2011 Annual Report

FEDERAL RESERVE BANK OF MINNEAPOLIS

Post-Crisis Use of Financial Market Data in Bank Supervision


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President's Message

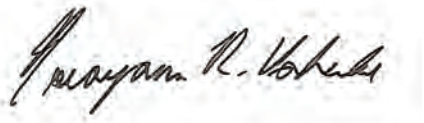
FEDERAL RESERVE BANK OF MINNEAPOLIS

One of the Federal Reserve System's main tasks is to ensure the safety and soundness of the nation's financial institutions through our supervision of their activities. At the Minneapolis Federal Reserve Bank, we support this System function in a number of ways, and one of the more important is our ongoing study and encouragement of enhanced approaches to supervision. Our *Annual Report* essay this year—authored by Ron Feldman and Jason Schmidt—is about one of those ideas: using financial market information as an input into the supervisory process.

The essay has two distinct pieces. The first is data-based. It documents that, in the run-up to the recent financial crisis, information in financial market data would have flagged many firms that ultimately faced collapse. Critically, in some cases, market data moved ahead of certain supervisory assessments. This evidence strongly suggests to me that the auxiliary use of market data could have encouraged supervisors to respond more quickly and forcefully to excessive risk-taking on the part of financial institutions in the period before the financial crisis.

Of course, market prices, like any other known system, are not perfect in identifying potential problematic banks. Consequently, in the second part of the essay, the authors provide a research agenda to address weaknesses in the use of market data in the supervisory process.

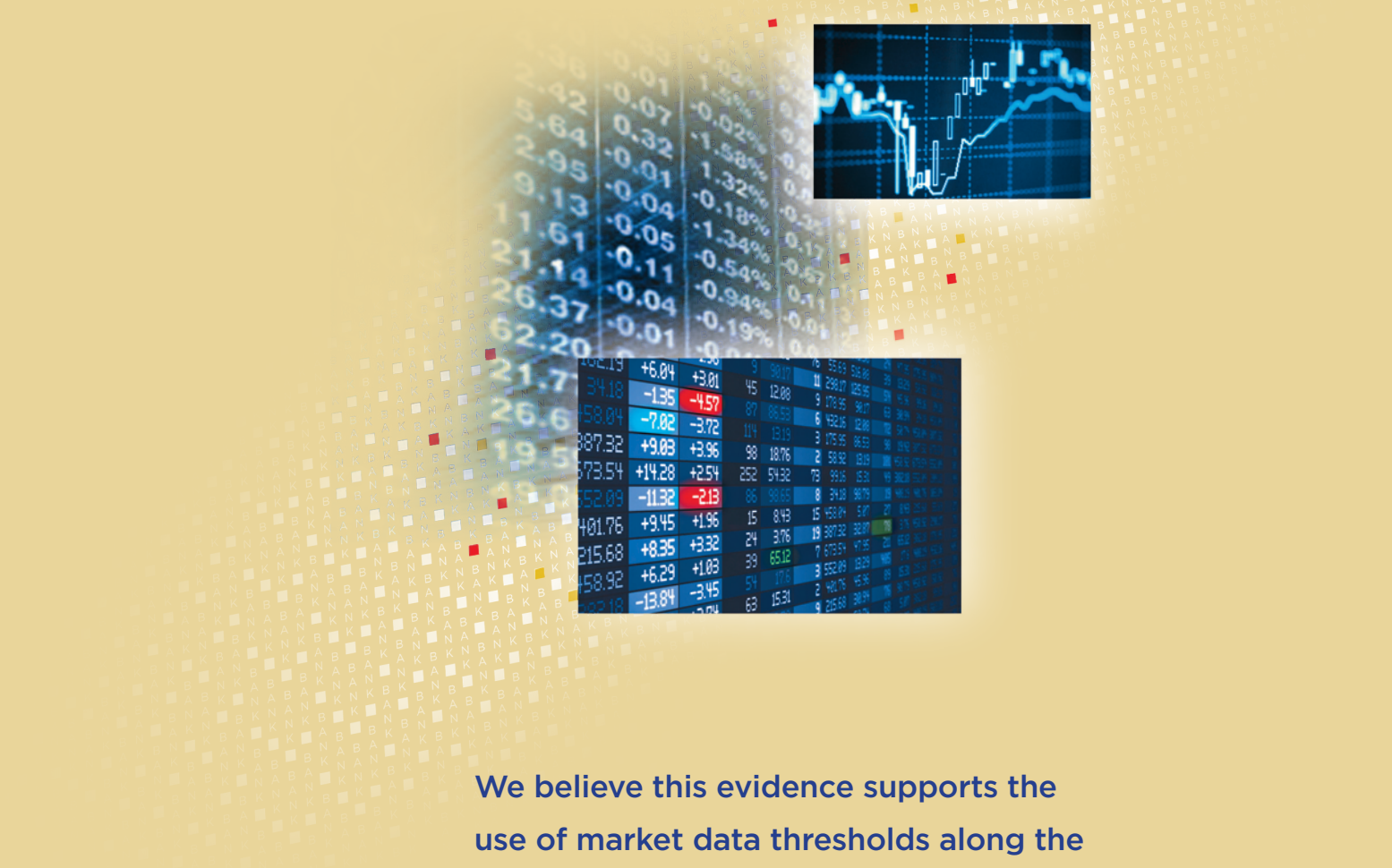
I've always been interested in the idea of using financial market information as an input into the supervision of financial institutions, and this year's *Annual Report* essay has only served to increase my enthusiasm for this approach. So, I'm delighted that this idea is now being translated into specific policy proposals. Recently, the Federal Reserve Board of Governors proposed a rule that would require supervisors to take a second look at a firm when market prices indicate that the firm appears risky.* The Minneapolis Fed's analysis over the years, and in this essay, provides strong support for the proposition that this proposed rule can help mitigate the risk of a recurrence of the events of 2008.



Narayana Kocherlakota
President

*See the Dec. 20, 2011, press release at federalreserve.gov/newsevents/press/bcreg/20111220a.htm.

We conclude that market data ... would augment other information incorporated in supervisory assessments.



We believe this evidence supports the use of market data thresholds along the lines proposed by the Federal Reserve.

Post-Crisis Use of

Financial Market Data in Bank Supervision

Data from financial markets inform Federal Reserve supervision of financial institutions. The Federal Reserve proposes to expand its use of market data as part of implementing the Dodd-Frank Act. We provide empirical support for the enhancement. We also suggest a research agenda to address challenges posed by incorporating market data in supervision.

The authors thank Andy Atkenson, Doug Clement, Mark Flannery, David Fettig, Fred Furlong, Narayana Kocherlakota, Jose Lopez, Molly Mahar and Jenni Schoppers for their comments. The views expressed in this essay are those of the authors and not necessarily of others in the Federal Reserve System.

Post-Crisis Use of Financial Market Data in Bank Supervision

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I. Introduction

Supervisors use a variety of data as inputs to assess the condition of banks.[1] This essay focuses on supervisory use of market data, primarily prices from financial markets.[2, 3] In particular, we review a specific Federal Reserve proposal that would more formally use certain types of market data ("market data thresholds") to identify large banks requiring additional supervisory scrutiny.[4]

We examine the proposal in Section II by describing a system of market data thresholds. In Section III, we examine how the thresholds performed prior to and during the recent financial crisis. In Section IV, we compare this performance relative to select supervisory assessments. We conclude that market data, utilized in this fashion, would augment other information incorporated in supervisory assessments.

Market data do not offer a free lunch, however. Section V notes the challenges supervisors face in using market data. We discuss a research agenda to help address those challenges in Section VI. We conclude in Section VII.

II. Market Data Thresholds

Why do supervisors review market data in the first place? After all, bank supervisors have access to information about banks that investors do not. And markets may strike at least some observers as subject to bubbles and other phenomena that cast their assessments of firms in doubt. (We discuss additional limitations of market data in Section V.)

In concept, market data also have many attractive features that have led supervisors to review them when assessing the condition of banks:

- Market investors who buy and sell securities related to banks have money at stake. Investors therefore have an incentive to gauge the risks posed by banks, particularly the risk that a weakened bank will generate losses for investors.
- Markets aggregate the multitude of participants' risk assessments into a single measure, such as the price or quantity traded of a security, which can be compared across many firms.
- Banks and supervisors do not set market prices, making prices an independent source of information.

- Market measures are often available on a frequent basis (daily or even by the minute in some cases).
- These measures can be continuously updated to reflect new information as it becomes available.
- Financial market prices are forward-looking. Market measures reflect expected outcomes based on today's available information; accounting and financial data on the condition of banks often reflect past experience.

Potentially, then, market signals are a cheap, insightful and objective measure of bank risk-taking.

The question is, how do the market data perform in practice as an input to supervision?

We answer this question in a narrow way. We examine a particular type of supervisory use of market data: market data thresholds. Under this approach, supervisors would give additional scrutiny to bank holding companies with assets greater than $50 billion ("large banks") that breach the thresholds. This approach—which builds on current use of market data in supervision—is embodied in a Federal Reserve proposal implementing one aspect of the very broad Dodd-Frank Act. Box 1 summarizes this proposal and the relevant parts of the DFA that prompted it. Appendix 1 discusses the evolution of supervisory use of market data.

Box 1

Summary of the Federal Reserve's Proposal on Market Data Thresholds in the Dodd-Frank "Early Remediation" Regime

Section 166 of the Dodd-Frank Act (DFA) requires the Board of Governors, consulting with other agencies, to "prescribe regulations establishing requirements to provide for the early remediation of financial distress" of large banks and nonbank financial firms deemed systemically important.

According to the DFA:

> The purpose of the early remediation requirements under subsection (a) shall be to establish a series of specific remedial actions to be taken by a nonbank financial company supervised by the Board of Governors or a bank holding company described in section 165(a) that is experiencing increasing financial distress, in order to minimize the probability that the company will become insolvent and the potential harm of such insolvency to the financial stability of the United States.[a]

The DFA requires the early remediation regime to define measures of a large bank's financial condition, to link supervisory responses or limitations to the measures of the condition and to have those requirements become more stringent as the condition of the large bank weakens. The act gives the Federal Reserve some discretion in defining the measures of the financial condition and the appropriate response. But, and notably for our discussion, the DFA requires the use of forward-looking measures of the condition, which made market signals a good candidate for early remediation.[b]

Continued on page 40

[a] See Section 166 (a) and (b) of the Dodd-Frank Wall Street Reformand Consumer Protection Act (Public Law 111-203, July 21, 2010).

[b] The DFA notes that early remediation should have "measures of the financial condition of the company, including regulatory capital, liquidity measures, and other forward-looking indicators."

We back-test a system of market data thresholds along the lines of those recently proposed by the Federal Reserve. Appendix 2 describes the market data thresholds we review in detail. We summarize the key features at a very high level here:

We use five types of market signals (e.g., credit default swaps (CDS)) to construct the thresholds. We develop six thresholds for each of the five signals. One relates to the absolute level of the signal, the second relates to the difference between the signal and a group of low-risk peers and the last four relate to changes in the signals.

We review these signals for 33 firms (listed in Box 2):

- 10 financial organizations that required private or public resolution in the face of failure during the financial crisis ("resolved financial organizations")[5] and
- 23 large banks that were above $50 billion as of December 2004 or December 2011, were not controlled by a foreign banking organization and were not resolved privately or publicly ("nonresolved large banks").

Finally, a firm breaches the market data thresholds in this regime when its market data signal at the end of a month is above the 95th percentile for all observations of that signal over the past five years for two consecutive months. A firm moves off "breach status" following two consecutive months of having no threshold breaches.

