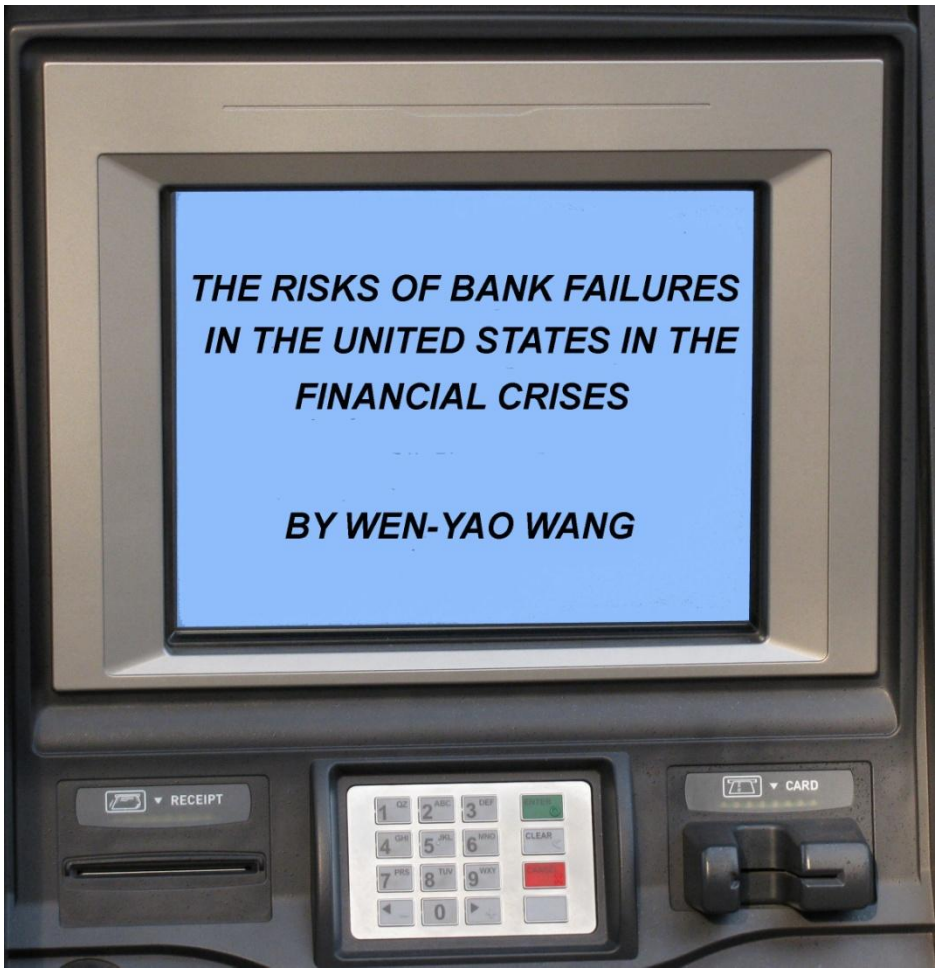

Peer Reviewed

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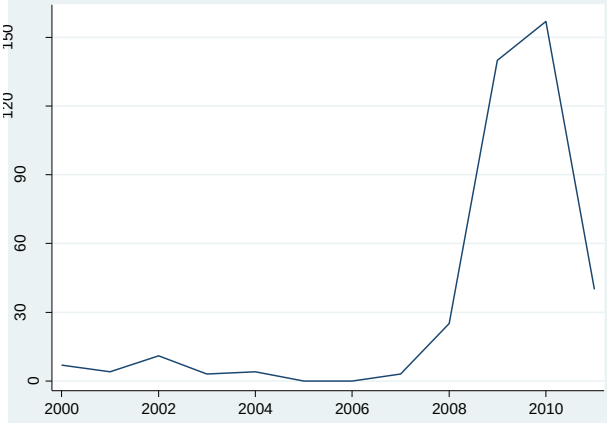
Abstract

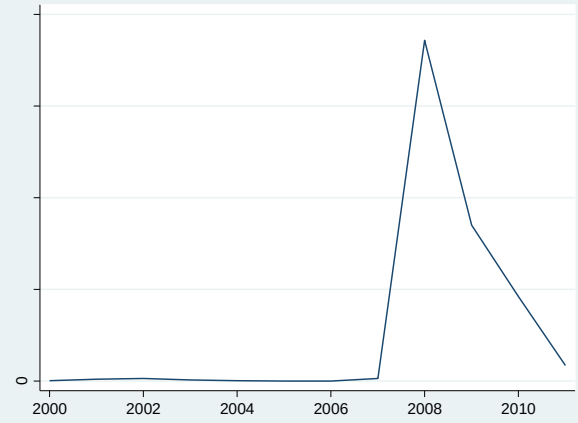
This research surveys the literature of the current financial crisis and provides new insights in explaining why numerous commercial banks in the United States failed. The risk channels defined in this study provide a guideline to reexamine the predictive accuracy of the early warning systems of banking crisis and bank failures.

