruptcy. It is certainly true that the Lehman bankruptcy is when the levees break. However, the period beginning in 2007 is when the hurricane reached land, the waters were rising at an alarming rate and the stability of the system came into question.

My colleagues in the Federal Reserve System—Kris Gerardi, Andreas Lehnert, Shane Sherlund, and Paul Willen⁴—published a very convincing paper showing that analyst reports indicated an optimistic view of future house price paths. More interestingly, the paper shows that the models produced by analysts indicated very high mortgage defaults in the event that housing prices declined by the relatively modest 5 to 10 percent declines actually seen in 2007. On this last point, there was certainly analysis within the Federal Reserve System indicating that defaults would rise severely in the event of a house price decline. For example, a 2006 internal Supervision department report at this Reserve Bank stated that “a plausible drop in residential real estate prices would significantly increase mortgage losses and weaken industry earnings.”

So it is clear that many industry participants and other experts were optimistic about housing prices and therefore took bets based on that optimism. That bet had paid off for a long time, but the results reversed when house prices declined. It is not particularly useful or insightful to conclude that it is better to have an accurate prediction rather than an inaccurate one. Moreover, market participants have plenty of financial incentives to produce good forecasts so there is no obvious externality that is subject to regulatory correction. There is no reason to believe that regulators are better than market participants in forecasting the direction of future market prices.

However, the notion that market participants sometimes make large forecast errors is not the entire story. Optimism or pessimism about an asset price will determine whether someone takes a long or short position. But the size of the exposure depends on risk/reward preferences. The interesting question is not why some large financial firms were long in mortgages, but rather why these firms were so long in mortgages that they came under severe distress when the housing market turned down by relatively modest amounts by mid-2007.

⁴ See Gerardi, Kristopher, Andreas Lehnert, Shane M. Sherlund, and Paul Willen. "Making sense of the subprime crisis." **Brookings Papers on Economic Activity** 2008, no. 2 (2008): 69-159.

As Gerardi, *et al.* show, many industry analysts produced mortgage outcomes under stressed housing conditions that indicated very high defaults under that scenario. Yet firms producing these analyses suffered extreme distress as a result of mortgage defaults when the housing market turned. Why were there only a few firms that attempted to protect themselves from this outcome?

In a 2010 paper,⁵ my colleague Julapa Jagtiani and I discuss in some detail how this disconnect could occur. There are several potential explanations for this result, including the possibility that senior executives and shareholders were not concerned about risk because of too-big-to-fail incentives. However, Julapa and I argue that the evidence supports the view that senior executives at most of the large financial firms did not understand their true exposure to mortgage defaults, as these exposures had been re-labeled and disguised within the structured finance market. This conclusion is supported by the 2009 Senior Supervisors Group Survey⁶ of major international financial firms, finding that many firms were still unable to accurately aggregate their exposures to mortgage-related assets two years after the mortgage meltdown. Moreover, there is evidence that in the few cases where senior executives did accurately size their exposure or focused on their inability to do so, exposure to housing and mortgages were substantially reduced.

The optimistic view of the housing market was not only provided as a reason to place one-sided bets; it was also used as a reason for not expending the resources to accurately understand firm exposure to down-side risk. While mortgage models were indicating sizeable defaults in the event of a housing downturn, firms were not producing analyses indicating their large scale exposure to those defaults.⁷

There are some important lessons that we can draw from these examples that I think are relevant to questions of regulation and supervision in the future.

The first lesson is the need for designing organizational mechanisms to combat group think and provide effective challenges to conventional wisdom. There is considerable literature in organizational theory, decision theory and psychology on this subject with various recommended methods for developing effective challenges. However, there is little if any academic, regulatory or industry analysis examining whether these methods are useful in assessing and mitigating financial risks.

The second lesson I draw from the pre-crisis experience is that dynamic markets will generate risks that are structured to escape detection. In standard finance, risks are generated by an exogenous stochastic process. The role of risk analytics is to estimate the probability distribution of potential outcomes and then decisions are made to maximize the objective function of the firm. The finance view of risk contrasts with an older view of risk that once dominated among bankers. That view emphasized the endogenous generation of risks from operational errors or intentional fraud.

⁵ See "The Mortgage and Financial Crises: The Role of Credit Risk Management and Corporate Governance," with Julapa Jagtiani, *Atlantic Economic Journal*, V.38, #3, 2010, p.295-316.

⁶ Senior Supervisors Group Survey (2009), "Risk Management Lessons from the Global Banking Crisis of 2008," October 21.

⁷ This was not dissimilar to the substantial body of analysis, including analysis within the Federal Reserve, indicating that a large increase in mortgage defaults would not have any significant impact on the financial sector. For example, former Federal Reserve Chairman Bernanke stated in May 2007: "we do not expect significant spillovers from the subprime market to the rest of the economy or to the financial system." Chairman Bernanke was far from alone in this assessment.

Of course, neither extreme view is correct. Risk arises as a result of stochastic outcomes. A lender makes loans to a group of mortgage borrowers and there will be a probability distribution over the number of those borrowers who will default because they lose their jobs or become seriously ill. Risk also arises endogenously. The classic example is that of a rogue trader. The appropriate response to that type of risk is enhanced internal controls or creating incentives that align employees with the objectives of the firm.

Insofar as risks are generated endogenously, there is a natural process for new risks to arise that escape the existing methods of risk detection. An analogy would be the process for combatting cybersecurity threats. At any point in time, there is a set of technologies and a set of actions that pose threats. Systems are designed to detect those threats and then criminals or terrorists try to design new threats that evade detection. In the cybersecurity example, this process is very deliberate but this type of process can occur naturally as a result of agency and incentive problems within a firm.

This doesn't mean that risk analysis is not useful. Many risks are primarily driven by stochastic outcomes that can be reasonably estimated. In addition, the more robust a risk measurement system, the more difficult it becomes to find ways around those defense mechanisms. Finally, and I believe most importantly, when done well risk analytics will often point to those issues that require more intense monitoring or additional information. Put another way, risk analytics can point to those unknowns that require the most attention.

What does this mean for the changes in supervision and regulation that have occurred since the financial crisis? Regulatory reform and changes in supervisory practice have greatly increased the importance of modern statistical analysis in managing the risks to the financial system. This has been a tremendous innovation and I am proud to say that the Federal Reserve Bank of Philadelphia has played a major role in pushing these innovations forward.

Our Reserve Bank has played a lead role in developing and implementing the supervisory stress testing models for the major consumer credit products – mortgages, home equity loans, auto loans, and credit cards. Our Reserve Bank also has major responsibilities for managing the huge data sets collected to conduct these stress tests as well as managing other key data assets for the Federal Reserve System. Developing these analytical tools and data capacity is critical to an effective regulatory system.

However, to obtain the most out of these new tools, it will be critical that they be used effectively in coordination with our examination authority. These tools should not only be good at supplying risk measurements, they should be used effectively to determine those areas of uncertainty that require more information and further investigation.

At the end of the day, there is no set of regulations and no supervisory tools that will be foolproof if we also want to have a vibrant financial system. However, we can have regulations and tools that make the system more resilient. The changes to supervisory risk practice since the crisis have been a major step in the right direction, but the mission is far from accomplished.

I am very much looking forward to the discussion over the next two days. I am certain to learn a great deal from the research presentations and the audience discussion. Thank you for your participation.