There are alternative ways to construct thresholds. The value of our thresholds, to choose one example, can change month to month. Other regimes use fixed thresholds. We discuss a few alternatives to our approach—and compare our approach to that of the Fed proposal—in Appendix 3.

Box 2

The 23 Large Banks That Were Not Resolved:

American Express
Bank of America
Bank of New York Mellon
BB&T Corp.
Capital One Financial
Citigroup
Comerica Inc.
Fifth Third Bancorp
Goldman Sachs
Huntington Bancshares
JPMorgan Chase
Keycorp
M&T Bank Corp.
MetLife
Morgan Stanley
Northern Trust
PNC Financial Services
Regions Financial
State Street
Suntrust Banks
U.S. Bancorp
Wells Fargo
Zions Bancorporation

The 10 Financial Organizations That Required Public Or Private Resolution:*

American International Group
Bear Stearns
Countrywide Financial
Fannie Mae
Freddie Mac
Lehman Brothers
Merrill Lynch
National City Corp.
Wachovia Bank
Washington Mutual

* We restrict this list of 10 firms to those that failed or required takeover by another public or private entity. That said, there is no established definition of private resolution; the list reflects our subjective judgments. For example, there are firms not on this list of 10 that received extraordinary government support during the crisis.

April 2007

- New Century Financial Corporation files for Chapter 11 bankruptcy (April 2).

June 2007

- Bear Stearns suspends redemptions from its High Grade Structured Credit Strategies Enhanced Leverage Fund (June 7).

July 2007

- Bear Stearns liquidates two hedge funds that invested in various types of mortgage-backed securities (July 31).

August 2007

- The FOMC votes to maintain its target for the federal funds rate at 5.25 percent (Aug. 7).
- BNP Paribas halts redemptions on three investment funds (Aug. 9).
- The Federal Reserve Board announces that "in current circumstances, depository institutions may experience unusual funding needs because of dislocations in money and credit markets" (Aug. 10).

September 2007

- The FOMC votes to reduce its target for the federal funds rate 50 basis points to 4.75 percent (Sept. 18).

November 2007

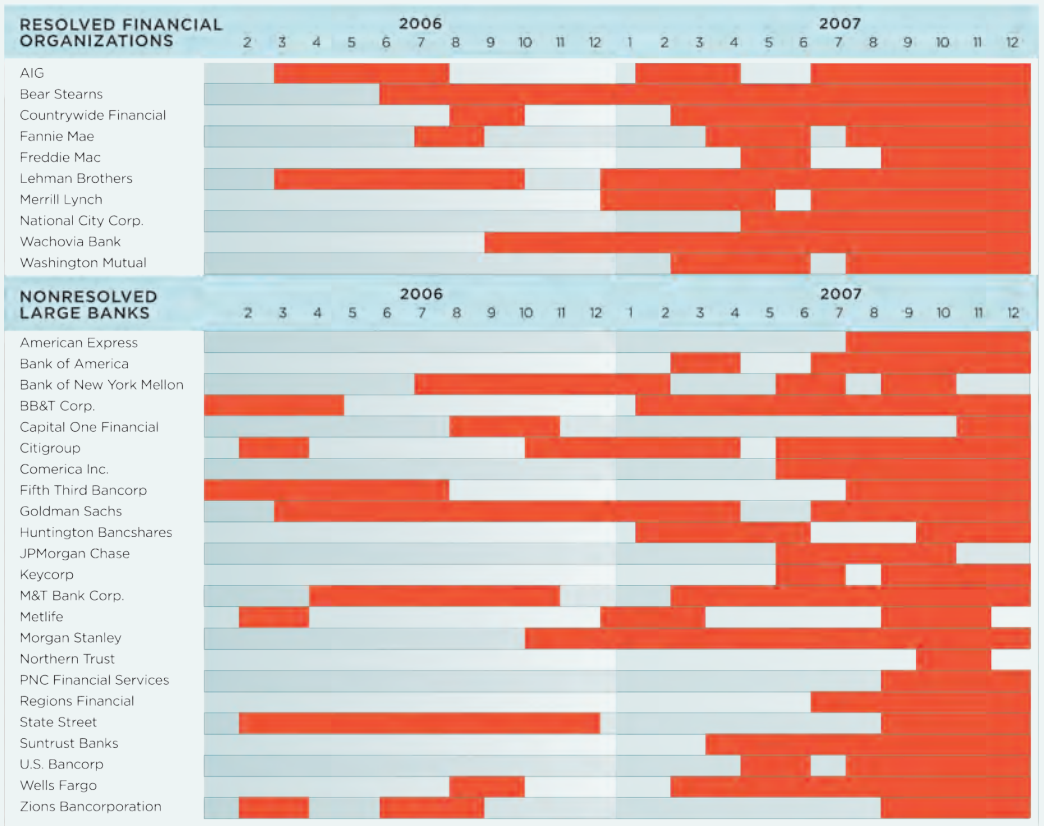
- Financial market pressures intensify, reflected in diminished liquidity in interbank funding markets.

December 2007

- The Federal Reserve Board announces the creation of a Term Auction Facility (TAF) (Dec. 2).

Threshold Results in the Pre-Crisis Period

Table 1



Select Events from Mid-2007 to Mid-2012

January 2008

- Bank of America announces purchase of Countrywide Financial (Jan.11).

March 2008

- The Federal Reserve Bank of New York announces financing to facilitate JPMorgan Chase's acquisition of Bear Stearns (March 24).

July - August 2008

- The Office of Thrift Supervision closes IndyMac Bank (July 11).
- The Treasury Department announces additional support for Fannie Mae and Freddie Mac (July 13).
- The FOMC releases a statement about the current financial market turmoil (Aug. 17).

September 2008

- The Federal Housing Finance Agency (FHFA) places Fannie Mae and Freddie Mac in government conservatorship (Sept. 7).
- Bank of America announces its intent to purchase Merrill Lynch for $50 billion and Lehman Brothers files for bankruptcy (Sept. 15).
- The Federal Reserve Bank of New York lends up to $85 billion to the American International Group (AIG) and the Reserve Primary Fund "breaks the buck" (Sept. 16).
- Goldman Sachs and Morgan Stanley approved to be bank holding companies by the Federal Reserve (Sept. 21).
- JPMorgan Chase acquires the banking operations of Washington Mutual with assistance from the FDIC (Sept. 25).

October - November 2008

- The Treasury Department announces that the Troubled Asset Relief Program (TARP) will purchase capital in financial institutions (Oct. 14).
- PNC Financial Services purchases National City Corporation (Oct 24).
- The U.S. Treasury Department, Federal Reserve and FDIC jointly announce support for Citigroup (Nov. 23).
- The Federal Reserve creates the Term Asset-Backed Securities Lending Facility (TALF) (Nov. 25).

January - February 2009

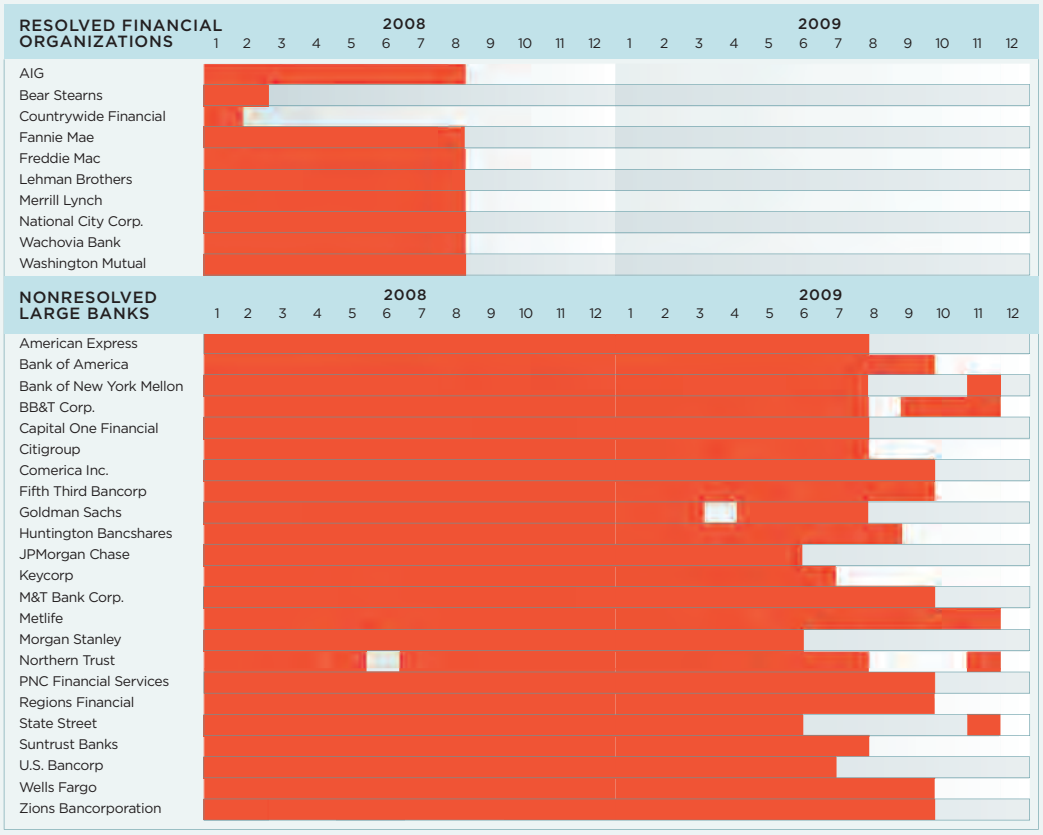
- The Treasury, Federal Reserve and FDIC announce support for Bank of America (Jan. 16).
- The federal bank regulatory agencies introduce the Supervisory Capital Assessment Program (SCAP) or "stress test" (Feb. 25).

May 2009

- The results of the SCAP exercise are released to the public (May 7).

Threshold Results in the Crisis Period

Table 2



December 2009

- Greek debt is downgraded by Fitch Ratings, and S&P warns about future downgrades (Dec. 10).

February 2010

- Several special lending facilities started by the Federal Reserve during the crisis expire (Feb. 1).

April - May 2010

- 10-year Greek bond yields rise above 9% in the secondary market by the end of April. The European Union (EU) and the IMF agree to a EUR 100 billion bailout package for Greece on May 2.
- The EU decides on a comprehensive package of measures to preserve financial stability in Europe, including a European Financial Stabilization mechanism with a total volume of up to EUR 500 billion (May 10).

November 2010

- 10-year Irish bond yields rise above 9% in the secondary market by the end of November. The EU and the IMF agree to a EUR 85 billion bailout package for Ireland on May 29.

April - May 2011

- Portugal formally requests a bailout on April 6. 10-year Portuguese bond yields continue to rise to 10% during May. The EU and IMF agree to a EUR 78 billion bailout for Portugal on May 16.

July 2011

- The EU and the IMF agree to release funds promised to Greece under the May 2010 bailout package and agree to prepare a second aid package.

August 2011

- 10-year bond yields for Italy and Spain both rise above 6% in early August. The European Central Bank says it will buy government bonds from these countries to try to bring down their borrowing costs.

October 2011

- Belgium, France and Luxembourg agree to bail out the troubled bank Dexia. European banks are told to raise more capital.
- European leaders obtain an agreement from banks to take a 50% loss on the face value of their Greek bonds as part of a plan to restructure Greece's debt.