Introduction

The increasing risk of financial institutions has taken its toll on the economy. We have experienced bankruptcies of major financial institutions and severe market illiquidity followed by financial meltdown. Accompanying that, we experienced a surge in the number of bank failures from 3 in 2007, 25 in 2008, 140 in 2009, to 157 in 2010. The Federal Deposit Insurance Corporation (FDIC) reported the increasing size of estimated losses in order to cover "the difference between the amount disbursed from the Deposit Insurance Fund" and "the amount to be ultimately recovered from the liquidation of the receivership estate" (FDIC website). The estimated cost was $0.21 billion, $19.86 billion, and $37.35 billion in 2007, 2008, and 2009, respectively. Figure 1 below shows the severity of the current financial crisis. Panel (A) reports the number of bank failures, and Panel (B) shows the sum of total assets for the banks that failed over the period from 2000 to 2011.



(A) Number of Bank Failures



(B) Total Assets for Failed Banks

More importantly, the financial crises manifested first in the United States have impacted the real economy in many ways. First, blocked access to capital markets has led to a credit crunch and market illiquidity in the U.S. Financial institutions and corporations in the private sector that relied heavily on banks for capital experienced funding difficulty after these adverse shocks. Second, a banking system that did not function normally obstructed the transmission mechanism of monetary policy and, thus, slowed the pace of recovery and growth. Third, the U.S. financial crisis turned into a global financial crisis due to the interconnection among banking systems, international regulatory forbearance, and the lack of global collaboration in policy.

Given the severity in terms of social costs and the magnitude of the recent financial crises, researchers appear increasingly concerned about the new challenges of potential risk exposure in the banking system. Therefore, this study fills the gaps in the literature and explains the new insights learned from the current financial crisis that can improve early warning systems in predicting bank failures.

The remainder of this paper is structured in the following way: First, risk exposure in the banking sector and financial intermediaries in the current financial crisis are discussed. Second, surveys of the early warning systems that predict the likelihood of banking crises and bank failures are re-examined. Third, challenges in terms of policy remedies for regulatory agencies are discussed. This discussion is followed by the author's conclusions.

New insight from the current financial crisis

Does history repeat itself? Is the U.S. sub-prime mortgage crisis different from previous financial crises? Sometimes history repeats itself, but researchers are fully aware that each crisis is unique in its own way. What can we learn from the historical crises, and what are the new insights of the current financial crisis? The following sections provide a detailed discussion of various risk channels that may ultimately lead to financial crises and bank failures.

Portfolio credit risk and investment risk

Diamond and Dybvig (1983) provide a micro-foundation to study bank's asset allocation and multiple equilibria. The model is applied by Cooper and Ross (1998), Ennis and Keister (2006, 2007, 2009, 2010), Peck and Shell (2010), and Uhlig (2010). Illiquid assets and long-term investment increase profitability, but they expose banks to illiquidity after intrinsic and extrinsic shocks.

Banks engaged in intermediation suffered from new forms of banking problems (Duffie, 2010). Banks' profit activities have shifted to securities underwriting, short-term trading, and off-balance-sheet activities. "Troubled financial institutions held portfolios in asset-backed securities rather than being invested in long-term projects" (Uhlig, 2010). The backstop or the implicit recourse to the off-balance-sheet special purpose vehicles contributed to overhanging loans for the sponsoring institutions (Gorton and Souleles, 2007; Brunnermeier, 2009; Shleiger and Vishny, 2010). Short-term assets that must be frequently rolled over could become problematic when uncertainty in the economy rises.

In addition, easy access to the capital markets exposes banks to unforeseen credit risks. Cebenoyan and Strahan (2004) and Wagner (2007) note that banks having access to loan sales have a larger percentage of risky assets which result in instability and externalities associated with banking failures. This leads to the problem that the model of bank failure prediction is unable to update and sustain the accuracy as the evolution of bank's asset transformation shifts from lending to securities underwriting and market trading.