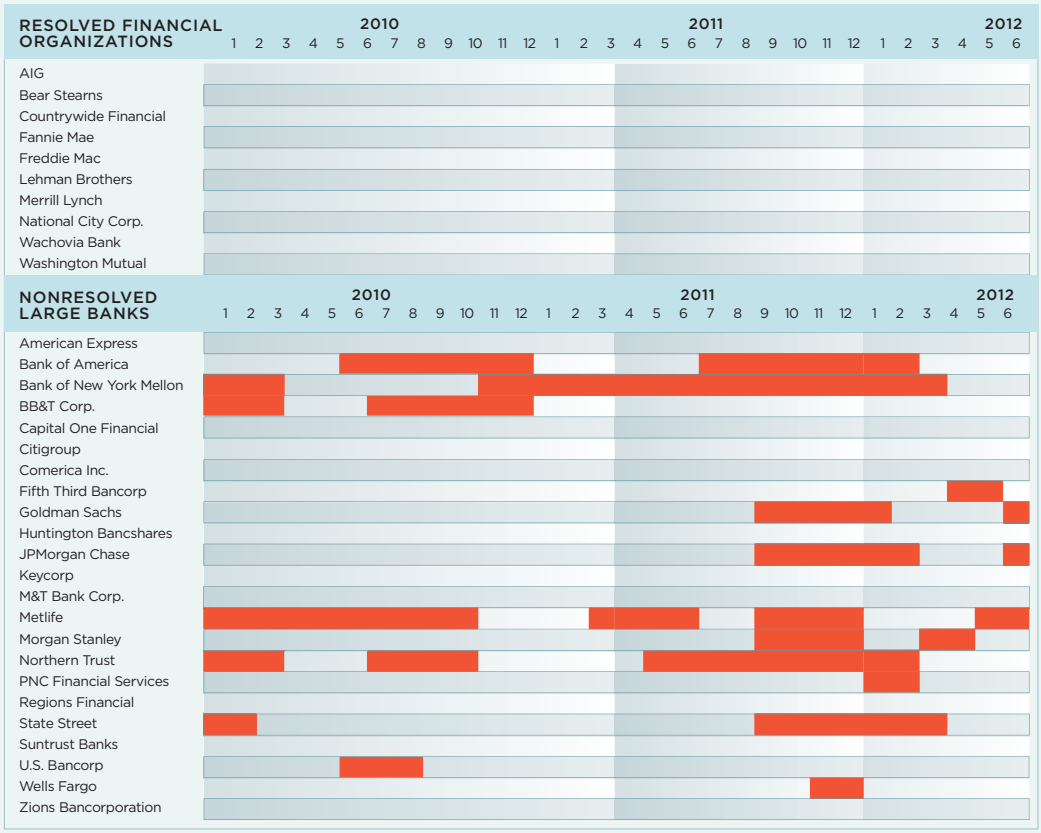
July 2012

- The president of the European Central Bank says the institution will do "whatever it takes" to preserve the euro.

Source: Federal Reserve Bank of St. Louis at timeline.stlouisfed.org/

Threshold Results in the Post-Crisis Period

Table 3



Threshold breaches indicated the systemic nature of the crisis near its inception.

The thresholds were breached for many resolved firms, as well as some unresolved firms, before or at the very earliest stages of the financial crisis.

Mass threshold breaches ended shortly after the Federal Reserve completed its Supervisory Capital Assessment Program (SCAP) in mid-2009.

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Firms with substantial investment banking operations—and a few others—had significant numbers of threshold breaches in the post-crisis period, particularly during the fall of 2011.

III. Performance of Market Data Thresholds in the Pre- and Post-Crisis Periods

We review the performance of sample market data thresholds before, during and after the financial crisis. (Page 10 provides a timeline of key events during the recent crisis.) We review the performance for select, large problem financial firms resolved by public or private means during the crisis. We also examine the performance for large banks targeted by the proposal.

Our main findings are as follows:

- Threshold breaches indicated the systemic nature of the crisis near its inception.
- The thresholds were breached for many resolved firms, as well as some unresolved firms, before or at the very earliest stages of the financial crisis.
- Mass threshold breaches ended shortly after the Federal Reserve completed its Supervisory Capital Assessment Program (SCAP) in mid-2009.
- Firms with substantial investment banking operations—and a few others—had significant numbers of threshold breaches in the post-crisis period, particularly during the fall of 2011.

In total, we believe this evidence supports the use of market data thresholds along the lines proposed by the Federal Reserve. We come to this conclusion because (a) the thresholds generally are breached in a timely fashion for firms that ultimately prove weak and are not breached excessively for firms that ultimately prove not weak and (b) the market-based data seem to complement supervisory assessments. (See Section IV for a discussion of this latter point.) Later in this section, we explain why we support the proposal even if it could erroneously identify a strong firm as weak.

Threshold Results: Pre-Crisis

We highlight two main features of the threshold breaches at the onset of the financial crisis and report our results for the pre-crisis period in Table 1, page 10.

- Virtually all 10 resolved firms breach their market data thresholds continuously from early/mid-2007 to their resolution. About one-third of the nonresolved large banks started similar extended periods of breached thresholds during early 2007. The remaining nonresolved large banks moved to prolonged threshold breach status by early fall 2007.

- Seven of the 10 resolved firms had a threshold breach during the period from March 2006 to January 2007. We would consider, by way of context, April 2007 an extremely early dating of the onset of the financial crisis. Five of these seven had at least one threshold breach at or before September 2006. Sixteen of the 23 nonresolved large banks had a breach by April 2007.

We come to two conclusions based on this record, both of which we think support inclusion of market data thresholds in supervision:

- Threshold breaches indicated the systemic and serious nature of the financial crisis at its onset. The Federal Reserve took unusual steps to encourage bank use of its standing lending facility in August 2007; the Fed was clearly aware of and acted on disruptions to bank funding and financial markets at that point. But widespread and sustained breaching of market data thresholds during the summer of 2007 should have raised the potential for a broad-based solvency crisis in banking to supervisors at that point. Thresholds could have reinforced the need for supervisors to take broad action.[6]
- The thresholds could have potentially provided early warning for select firms. Consider the five independent investment banks at the epicenter of the financial crisis. All but Merrill Lynch breached the threshold at least once before November 2006; Goldman Sachs was in breach status for most of 2006, and Bear Stearns and Lehman Brothers both breached their thresholds for at least six consecutive months in 2006. There were other sporadic threshold breaches of a similar vein: Citigroup breached its threshold in November 2006 and continued to have breaches for almost the rest of the crisis, for example.

The early warning record is certainly mixed. Some might think the warnings noted above were not early enough. Other firms that later had severe problems—Freddie Mac, for example—were not continuously breaching their thresholds until the fall of 2007. A few firms that did not receive institution-specific government support during the crisis—Fifth Third Bancorp, M&T Bank Corp. and State Street stand out—are flagged relatively early and often.

We do not view this outcome as inconsistent with our expected outcomes or a reason to not support the proposal for several reasons:

First, determining which banks will end up weak and which will end up strong is very challenging. No system—including the current supervisory system—has historically performed or will in the future perform that sorting flawlessly.

Second, we weigh the benefits of getting it right for a few firms in real time as greater than the costs of getting it wrong for some firms in retrospect. Supervisors could have benefited from several more months to consider their posture to firms that breached thresholds and the financial system entering a crisis; the costs associated with additional discussion of firms that ultimately did not require resolution or other institution-specific government support—which is the response required when firms breach the market data thresholds in the Federal Reserve proposal—seem low to us relative to these potential benefits. Finally, we already noted that market data seem to complement supervisory assessments when the two are compared directly. But market data do not need to be perfect in their assessments or always earlier to identify

a problem to help supervisors. Supervisors face substantial uncertainty in their assignments. Our results suggest that market data have relevant information (and other attractive attributes noted below). Responding to market data threshold breaches should reduce the uncertainty that supervisors face.

Threshold Results: Mid-Crisis

We would expect the thresholds to flash red for virtually all nonresolved large banks when a systemic banking crisis occurs. We find this result (see Table 2, page 11). The "wall of red" occurs from January 2008 to a few months after May 2009, the month the Federal Reserve announced the results of the Federal Reserve's SCAP, or "stress test." This result is consistent with views that the stress test played a critical role in bringing the financial crisis to an end.[7]

Threshold Results: Post-Crisis

We run the same thresholds on firms remaining in our sample during the post-crisis period. We report those findings in Table 3 on page 12, which summarizes results from 2010 to June 2012. We find the following:

- There was another episode during the fall of 2011 where a significant cross section of the large bank universe (about one-third) experienced sustained threshold breaching. This episode coincided with deepening of the European crisis at the time.
- Three types of firms seem to have the most threshold breaches during the post-crisis period:
  - Firms with substantial investment banks (e.g., JPMorgan Chase, Goldman Sachs and Morgan Stanley).
  - Firms with substantial processing operations (e.g., Bank of New York Mellon, Northern Trust and State Street).
  - Bank of America and MetLife.

IV. Threshold Breaches Relative to Changes in Supervisory Ratings and Credit Ratings

We compare historical threshold breaches to changes in certain supervisory ratings of bank holding companies as well as credit ratings. Supervisory ratings and changes to them are the best information we have to make these comparisons. But we stress up front that our approach faces two limitations. One is that ratings are confidential. We cannot reveal ratings of specific firms, for example. We therefore focus on changes across the portfolio because this information does not reveal the actual rating of any firm. The other is that ratings are incomplete measures of supervisory knowledge of firms, assessments of and actions against banks, and overall posture to the banks. Supervisors can be very concerned about and take action against a firm even if they do not lower their ratings.

We find that during the period when there were relatively many threshold breaches for the firms under review, there were relatively fewer, and substantially fewer in some cases, changes in the supervisory ratings given to those firms. This comparison suggests that market data thresholds would be a useful complement to other supervisory assessments of risk. We summarize our findings in this section. We provide more details on the supervisory assessments and formal actions we discuss in this section in Appendix 4.

This comparison reviews a sample of 22 bank holding companies contained in our two groups and reviews two types of supervisory assessments of these BHCs: a *composite rating* and a single component of that composite, the financial condition rating, or the *F rating*. Specifically, we review *when* these two ratings were downgraded in the pre-crisis and crisis periods, and we compare the timing of these downgrades to the timing of market-based threshold breaches reviewed in preceding sections.

This comparison reveals that, although there were across-the-board breaches of market data thresholds in mid-2007, there was just a single composite rating downgrade among these BHCs in 2007. And that downgrade did not lower the firm to "less-than-satisfactory" condition (a rating of 3 or worse on a 5-point scale, with 1 being highest or best). There were five downgrades in 2008.[8]

Similarly, for the same sample of 22 BHCs, there were no financial component rating downgrades from 2005 to 2007, though market data thresholds were suggesting widespread problems by mid-2007; there were nine financial component rating downgrades in 2008, most of them in the middle of the year.

Not commenting on the actual level of ratings across all firms leaves open the option that firms did not receive downgrades in the 2005-08 period because they already had ratings indicating weakness. We address this potential in two ways.

- Bank supervisors have to make public legal "formal" actions that they take against a BHC.[9] Often, but not always, a BHC with a weak composite rating (4 or 5 on the 5-point scale) has a formal action; BHCs can also have formal actions without such a weak rating. Only four firms in this group had a formal agreement during the 2005-2008 period, mostly related to factors not directly related to financial weakness.

- The Financial Crisis Inquiry Commission (FCIC) made ratings available for three of the most troubled firms and commented more generally on BHC rating trends for large firms. We repeat that information in Box 3 on page 18, which suggests that firms did not have weak ratings when the thresholds were breached.

In addition, credit ratings for the sample firms in the 2005-08 period are available from Standard & Poor's and Moody's.[10] All 23 firms had ratings from S&P and 17 had ratings from Moody's. In Table 4 on page 18, we see that S&P and Moody rating downgrades occurred in 2008, well after breaches of market data thresholds had already highlighted the systemic nature of the crisis.

Credit Rating Upgrades and Downgrades for Sample Firms from 2005 to 2008

Table 4

	Moody's		S & P	
Year	Upgrade	Downgrade	Upgrade	Downgrade
2005	2	1	4	3
2006	0	1	8	0
2007	5	1	8	3
2008	0	10	1	17

Note: 21 of the 33 firms in our sample had issuer ratings from Moody's during the period, and all 33 firms had issuer ratings from S&P.

Box 3

Discussion of Select Holding Company Ratings in Report of the Financial Crisis Inquiry Commission[a]

The following direct quotes from the Report of the Financial Crisis Inquiry Commission (FCIC) provide information on rating changes and the absolute ratings levels for select large banks.

GENERAL TRENDS IN LARGE FIRM RATINGS

By the end of 2007, the FDIC had 76 banks, mainly smaller ones, on its "problem list"; their combined assets totaled $22.2 billion. (When large banks started to be downgraded, in early 2008, they stayed off the FDIC's problem list, as supervisors rarely give the largest institutions the lowest ratings.)[b]

As the commercial banks' health worsened in 2008, examiners downgraded even large institutions that had maintained favorable ratings and required several to fix their risk management processes. These ratings downgrades and enforcement actions came late in the day—often just as firms were on the verge of failure. In cases that the FCIC investigated, regulators either did not identify the problems early enough or did not act forcefully enough to compel the necessary changes.[c]

AIG

In March [2008], the Office of Thrift Supervision, the federal regulator in charge of regulating AIG and its subsidiaries, downgraded the company's composite rating from a 2, signifying that AIG was "fundamentally sound," to a 3, indicating moderate to severe supervisory concern. The OTS still judged the threat to overall viability as remote.[d]

Citigroup

For Citigroup, supervisors at the New York Fed, who examined the bank holding company, and at the Office of the Comptroller of the Currency, who oversaw the national bank subsidiary, finally downgraded the company and its main bank to "less than satisfactory" in April 2008—five months after the firm's announcement in November 2007 of billions of dollars in write-downs related to its mortgage-related holdings. The supervisors put the company under

[a] See the *Report of the Financial Crisis Inquiry Commission* at http://fcic.law stanford.edu/report/.

[b] *Report of the FCIC*, p. 301

[c] *Report of the FCIC*, p. 302

[d] *Report of the FCIC*, p. 274

new enforcement actions in May and June. Only a year earlier, both the Fed and the OCC had upgraded the company, after lifting all remaining restrictions and enforcement actions related to complex transactions that it had structured for Enron and to the actions of its subprime subsidiary CitiFinancial, discussed in an earlier chapter. "The risk management assessment for 2006 is reflective of a control environment where the risks facing Citigroup continue to be managed in a satisfactory manner," the New York Fed's rating upgrade, delivered in its annual inspection report on April 9, 2007 had noted. "During 2006, all formal restrictions and enforcement actions between the Federal Reserve and Citigroup were lifted. Board and senior management remain actively engaged in improving relevant processes." [e]

In April 2008, the Fed and OCC downgraded their overall ratings of the company and its largest bank subsidiary from 2 (satisfactory) to 3 (less than satisfactory), reflecting weaknesses in risk management that were now apparent to the supervisors.[f]

Wachovia

On the same day as the announcement [July 22, 2008], S&P downgraded the bank, and the Fed, after years of "satisfactory" ratings, downgraded Wachovia to 3, or "less than satisfactory." [g]

V. Challenges in Supervisory Use of Market Data as Thresholds

In the preceding section, we presented evidence that market data thresholds are a useful source of information for the supervisors of financial institutions. At the same time, though, it is important to keep in mind that market data have potential pitfalls. The challenges concern (a) potential for market signals to convey "noise" rather than information on the condition of firms and (b) potential for gaming market signals.

We review these challenges in some detail for two reasons. First, they help inform our view as to the appropriate response to breaches of market data thresholds. The Federal Reserve proposal requires an additional supervisory review of firms that breach market data thresholds. It does not require, as is mandated for other types of nonmarket threshold breaches, hard and fast changes in bank operations such as restrictions on capital distributions like dividends. We think our limited experience with these thresholds suggests a slow start; we would not support mandatory action in response to market data thresholds at this point.

The way to address this concern and our second reason for listing the challenges in detail is to motivate our recommendations for additional analysis and research, which we discuss in Section VI. We see the challenges as issues to address rather than insurmountable weaknesses. Indeed, is it not clear if challenges in supervisory use of market data loom particularly large relative to those facing more traditional supervision, particularly in light of the latter's pre-crisis track record.

[e] *Report of the FCIC*, p. 302

[f] *Report of the FCIC*, pp. 303-04

[g] *Report of the FCIC*, p. 305

Noise Versus Information

The use of any data in supervision should be conditional on the information the data provide. Supervisors should not use data that provide no information or, worse yet, provide information not correlated with the true condition of a firm (i.e., "noise"). All data used by supervisors can have some noise. To offer a few examples:

- Some standard accounting data on loan performance can mask high default rates when the volume of loans grows quickly.
- Supervisory and firm assessments of the quality of loans have proven misleading at times, not recognizing future repayment weakness in a timely manner.
- Firm and supervisory measures of liquidity have wrongly suggested that a firm was well positioned to fund itself right before it was not.

Market data naturally have noise as well. We highlight four important sources of noise in market signals (not in order of importance).

1. MICROSTRUCTURE. The nature of the transactions that generate market signals can introduce noise. Some markets have such limited transactions that the market signal used is a quote—the price at which a dealer says it would conduct a transaction—and not an actual transaction price. In other cases, there are only a few true transactions. The absence of many actual transactions and quotes raises questions if the signal fully reflects the views of market participants.

Having just a few transactions in a bond, for example, may also lead investors to demand a premium to buy the security (to compensate for having few buyers when they want to sell). This premium shows up in market prices even though it may not be related to the risk of the bank. Other nondefault-related factors, such as taxes, can influence market signals.[11]

2. PERCEIVED GOVERNMENT SUPPORT. Investors take into account the potential riskiness of a firm if they have money at risk. Perceived government commitment to absorb investors' losses mutes accurate market pricing. The actual risk of a firm would exceed market perceptions of risk when the government shields the market from loss. The data we reviewed in Section II demonstrate that market participants believed themselves at some risk of loss, even after the government provided extensive support to bank creditors. Nonetheless, the perception of support could reduce the degree to which the risk of firms shows up in market signals.

3. EFFECT OF SUPERVISORY USE OF MARKET SIGNALS. We argue for supervisors to inform their actions with market signal information. Market participants may come to expect certain supervisory actions based on market signals. Those actions could, for example, reduce the risk of the firm. Supervisors could require firms with weak market signals to hold more capital or more dependable funding sources.

Market participants would include such expectations of future supervisory action in their pricing decisions. The expectation of supervisory action could therefore alter the signals that markets generate.[12]

4. LIMITED INFORMATION. Banks can hold difficult-to-value assets. Investors may not have sufficient information to value such assets.[13] Market signals may therefore not accurately assess the true condition of firms.

Gaming Signals

Market participants can structure transactions that pay off if supervisors take action against firms. Supervisory use of market signals could encourage such transactions. Consider the extreme case: One bank might wish to drive another out of business. If unusually weak market signals were an input to closure, a bank might try to move markets to breach thresholds, even if those market transactions lost money. An absence of liquidity in a market could make gaming easier to carry out; a small number of transactions can have large effects on prices in illiquid markets. Market signals based on quotes may also present opportunity for gaming.

VI. Research Agenda to Facilitate Greater Use of Market Data in Supervision

We first outline a research agenda for interested parties to enhance use of market signals as a threshold for supervisory action. We then suggest an agenda for interested parties to confront the remaining challenges noted in Section V.

Facilitating Market Signals as Thresholds for Supervisory Action

We view a desirable threshold as one that identifies as many weak firms as outliers as possible and as early as possible given an acceptable number of strong firms mischaracterized as such. The threshold regime should also prove robust. That is, it should prove reliable as an early identifier of weak firms across time and circumstances.

The Federal Reserve's DFA proposal seeks to implement such a robust regime. But as the proposal makes clear, additional research could help improve the proposed regime. Indeed, in the proposal, the Board of Governors indicated that it would at least annually revisit the specifics of its market data threshold system and seek comment on it.

WE PROVIDE A FEW SUGGESTIONS FOR THRESHOLD RESEARCH.

As a first step, researchers should develop multiple alternative threshold structures and examine how they tie to supervisory objectives. For example, some structures might do best at figuring out which highly rated firms will become 3 rated or worse a year in advance. Other systems might do

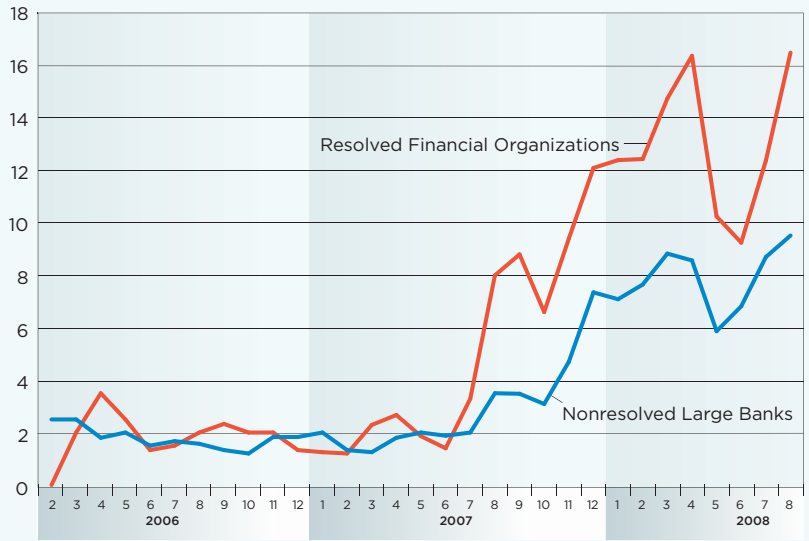
better at identifying when weak firms become healthy. Still other thresholds may do best signaling systemic problems across many banks. The Federal Reserve would have more information when modifying the proposed threshold regime if researchers developed more regimes with clear conceptual links to supervisory objectives.

Second, analysts should gather as much market data as possible to test potential thresholds in as robust a fashion as possible. This testing should occur in an "out-of-sample" framework. This means that the actual data that supervisors would have had in the past are tested in "real time" as if supervisors did not have advance knowledge of the future. This environment is as close to reality as analysts can get. Analysts should test the data across as many years as they can, particularly years that have outcomes supervisors want to avoid. Moreover, the tests should occur across as many comparable countries as they can to broaden the review.

In these comparisons, researchers should look at the performance of specific market sources of information and construction of the threshold. Do credit default swaps perform better or worse as thresholds than equity-based thresholds? Does a change threshold perform better than one based on absolute values? Tables 5 through 7 and Charts 1 through 3 provide additional data on the breaching of the thresholds we review based on their construction and source to further such analysis.