Systemic risk

Financial institutions were aware of opportunities to shift the downside risks onto the safety net (Caprio, Demigur-Kunt, and Kane, 2008). Large banks that went through greater fire sale discounts created instability in the financial system (Acharya, Santos, and Yorulmazer, 2010). Herding of individual bank investment, on the other hand, increased risks that many banks would fail together. As a result, when regulators showed greater ex-post forbearance during systemic crises, banks had incentives to herd in the interconnected global financial system and thus exacerbated moral hazard, the contagion effect, and the problem of systemic risk. This raises the question of whether the early warning system in the literature is effective for identifying the systemically important institutions and regulating risks associated with those too-systemic-to-fail or too-many-to-fail financial institutions?

Incentives and risk

Kashyap, Rajan, Stein (2007) and Kane (2009) note that limited incentive alignment, flawed internal compensation, and conflict of interests worsened agency problems. Information providers in the private sector had incentives to manipulate the information to satisfy their clients at every stage of the securitization process. Given that fund managers are rewarded for increasing the value of assets under their management, the misaligned incentives increased risk exposure and caused managers' interests to deviate from those that are desirable for investors (Basak, Pavlova, and Shapiro, 2008). Thus, regulators face the issue that the early warning system is unable to identify the incentive and governance problems rooted in the process of securitization, collaterized borrowing, or off-balance-sheet activities through special purpose vehicles.

Capital and liquidity risks

Capital requirements and the Basel Accords were supposed to prevent banks' from taking excessive risks by putting shareholders at risk; however, it created regulatory arbitrage through asset transformation. In good times, short-term debt was cheap to issue; thus it resulted in the entry of limited capitalized, but highly leveraged financial institutions (Acharya and Viswanathan, 2010). Banks attracted short-term funding through non-deposit sources at the cost of enhanced bank fragility. When the crises unfolded, distressed banks were forced to liquidate assets at the time when asset quality was hard to value. The liquidation easily wiped out banks' capital and caused banking failures (Adrian and Shin, 2009; Brunnermeier and Pedersen, 2009; Shleifer and Vishny, 2010). Given the interconnected nature of the global financial system, cross-broader regulatory arbitrage could turn a regional sub-prime mortgage crisis into a global financial crisis (Mishkin, 2011). The model predicting bank failures had difficulty capturing the risk of regulatory arbitrage and the complexity of potential loophole mining.

Market illiquidity risk

Once the crises unfolded, asset quality was hard to value and, thus, the liquidity of the market evaporated. Restricted debt capacity (Acharya, Santos, and Yorulmazer, 2010) or overhang with illiquid assets seized up sellers' term credits in the distressed economy and could cause market illiquidity (Diamond and Rajan, 2009a). The funding liquidity intertwined with the market liquidity increased the severity of the financial crisis (Brunnermeier and Pedersen, 2009). Once the funding channel was blocked, banks stocked with illiquid, toxic assets failed (Demirgüç-Kunt and Huizinga, 2010).

Some facts are noteworthy. First, rather than depositors withdrawing from local banks, "funds withdrawn by financial institutions at some core financial institutions (Uhlig, 2010)" worsened market illiquidity. Second, as Caprio, Demigur-Kunt, and Kane (2008) note, the boundary between illiquidity and insolvency that was previously recognized in the literature somehow dissolved when a financial institution experienced a liquidity crisis. Third, dynamic response among depositors and financial institutions due to the time inconsistency in implementing policy may create waves of crisis and withdrawals. Examiners need to inquire if the early warning system is able to include these facts in determining the probability of banking crises and bank failures.

Literature of the early warning systems in predicting crisis and bank failures

Given new challenges and potential risk exposure in the banking system, researchers appear increasingly concerned about the sustainability and prediction accuracy of the early warning systems that predict bank failures. The indicators that successfully distinguish surviving banks from their failed peers can serve as a signal to prevent future bank failures. In this section, the literature is surveyed at a broad level in order to assess the pros and cons of various models forecasting bank failures.