Chart 1

Average Number of Thresholds Breached



There are also a variety of more narrow and technical areas for additional analysis, some of which are raised in the DFA proposal.[14]

Finally, as discussed in Box 1, the market data threshold system is one of several thresholds to identify large banks that require increased supervisory review and action in the Federal Reserve's proposal (the others are not market-based). Researchers should explore the relative expected performance across these thresholds when considering if and how to modify them.

We listed four sources of noise in Section V. We suggest potential approaches for addressing these same four. We also raise some options for addressing challenges of gaming.

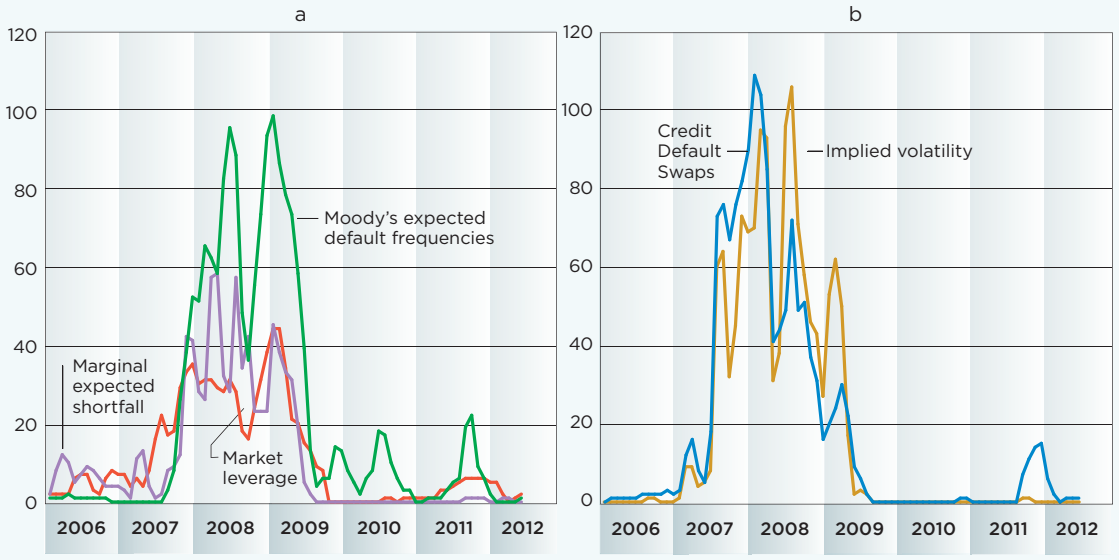
Addressing Noise Concerns

1. MICROSTRUCTURE. There are several research agendas that could help shed light on microstructure concerns. While there is natural concern about using quotes instead of actual trades, there is also relatively little analysis comparing quotes versus trades.[15] We may find that quote levels match up well with actual prices. Moreover, the changes in quotes may prove very similar to the changes in prices. A systematic comparison of the two is in order.

In addition, a variety of techniques try to tease out the liquidity premium in prices and/

Chart 2

Number of Threshold Breaches by Market



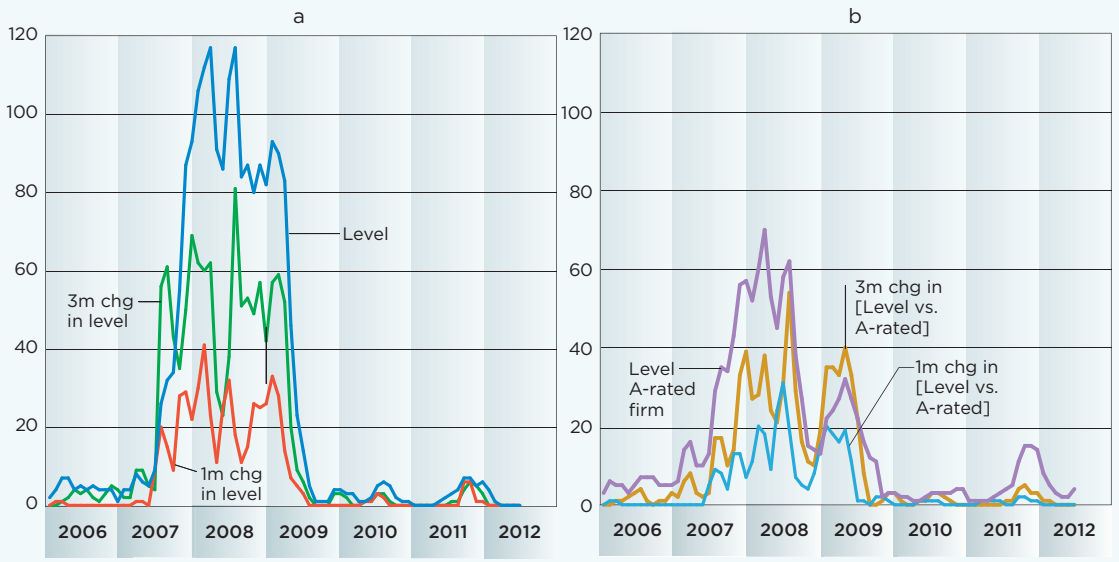
or make adjustments to market prices to account for illiquidity.[16] These techniques have not been applied systemically to the full range of market signals used by supervisors. Such application seems like a reasonable step, although certainly no guarantee to fix concerns.

At the same time, we encourage more simple analysis. Analysts should document on a regular basis the level of trading in the financial markets from which market signals come, as well as other measures of liquidity. Background on the degree of liquidity in financial markets could help analysts choose which signals to track. Data on liquidity gathered at very high frequencies (e.g., daily) might also lead to simple steps, such as modifying data from a particularly illiquid day, that could make market data more robust. Providing supervisors with rules of thumb grounded in analysis to start addressing illiquidity would be quite beneficial.[17]

2. PERCEIVED GOVERNMENT SUPPORT. Aspects of the approach just outlined for addressing concerns about microstructure/liquidity could help adjust for other factors present in market signals that obscure the risk of loss for a specific financial firm. Analysts have developed measures of the implied support banks receive from governments, for example.[18] Analysts could therefore adjust at least some signals to account for perceived support.

Chart 3

Number of Threshold Breaches by Type of Market Signal



3. EFFECT OF SUPERVISORY USE OF MARKET SIGNALS. We noted that the anticipation of supervisory use of market data changes investors' perception of risk. Those advancing the argument note several conditions under which this theoretical concern would not hold. For example, the concern could be obviated if supervisors look across many markets, which they do. Thus, we view this general concern as secondary in importance.

4. LIMITED INFORMATION. More publicly available information on banks seems the most direct path to more informed investors. Banks themselves could disclose additional information. Banks and bank supervisors have repeatedly called for enhanced disclosure to improve the quality of market signals and the discipline market forces exert on banks.[19] Analysis of the key material on banking exposures that markets do not have and which would improve the quality of market prices should be helpful.

Supervisors have also increased their disclosures on bank riskiness by releasing certain facts about how banks perform on the supervisory stress test.[20] It would be useful to understand if and how such releases inform market prices. Additional analysis of the pros and cons of releasing additional supervisory information about the riskiness of firms may also prove helpful.[21]

Table 5 **Number of Thresholds Breached During the Pre-Crisis Period**

RESOLVED FINANCIAL ORGANIZATIONS	2006											2007										
	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
AIG			1	1	1	1	1						1	1	1			1	4	4	1	4	8
Bear Stearns						2	3	3	3	2	2	1	1	3	3	2	2	6	14	13	7	4	5
Countrywide Financial								1	1					4	6	3	1	5	13	16	16	21	21
Fannie Mae					2	2	2								1	1			3	4	2	7	11
Freddie Mac																			2	2	3	7	13
Lehman Brothers		2	6	4	1	1	2	3	2			1	1	2	2	1	1	3	13	14	9	5	3
Merrill Lynch											1	2	2	2	2			4	10	7	4	9	10
National City Corp.															1	2	2	2	6	9	8	9	15
Wachovia Bank											1	1	1	1	2	1	1	2	6	6	5	10	14
Washington Mutual														3	6	3			9	13	11	18	21

NONRESOLVED LARGE BANKS	2006											2007										
	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
American Express																			4	4	2	2	5
Bank of America														1	2	1		1	4	3	2	5	7
Bank of New York Mellon							1	1	1	1	1	1	1						2	2	1	1	1
BB&T Corp.	3	3	2	2									1	1	1	1	1	1	3	5	5	8	11
Capital One Financial					1	1	2	1											1	1	1	3	5
Citigroup										3	3	2		1	1		2	2	5	5	5	10	18
Comerica Inc.																			6	6	6	5	7
Fifth Third Bancorp	2	4	3	3	2	2	1												2	2	4	6	13
Goldman Sachs			1	1	1	2	2	2	2	3	3	3	2	1	1			3	8	6	2	2	1
Huntington Bancshares													1	1	1	1	1			1	1	3	12
JPMorgan Chase																			5	5	1		
Keycorp																			2	3	4	7	12
M&T Bank Corp.				1	1	1	1	1	1	1				1	1	2	3	3	4	4	3	2	3
Metlife		2	2								1	2	2						4	4	1		
Morgan Stanley										2	2		1	2	2	1	1	2	4	4	3	4	5
Northern Trust																			1	1			
PNC Financial Services																		2	3	1	5	4	5
Regions Financial																	2	2	3	2	3	6	10
State Street		1	1	3	3	2	2	2	1	1	1								1	2	3	3	3
Suntrust Banks															1	2	2	2	6	7	5	7	7
U.S. Bancorp															2	2			4	4	3	2	1
Wells Fargo								1	1					2	6	6	3	2	4	5	5	6	11
Zions Bancorporation					1	2	2												1	3	3	8	10

Gaming

Some of the research agenda just noted would help policymakers consider the potential for gaming in supervisory use of market data. We noted that gaming seems most likely in illiquid markets. Research on illiquidity should clarify if and how to account for that trait and which types of signals may prove less amenable to gaming.

Concern about market manipulation certainly goes beyond supervisory use of market data. Supervisors may first wish to determine if and how to learn from other experiences, such as use of market prices to set certain electrical rates.[22] Such experiences may help determine how to structure rules, penalties and monitoring for supervisory use of market signals.

Research could also focus on surveillance and reporting methods to try to detect and deter gaming.[23]

There may also be fairly straightforward approaches that reduce incentives or ability to game. Not spelling out the process by which supervisors use market data could reduce the threat of manipulation.[24] Likewise, relying on many market signals or lowering the severity of the supervisory response to market signals should drive down the returns to gaming. These steps could, however, reduce the benefits from use of signals. Analysis of these costs and benefits would be constructive.

Table 6 **Number of Thresholds Breached During the Crisis Period**

RESOLVED FINANCIAL ORGANIZATIONS	2008												2009											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
AIG	8	9	10	9	4	6	13	18																
Bear Stearns	7	8																						
Countrywide Financial	18																							
Fannie Mae	12	13	12	11	3	2	6	11																
Freddie Mac	16	19	18	17	7	5	10	19																
Lehman Brothers	4	7	12	19	16	17	18	19																
Merrill Lynch	9	9	14	17	12	12	10	14																
National City Corp.	16	14	16	22	20	12	13	15																
Wachovia Bank	13	15	18	16	11	13	16	19																
Washington Mutual	21	18	18	20	9	7	13	17																

NONRESOLVED LARGE BANKS	2008												2009											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
American Express	5	8	10	9	3	3	6	8	9	12	12	11	8	8	12	13	7	4	2	1				
Bank of America	8	8	9	10	7	8	10	11	12	8	9	9	13	22	20	18	11	2	2	1	1	1		
Bank of New York Mellon	4	5	5	8	5	4	6	11	11	12	11	8	6	6	6	5	6	5	4	1				2
BB&T Corp.	13	11	11	8	5	6	12	15	15	7	1	4	5	7	8	8	5	3	2	1		1	2	5
Capital One Financial	5	8	8	5	1	4	8	7	6	3	3	6	7	10	15	16	11	1	1	1				
Citigroup	16	15	19	18	9	10	12	12	10	9	11	14	14	21	19	15	6	4	4	1				
Comerica Inc.	8	11	13	11	8	6	11	11	11	6	5	7	8	8	6	5	3	5	5	2	1	1		
Fifth Third Bancorp	14	11	14	16	14	14	15	10	10	11	10	8	10	17	16	10	1	1	1	1	1	1		
Goldman Sachs	2	7	9	7	3	3	2	4	4	10	12	10	7	7	2		1	2	2	2				
Huntington Bancshares	15	13	12	13	11	9	11	11	10	4	1	3	5	17	19	14	9	1	1	1	1			
JPMorgan Chase	1	6	7	6	2	2	4	7	7	7	7	11	10	10	9	9	4	2						
Keycorp	13	10	11	10	11	19	21	18	16	17	14	12	8	7	5	5	13	12	5					
M&T Bank Corp.	4	4	5	4	4	7	8	8	8	7	4	7	7	7	8	8	9	10	7	1	1	1		
Metlife	1	7	7	5	1	1	2	4	7	12	18	18	11	8	9	9	6	5	4	2	1	2	4	3
Morgan Stanley	7	8	8	6	2	3	5	7	7	17	17	16	7	5	5	6	7	4						
Northern Trust	1	2	3	5	2		1	1	1	4	8	9	6	5	2	2	5	8	6	3				2
PNC Financial Services	7	7	6	5	2	1	2	6	6	4	6	10	12	16	14	11	7	7	6	5	3	3		
Regions Financial	10	9	9	6	6	9	13	14	14	11	2	3	7	11	9	5	4	1	1	1	1	1		
State Street	2	2	2	5	5	5	4	3	5	7	9	8	10	11	10	9	5	1						2
Suntrust Banks	7	7	11	12	12	15	17	16	15	11	8	8	7	14	16	15	13	12	2	2				
U.S. Bancorp	1	2	4	6	4	4	8	10	10	7	6	8	11	15	14	14	7	3	2					
Wells Fargo	10	9	11	10	7	7	9	10	11	8	6	6	10	17	19	20	13	7	6	3	2	2		
Zions Bancorporation	9	6	9	12	11	10	13	15	15	9	5	5	8	11	11	8	11	8	5	3	1	1		

VII. Conclusion

A Federal Reserve proposal would further increase supervisory use of market data by using market data thresholds to enhance supervision. We provided empirical support from the crisis period for such enhancements. We also articulated a research agenda to further the use of market signals in supervision.

Table 7 **Number of Thresholds Breached During the Post-Crisis Period**

RESOLVED FINANCIAL ORGANIZATIONS	2010												2011												2012					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
AIG																														
Bear Stearns																														
Countrywide Financial																														
Fannie Mae																														
Freddie Mac																														
Lehman Brothers																														
Merrill Lynch																														
National City Corp.																														
Wachovia Bank																														
Washington Mutual																														

NONRESOLVED LARGE BANKS	2010												2011												2012					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
American Express																														
Bank of America						1	4	4	3	3	3	3							2	4	11	11	8	8	3	1				
Bank of New York Mellon	2	2	1								1	1	1	1	1	1	1	1	2	2	6	6	5	2	2	2	1			
BB&T Corp.	4	1	1				6	6	4	1	1	1																		
Capital One Financial																														
Citigroup																														
Comerica Inc.																														
Fifth Third Bancorp																												1	1	
Goldman Sachs																					2	6	5	6	4					1
Huntington Bancshares																														
JPMorgan Chase																					1	3	3	3	1	1				2
Keycorp																														
M&T Bank Corp.																														
Metlife	3	2	2	2	6	6	5	4	2	1					1	1	1	1			6	6	2	2					1	1
Morgan Stanley																					1	2	3	3			1	1		
Northern Trust	2	2	1				2	3	2	1							2	4	5	5	6	6	2	2	1	1				
PNC Financial Services																									1	1				
Regions Financial																														
State Street	2	1																			1	1	1	1	1	1	1			
Suntrust Banks																														
U.S. Bancorp						1	1	1																						
Wells Fargo																							1	1						
Zions Bancorporation																														

Endnotes

[1] We use "banks" to refer to banks or bank holding companies. We use the term "bank holding companies" to refer specifically to such firms.

[2] We use "financial market signals" to mean prices of financial instruments related to banks, including but not limited to signals related to equity, derivatives and fixed income obligations of banks. Quantities from financial markets can also convey information, but we do not explore that feature of market data in this essay.

[3] We focus in this essay on market signals on supervised financial institutions. Supervisors could, and do, use market signals to assess the condition of firms to which financial institutions have exposure.

[4] See Federal Reserve System (2012).

[5] We restrict this list of 10 firms to those that failed or required takeover by another public or private entity. That said, there is no established definition of private resolution; the list reflects our subjective judgments. For example, there are firms not on this list of 10 that received extraordinary government support during the crisis.

[6] The president of the Federal Reserve Bank of Boston noted in 2010 the potential gains from more timely supervisory action during the initial phase of the financial crisis. "The 2007 events did not lead to similarly significant changes in supervisory policy. The dividends on common stock declared by the largest banking organizations (the 19 SCAP participants and others) actually increased in the 4th quarter of 2007, and did not show dramatic reductions until after the financial crisis hit a crescendo in the fall of 2008." (See Rosengren 2010.)

[7] The stress test was conducted on domestic bank holding companies with assets of $100 billion or greater as of year-end 2008. See the press release at federalreserve.gov/newsevents/press/bcreg/20090507a.htm. For a discussion of the SCAP and its role in addressing the financial crisis, see Bernanke (2010). The stress test could have reduced market concerns about banks in at least two ways: by providing participants with new information on the condition of the firms and/or by providing the firms with additional government support. We do not assess the relative contribution of the two factors. See Peristiani, Morgan and Savino (2010) for a discussion of the information provided by the stress test to markets.

[8] We also review composite rating downgrades in 2005 and 2006 to determine if the absence of action in 2007 and 2008 reflects prior moves. It does not. There were no downgrades in this group in 2005 and 2006.

[9] For more general discussions of enforcement actions, see Alvarez (2012) and Brunmeier and Willardson (2006).

[10] These ratings are the long-term, local currency issuer ratings.

[11] See Elton et al. (2001) for a discussion of the factors that influence the spread between corporate bonds and Treasury securities. They note that credit risk explains a small portion of that spread. Equity-based measures can, in some cases, also have features that induce noise.

[12] See, for example, Bond, Goldstein and Prescott (2010).

[13] For a discussion of the opaqueness of banks, see Morgan (2002) and Flannery, Kwan and Nimalendran (2010).

[14] A few examples of these more technical areas of research include determining the optimal methods for calculating thresholds based on idiosyncratic measures of market data; comparing the relative benefits and costs of fixed thresholds versus time-varying thresholds, which we discuss in Appendix 2; and using statistical techniques to isolate common signals across the many market data thresholds (thereby allowing a reduction in the number of signals tracked and reported).

[15] One paper that does look at the details of market data reporting across data sources is Mayordomo, Peña and Schwartz (2010).

[16] For one example among many, see clevelandfed.org/Research/data/TIPS/lpremium.cfm?DCS.nav=Local.

[17] In this vein, we did require a minimum number of data observations in the sample threshold regime we reviewed. (See Appendix 2.)

[18] For a recent example, see Noss and Sowerbutts (2012).

[19] In 2001, for example, the Federal Reserve established a working group of private sector experts to encourage additional disclosures from banks. See the press release at federalreserve.gov/boarddocs/press/general/2001/20010111/default.htm. Enhanced disclosure by banks has also been a cornerstone of international supervisory efforts. See bis.org/list/bcbs/tid_31/index.htm. See also the new disclosure task force established by the Financial Stability Board at financialstability board.org/press/pr_120510.pdf.

[20] For a discussion of stress tests and disclosure, see Tarullo (2012).

[21] For examples, see Prescott (2008). For a more positive view, see Feldman, Jagtiani and Schmidt (2003).

[22] See, for example, the lessons learned from Borenstein et al. (2008).

[23] For one example, see data analysis by Snider and Youle (2010) that suggested unusual quotes in the LIBOR panel.

[24] An extensive comment letter from five industry representatives raised concern about potential manipulation of market-based thresholds, but suggested that less public disclosure of market data thresholds could potentially address these concerns. See the April 27, 2012, comment letter from the The Clearing House and others at federalreserve.gov/SECRS/2012/May/20120501/R-1438_042712_107270_542775340448_1.pdf. To review all of the comments on the proposal, see the Freedom of Information Office page at federalreserve.gov/apps/foia/ViewAllComments.aspx?doc_id=R-1438&doc_ver=1.

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Appendix 1

Pre-Crisis Supervisory Use of Market Data

Because of the attractive features of market data we discussed, supervisors made use of market data to supplement other inputs prior to the crisis.[25] Pre-crisis reviews of supervisory use of market data also describe an upward trend in the use of this external data. By the late 1990s and early 2000s, supervisory use of market data was relatively common, although "use" often reflected a fairly informal monitoring role not fully integrated into other supervisory processes.[26] Later reviews in the mid-2000s found increasing resources devoted to supervisory use of market data—albeit from a modest level. More generally, such reviews found that supervisory use of market data was "roughly consistent with the researching findings."[27] In practice, this meant that large-bank supervisors were monitoring market prices and quantities, often on a high-frequency basis.

The use of market data, even though it has limitations, has been promoted by Federal Reserve policymakers. The then chair and vice chair of the Board of Governors spoke directly to this end as use of market data grew: Vice Chair Roger Ferguson captured the spirit, noting: "Our examiners are extremely good at what they do, but any good examiner recognizes that data should come from a variety of different sources, including the signals that come from the market."[28]

Post-crisis improvements to Federal Reserve supervision reinforced the use of market data as one of several inputs for supervisory assessment. Governor Daniel Tarullo noted, for example, "The Federal Reserve is also putting in place a permanent quantitative surveillance mechanism for the large, complex financial organizations we supervise. This mechanism will incorporate supervisory information, firm-specific data analysis, and market-based indicators to identify developing strains and imbalances that may affect multiple institutions, as well as emerging risks to specific firms."[29]

Tarullo provided additional details on the use of market data in the supervision of systemically important firms in the new regime:

> There are other ways to incorporate non-governmental views into the regulatory system. We have already taken steps in this direction in conjunction with the Federal Reserve's overhaul of its approach to supervising the largest financial holding companies. As part of this effort—and with the aim of advancing both our microprudential and macroprudential goals—we have created a quantitative surveillance mechanism (QSM) to regularize the collection and analysis of relevant data. Among other things, the QSM will use market-based indicators such as stock prices, option prices, credit default swap spreads, and short-term funding costs to provide an external perspective on the condition of these institutions—one that will be formally presented to regular meetings of senior supervisory and other Federal Reserve staff. Market-based indicators of macroeconomic and financial market risks that could pose threats to the largest institutions also will be used to assess their condition.[30]

As part of the enhanced formality and process noted by Tarullo, the Federal Reserve requires appropriate discussion and review of the current supervisory posture to firms with outlier market signals. Supervisors will also review, as relevant, implications of the market signals for firm operations and performance in areas such as funding. This enhanced process does not necessarily make use of new market data or even increase use of market data by some supervisors. Rather, it encourages consistent use of market data in the context of a well-functioning, cross-firm supervisory review process.

[25] The Federal Reserve Bank of Minneapolis has advocated for use of market data in the supervisory process and tracked that use for some time. See, for example, Feldman and Rolnick (1998), Feldman and Levonian (2001) and Stern (2001).

[26] See Schmidt (2004) and the papers at clevelandfed.org/research/conferences/2004/march/index.cfm for discussion of supervisory use of market data.

[27] See Furlong and Williams (2006).

[28] See the interviews with Ferguson (2000) and Greenspan (2001).

[29] See Tarullo (2009).

[30] See Tarullo (2010).

Appendix 2

Construction of the Market Data Thresholds Reviewed in this Essay

The market data thresholds reviewed in this essay are constructed as follows:

WE USE FIVE SOURCES FOR MARKET SIGNALS:

- Credit default swaps (CDS): A credit default swap is a financial contract offering protection against default on an obligation—such as a bond or loan.
- Moody's expected default frequencies (EDF): An EDF measures the expected probability of default of an entity in the next 365 days.
- Option implied equity volatilities: The option implied volatility of a firm's stock price is calculated from out-of-the-money option prices using a standard option pricing model.
- Market leverage ratios: The market leverage ratio is the ratio of market value of equity to market value of equity plus book value of debt.
- Marginal expected shortfalls (MES): An MES is the expected loss on equity when the overall market declines by more than a certain amount.

WE EXAMINE SIX SPECIFIC MEASURES FOR EACH OF THE FIVE SIGNALS:

- The absolute level of the signal observed at month-end relative to the historical range of that signal for each firm.
- The difference between the level of the signal and the median level of the signal for a group of low-risk financial peers (defined as financial firms whose average issuer debt rating is A as calculated by Markit) relative to the historical range of the difference.
- The one-month and three-month changes in the signal for a firm relative to its historical range of one-month and three-month changes.
- The one-month and three-month changes in the differences between the signal and the median level of the low-risk peer group, relative to the historical range of the changes in differences.

WE REVIEW THESE SIGNALS FOR 33 FIRMS (listed in box 3):

- 10 financial organizations that required private or public resolution in the face of failure during the financial crisis ("resolved financial organizations").[31]
- 23 large banks that were above $50 billion as of December 2004 or December 2011, were not controlled by a foreign banking organization and were not resolved privately or publicly ("non-resolved large banks").

Number of Observations for Each Market Signal

	Observations from 1/2001 to 8/2008 (max=92)				
RESOLVED FINANCIAL ORGANIZATIONS	CDS	EDF	IMP VOL	MKT LEV	MES
AIG	92	92	92	92	92
Bear Stearns	92	89	89	88	89
Countrywide Financial	92	90	90	90	90
Fannie Mae	85	92	92	92	92
Freddie Mac	79	92	92	92	84
Lehman Brothers	92	92	92	92	92
Merrill Lynch	92	92	92	92	92
National City Corp.	56	92	92	92	92
Wachovia Bank	92	92	92	92	92
Washington Mutual	83	92	92	92	92

	Observations from 1/2001 to 6/2012 (max=138)				
NONRESOLVED LARGE BANKS	CDS	EDF	IMP VOL	MKT LEV	MES
American Express	138	138	138	136	138
Bank of America	138	138	138	138	138
Bank of New York Mellon	108	138	138	137	138
BB&T Corp.	111	138	138	137	138
Capital One Financial	131	138	138	138	138
Citigroup	138	138	138	138	138
Comerica Inc.	50	138	134	138	138
Fifth Third Bancorp	59	138	138	138	138
Goldman Sachs	138	138	138	138	138
Huntington Bancshares	0	138	138	138	138
JPMorgan Chase	138	138	138	138	138
Keycorp	113	138	138	138	138
M&T Bank Corp.	0	138	138	136	138
MetLife	125	138	138	138	137
Morgan Stanley	138	138	138	134	138
Northern Trust	28	138	138	138	138
PNC Financial Services	100	138	136	137	138
Regions Financial	34	138	138	135	138
State Street	81	138	138	136	138
Suntrust Banks	119	138	138	137	138
U.S. Bancorp	129	138	138	138	138
Wells Fargo	138	138	138	136	138
Zions Bancorporation	0	138	138	138	138

WE CONSTRUCT THE THRESHOLDS AS FOLLOWS.

- Each market indicator is measured as of month-end along with the median value of the indicator for a group of A-rated financial firms (as defined by Markit).
- The resulting time series of monthly observations are then used to calculate (a) the value of the indicator for each firm relative to the A-rated firm median, (b) the one-month and three-month changes in the market indicator and (c) the one-month and three-month changes in the indicators relative to the A-rated firm. This gives us a total of 30 different signals (five absolute levels for each indicator listed above, five relative levels, 10 one-month change measures and 10 three-month change measures).

- We create these monthly time series starting in 2001. The accompanying table lists the number of months for which we have signals for each market data type for each firm. For each level measurement beginning in 2006, we calculate the 95th percentile observation corresponding to each firm's unique time series over a rolling five-year window. We then compare the value of the firm's current data point to the 95th percentile.
- The one-month and three-month change measurements are treated slightly differently than the thresholds based on levels. For those signals, we measure the average and standard deviation (of nonoverlapping changes) within each firm's unique time series over a rolling five-year window and then use those data points to calculate a statistical z-score for each measure (defined as the current observation minus the average value and divided by the standard deviation). Z-scores that are 1.65 or greater (which are equivalent to the observations being above the 95th percentile, assuming the changes are normally distributed) are then identified. Firms with two consecutive such scores breach their thresholds.
- Firms that had two consecutive months in which the same signal was above its rolling 95th percentile breach their threshold. We consider a firm in breach of the threshold until it has two months in a row where the signal is no longer above the 95th percentile. The market leverage ratio, in which lower values signal greater distress, is measured at the fifth percentile.
    - We do not allow for a breach of a given signal unless we have at least 20 monthly observations over the rolling two-year period leading up to each measurement.

[31] We restrict this list of 10 firms to those that failed or required takeover by another public or private entity. That said, there is no established definition of private resolution; the list reflects our subjective judgments.

Appendix 3

Constructing Market Data Thresholds: The Approach Reviewed in This Essay and the Fed Proposal

We base the thresholds we review in this Essay on the federal reserve proposal. There are some differences between the two.

First, thresholds in the proposed rule would also rely on an additional type of market data, subordinated debt. We do not have ready access to such data for most of the firms in our sample for the earlier parts of the time period we examine.

Second, the proposed rule relies on a different threshold regime. The firms in the proposed rule would breach the threshold if the median value of the signal over the trailing 22-day period exceeded the 95th percentile of the five-year range. We do not have daily observations across all of our measures in the time period under review. It appears that this difference may not matter. We compare our results using end-of-month observations along with the requirement that two consecutive observations breach the 95th percentile to the threshold system in the proposed rule when we have daily data, and the results are almost identical.

Third, the proposed thresholds also included measures that controlled for overall market effects by subtracting the median of corresponding changes from a larger peer group. Because of data limitations, we have omitted such measures from our discussion.

Finally, the proposed rule also sets forth a threshold regime based on fixed thresholds. The thresholds we use change over time as the distribution of historical observations evolves. We do not back-test the fixed thresholds. We assume the Federal Reserve would have altered the fixed levels annually to ensure that the thresholds identify more potentially weak firms and fewer potentially strong firms. We cannot make these adjustments in our analysis.

A fixed threshold regime could perform differently around crises periods than the varying threshold regime we use. The fixed threshold regime may remain in breach long after the worst of the crisis; the absolute level of the market data may still be above the fixed threshold level. A varying threshold may be harder to breach after the worst of the crisis. Almost by definition, the worst recent experience used to calibrate the varying threshold has already occurred, making it difficult for additional observations to exceed the 95th percentile.

In contrast, a varying threshold regime may be breached more easily in a pre-crisis period. Recall that a firm breaches the varying threshold we review if it exceeds the 95th percentile of historical observations over the last five years in our example. A firm could breach such a threshold even if the absolute level of the threshold would not strike an observer as worrisome.

To explore the performance of fixed versus varying thresholds, we alter the threshold regime we review in this essay as follows: Instead of using varying thresholds, we run the same back-

testing experiment, but use the fixed thresholds discussed in the Federal Reserve's proposal. The thresholds in that proposal are set at CDS levels above 44 bps, EDFs above 0.57 percent, implied volatilities above 45.6 percent and marginal expected shortfalls greater than 4.7 percent. The proposal notes that these levels were chosen after considering the trade-off between early warning and potentially false signals.

Relative to our varying thresholds, fixed thresholds provided less of an early warning, but remained in breach status much longer. Specifically, from January 2007 to July 2007, the varying thresholds had breaches for all but one of the failed firms and 14 of 23 of the other large banks. Under the fixed thresholds, there are three failed firms and three large banks with breaches during this same period. From August 2007 to November 2007, all of the large banks and failed firms had threshold breaches when varying thresholds were used. In contrast, six of the 23 large banks and seven of the 10 failed firms had breaches when the fixed thresholds were used.

By October 2009, more than half of the large banks were no longer in regular breach status under the varying thresholds. Under the fixed thresholds, there were only six firms not experiencing a breach as of June 2012.

Appendix 4

Additional Detail on Supervisory Ratings and Actions Reviewed

We review two types of supervisory assessments of bank holding companies (BHCs) in our comparison to market data threshold breaches: the overall or composite holding company rating and the component of the overall rating focused on financial condition.[32] Supervisors assign a composite rating "based on an evaluation and rating of its managerial and financial condition and an assessment of future potential risk to its subsidiary depository institution(s)."[33] This composite rating "encompasses both a forward-looking and static assessment of the consolidated organization, as well as an assessment of the relationship between the depository and nondepository entities."[34]

The financial condition rating, or F rating, "represents an evaluation of the consolidated organization's financial strength. The F rating focuses on the ability of the BHC's resources to support the level of risk associated with its activities. The F rating is supported by four subcomponents: capital (C), asset quality (A), earnings (E) and liquidity (L)."[35]

Specifically, we review when these two ratings were downgraded in the pre-crisis and crisis periods. The ratings occur on a 1 to 5 scale with 1 being the best. A 3 rating or below defines an institution as in less-than-satisfactory condition. A downgrade occurs when a rating moves from a better rating to a worse rating (e.g., from 1 to 2 or 4 to 5).

WE COLLECTED DATA ON SUPERVISORY ASSESSMENTS AS FOLLOWS

Ratings

We obtained from the National Examination Database (NED) a listing of all bank holding company inspections that were started between 2005 and 2008 that resulted in the assignment of a BHC composite rating for the firms in our sample that were BHCs at the time. We then used these observations to construct a monthly time series of both the overall composite rating and the financial subcomponent rating for each firm. Lastly, we reviewed these time series and identified all of the instances in which a downgrade occurred. Our initial set of data from the NED consisted of 122 separate inspection events for 22 firms (most of which were "full scope" inspections; however, our data set also included several observations that were from limited or targeted inspections, as well as several supervisory assessment events). As an additional robustness check, we adjusted and informed our automated search based on a select manual review of the supervisory reports contained in a Federal Reserve document repository.

Of the 33 firms for which we reviewed market data thresholds, we do not have any ratings data for the following during the 2005-08 period:

AIG
American Express
Bear Stearns
Countrywide Financial (we have a single rating observation from 11/2005)
Fannie Mae
Freddie Mac
Goldman Sachs
Lehman Brothers
Merrill Lynch
Morgan Stanley
Washington Mutual

Enforcement Actions

We obtained from the Board of Governors public website a list of all enforcement actions from 2005 to 2008. During this period (sampled on July 9, 2012), 193 separate entries were reported. We reviewed the list and identified eight observations that were associated with BHCs in our sample. Four of the eight observations dealt with terminations of preexisting enforcement actions. The remaining four observations were the following:

2/9/2005	Written agreement with Bank of America (BAC)
3/31/2005	Written agreement with Huntington Bancshares (HBAN)
4/24/2006	Written agreement with Bank of New York (BONY)
8/6/2007	Order of assessment of a civil money penalty and a cease and desist order against American Express Bank International

Box 1

from page 8

A Federal Reserve proposal for incorporating market data into an early remediation regime required by section 166 of the DFA builds on the post-crisis use of market data.[c] The Board of Governors included market data in the proposal, thinking that such prices complement supervisory information and could provide "an early signal of deterioration in a company's financial condition." Specifically, the proposal sets out several "thresholds" based on market prices. The thresholds would identify firms whose relevant market prices are worse than pre-specified levels. The proposal describes several potential thresholds: market signals that suggest a chance of default higher than a peer group, higher than is normal for that firm or higher than a preset tripwire. A firm whose market prices breach a threshold face heightened supervisory review (so-called level 1 remediation in the proposal). Specifically, the Board of Governors would produce a report within 30 days of a threshold breach, essentially assessing the condition of the firm and determining if additional remediation makes sense. The proposal effectively formalizes current practice.

The proposed use of market data in the early remediation regime received several comments from outside parties. Several of the comments were generally supportive, with representatives of the banking industry expressing concern.[d]

To be clear, the market data thresholds are only one part of the early remediation regime. The majority of thresholds in the early remediation regime are not market based. The four others concern risk-based capital/leverage, stress tests, enhanced risk management and risk committee standards, and enhanced liquidity risk management standards.

There are also different types of remediation in response to a threshold breach under the early remediation proposal. They are the already mentioned heightened supervisory review (which applies to the market data threshold), initial remediation, recovery and recommended resolution. To provide some context, the third level of remediation, for example, requires that the Federal Reserve place a firm under a written agreement that prohibits all capital distributions, any quarterly growth of total assets or risk-weighted assets and material acquisitions, among other steps.

[c] The proposal can be found at http://www.federalreserve.gov/newsevents/press/bcreg/20111220a.htm.

[d] One of the most detailed and supportive comments came from Moody's Analytics at federalreserve.gov/SECRS/2012/May/20120501/R1438/R-1438_043012_107224_613995658948_1.pdf. Comments by Sheila Bair and others at federalreserve.gov/SECRS/2012May/20120501/R-1438/R-1438_033012_107166_399897884753_1.pdf and the Shadow Financial Regulatory Committee at federalreserve.gov/SECRS/2012/May/20120501/R-1438/R-1438_032812_107159_531397866323_1.pdf were also generally supportive. For concerns about the proposal, see the April 27, 2012, comment from The Clearing House and others at federalreserve.gov/SECRS/2012/May/20120501/R-1438_042712_107270_542775340448_1.pdf. To review the comments on the proposal, see federalreserve.gov/apps/foia/ViewAllComments.aspx?doc_id=R-1438&doc_ver=1.

As part of the enhanced formality and process noted by Tarullo, the Federal Reserve requires appropriate discussion and review of the current supervisory posture to firms with outlier market signals. Supervisors will also review, as relevant, implications of the market signals for firm operations and performance in areas such as funding. This enhanced process does not necessarily make use of new market data or even increase use of market data by some supervisors. Rather, it encourages consistent use of market data in the context of a well-functioning, cross-firm supervisory review process.

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[26] See Schmidt (2004) and the papers at clevelandfed.org/research/conferences/2004/march/index.cfm for discussion of supervisory use of market data.

[27] See Furlong and Williams (2006).

[28] See the interviews with Ferguson (2000) and Greenspan (2001).

[29] See Tarullo (2009).

[30] See Tarullo (2010).

2011 Operations Report

FEDERAL RESERVE BANK OF MINNEAPOLIS

Message from the First Vice President

2011 was a year of both continuity and change for the Bank. During the year, our staff in research and policy, supervision and regulation, and operations continued their work to fulfill our responsibilities to the Federal Reserve's mission to foster the stability, integrity and efficiency of the nation's monetary, financial and payments systems in order to promote optimal economic performance. In 2011, we also experienced notable change in some areas of our operations. This change was due to dynamics long evident in the System's operations: operational consolidation to improve efficiency and growth in statutory responsibilities.

For 2011, the Bank posted strong operating results. Expenses were below budget and operating metrics were achieved. The accompanying "2011 by the Numbers" highlights the scope of some of the Bank's operations. Over the past decade, this "By the Numbers" summary of some of our key operational activities has changed enormously. In my 2007 letter, I noted that during 2006, the Bank had processed 769 million checks worth $851 billion. By 2010, this activity and the several hundred employees involved in it were gone, as the System completed its conversion of check processing from physical handling of the paper items to electronic processing of digital images of the items and the consolidation of this physical processing activity from 45 offices to just one. In less than a decade, we have seen a complete transformation of the check processing business made possible by the System's leadership to put check images on the same legal footing as the original items.

This dynamic of technological change creating opportunities for greater efficiency and the System reorganizing and consolidating its operations to take full advantage of these opportunities is evident across our operations. In information technology, we are engaged in a multiyear effort to consolidate our server farms and networks Systemwide to achieve greater efficiency. As 2011 began, the U.S. Treasury's Bureau of the Public Debt was in the process of selecting between the Minneapolis Fed and the Pittsburgh Branch of the Cleveland Fed to be the sole surviving site for conducting retail securities operations as fiscal agent for the Treasury. At one time, all 12 Reserve Banks conducted this work in their districts for the Treasury. Technology has allowed consolidation and significant operational savings. In February, the Treasury announced its selection of Minneapolis as the surviving site. We completed this consolidation in 2011 on schedule and on budget.

For the System's supervision and regulation area, assuming expanded responsibility pursuant to the Dodd-Frank Act as systemic risk regulator, supervisor of thrift holding companies and supervisor of systemically important financial market utilities requires significant additional resources. Evolving regulatory and supervisory frameworks require increased emphasis on the analysis and review of financial organizations' risk profiles. In this regard, the Bank is strengthening the analytical and technical skills of staff in order to address these new demands.

In 2011, there were a number of opportunities for the Bank to leverage its expertise and expand its System responsibilities. The Bank's legal function assumed a new responsibility for System work on employee data privacy. The Bank's information technology function is partnering with the Chicago Fed to lead an initiative to evaluate content management technology and is working with the Board of Governors' supervision and regulation function on a broad document management framework and on supervision and regulation's specific document management tool selection.

2011 by the Numbers

In 2011, the Federal Reserve Bank of Minneapolis processed:

- 11.9 billion ACH (Automated Clearing House) payments worth approximately $22.4 trillion. FedACH is a nationwide system, developed and operated by Minneapolis staff on behalf of the entire Federal Reserve System, which provides the electronic exchange of debits and credits.

- $10.9 billion of currency deposits from financial institutions, destroyed $819 million of worn and torn currency, and shipped $12.6 billion of currency to financial institutions.

- Tenders, account maintenance, forms and other customer transactions for 149,000 active Legacy Treasury Direct accounts for individuals holding Treasury securities totaling $23 billion, and 1.7 million savings bond purchase requests worth $1.5 billion, as the Treasury Retail Securities site for the Federal Reserve System.

Another area of greater emphasis in 2011 and going forward is the Bank's outreach efforts. To address this priority, the Bank hired a senior vice president responsible for outreach and community affairs as a member of the management committee. She oversees our efforts to facilitate interaction and provide analytical support on issues ranging from the inner city to rural areas and to American Indian reservations. She is also coordinating our efforts to strengthen and broaden our dialogue with business owners, bankers, community leaders and community groups. As part of these efforts, we are continuously evaluating our activities and communications with the goal of enhancing transparency, understanding and accessibility.

Last year, we established an Office of Minority and Women Inclusion consistent with Section 342 of the Dodd-Frank Act. While the office is new, its objectives, which include promoting inclusion of minorities and women across all levels of our workforce, ensuring participation of minority- and women-owned businesses in our procurement activities and fostering financial literacy, reflect long-standing priorities of the Bank. The annual report of the OMWI director, published each March, will provide us a new channel to communicate our activities and results.

Going forward, the Bank will continue to seek opportunities to leverage its strengths in making important System contributions while at the same time pursuing financial and operational strategies directed at ensuring that all System objectives are met efficiently and with high quality. The Bank will continue its focus on academic research in applied economics and is expanding its capabilities related to selected public policy issue-oriented research.

The Bank's continued success in addressing challenges is a result of our employees' strong commitment to excellence and the Bank's core values. As we look to the future, this unwavering commitment to our core values and to acting in the public interest, as well as our commitment to excellence, will allow us to successfully meet future challenges.

James M. Lyon
First Vice President

2011 Financial Statements

FEDERAL RESERVE BANK OF MINNEAPOLIS

federalreserve.gov/monetarypolicy/bst_ fedfinancials.htm

federalreserve.gov/monetarypolicy/files/BSTMinneapolisfinstmt2011.pdf

Auditor Independence

In 2011, the Board of Governors engaged Deloitte & Touche LLP (D&T) to audit the combined and individual financial statements of the Reserve Banks and those of the consolidated LLC entities.[1] In 2011, D&T also conducted audits of internal control over financial reporting for each of the Reserve Banks and the consolidated LLC entities. Fees for D&T's services totaled $8 million, of which $2 million was for the audits of the consolidated LLC entities. To ensure auditor independence, the Board of Governors requires that D&T be independent in all matters relating to the audits. Specifically, D&T may not perform services for the Reserve Banks or others that would place it in a position of auditing its own work, making management decisions on behalf of the Reserve Banks, or in any other way impairing its audit independence. In 2011, the Federal Reserve Bank of Minneapolis did not engage D&T for any non-audit services.

[1]Each LLC will reimburse the Board of Governors for the fees related to the audit of its financial statements from the entity's available net assets.

2011 Helena Branch Board of Directors FEDERAL RESERVE BANK OF MINNEAPOLIS

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Warroad, Minnesota

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(Seated left to right): Michael O'Meara, Julie Causey, Howard Dahl, Lawrence Simkins

Photography Steve Niedorf

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(Standing left to right): Linda Gilligan, Duane Carter, Ron Feldman, James Lyon, Dorothy Bridges; (Seated left to right): Kei-Mu Yi, Niel Willardson, Narayana Kocherlakota, Claudia Swendseid

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minneapolisfed.org

Useful telephone numbers
(612 area code unless otherwise indicated):

For the Public

- Consumer Affairs Help Line: 204-6500
- Media Inquiries: 204-5261
- Research Library: 204-5509
- Treasury Auction Results, Current Offerings, Bills, Notes, Bonds: 1-800-722-2678

For Financial Institutions

- Cash Services Help Line: 204-5227 or 1-800-553-9656
- Check Services Support: 1-877-FRB-CHKS or 1-877-372-2457
- Electronic Access Customer Contact Center
  FedLine Support: 1-888-333-7010
  FedLine Direct/Command: 1-888-881-6700
- FedACH Central Operations Support: 1-886-234-5681
- Fedwire Operations Support: 1-800-333-2448
- Savings Bond Customer Service: 1-800-553-2663