In the literature of early warning systems, the proxies for the CAMELS (capital adequacy, asset quality, management, earnings, liquidity, sensitivity to market risk) including the capital adequacy ratio, ratio of nonperforming loans, liquidity ratio, loan growth, value of real-estate collateral, and other variables on a bank's balance sheets and income statements are used extensively to assess or predict bank failures. The logit model is commonly used in predicting banking failures. Martin (1977) employs the logit model using a cross-sectional data for 1970 to identify key variables such as net income ratio, charge-offs, loan to asset ratio, commercial loans ratio, loss provision, net liquid asset ratio, and the capital ratio that are highly related to the probability of bank failures. The author concludes that "conventional bank soundness criteria will vary over the business cycle." Similarly, West (1985) uses logit estimators to measure the condition of individual institutions and the probability of being classified a problem bank. Kolari, Glennon, Shin and Caputo (2002) use logit and nonparametric trait recognition to predict large U.S. commercial bank failures in the late 1980s and early 1990s. Given a set of independent variables such as size, profitability, capitalization, credit risk, liquidity, liabilities, and diversification, the authors find that both logit and trait recognition

performed well in terms of classification results. Trait recognition has better prediction accuracy using holdout samples.

Poghosyan and Cihak (2009) analyze the causes of bank distresses in Europe using several logistic probability models. The authors "establish plausible thresholds for identifying weak banks" by checking indicators of the CAMELs variables, market price of financial instruments, bank concentration, and market discipline. In addition, the results do not reveal much heterogeneity across European Union countries. Hence, the common benchmark criteria are suitable, but exposure to systemic risks will be extremely high as well. Cole and White (2010) note that the proxies for the CAMELS and the measures of commercial real estate are better indicators than residential mortgage-backed securities in predicting the likelihood of U.S. commercial bank failures in the most recent financial crisis. Foos, Norden, and Weber (2010, JBF) study how loan growth impacts the riskiness of banks in 16 countries. They find that past abnormal loan growth has persistently positive effects on subsequent loan losses, declines in interest income, and a decrease in bank solvency. However, in light of the 2007-2009 financial crises, the authors are aware that the study leaves off-balance sheet activities, credit risk transfer, and dynamic market-based risk not discussed.

Davis and Karim (2008) provide early warning systems for banking crises in which the predictive efficiency vary accordingly due to the choice of dependent variables, the lags and interactive terms included, and the choice of country-specific warning models versus the ones in global arena. They conclude that real GDP growth and terms of trade are leading indicators in predicting banking crises under a multinomial logit setup and signal extraction procedures. Later, Barrell et al. (2010) perform logit regression and find that bank capital, bank liquidity, and property prices detect the probability of banking crises for the OECD (Organization of Economic Co-operation and Development) countries in early warning systems. Cihak and Schaeck (2010) focus on the effect of aggregate prudential ratios, known as financial soundness indicators, in identifying systemic banking problems and banking crises in the dataset of 100 developed and developing economies. They find that banks' return on equity, corporate leverage, capital adequacy ratio, and the ratio of nonperforming loans are good early warning signals that successfully detect bank's vulnerabilities, panic, and crisis. The studies listed above focus on banking crisis prediction on a broader level, rather than the prediction of bank failures. Demyanyk and Hasan (2010) provide a comprehensive summary in reviewing prediction methods of financial crises and bank failures. The authors review and compare econometric analyses to the operations research models.

More challenges to fix financial crises and bank failures

There is no easy fix on the issue of financial crises. To improve the predictive accuracy of early warning systems, we have to be aware of the scope of banking activities and potential risks in the process of those banking transactions. The traditional Diamond-Dybvig model is applied extensively in discussing time inconsistency, bank's asset allocation, and multiple equilibria. However, under the setting with liquid and

illiquid assets, this model may not fully address the structure of the firm which indicates whether it is systemically important and whether this firm is heavily involved in securitization and market trading. Without considering the new layer of complexity, policy suggestions based on the Diamond-Dybvig type banking model may not be able to capture financial instability in general or the chance of banking failures in particular, rooted from the new banking problem and systemic risks.

Forcing banks to hold only liquid assets reduces the risk of running out of cash, but it creates the incentive for other liquidity risks (Peck and Shell, 2010). Setting limits on product mixes will be hard because the appropriate structure of firms may result from organic growth based on superior efficiency (Rajan, 2009). Goolsbee (2010) has made a similar argument by noting that, without addressing the scope of institution's activities and the interconnectedness of the lines of business, simply breaking up large financial institutions will not solve the problem of systemic risk. It simply creates small institutions with complicated financial activities and transactions. To make things more complicated, response to the global financial crisis may often lead to cross border regulatory arbitrage in an absence of a global coordination (Moshirian, 2011).

Another challenge faced by a regulatory agency is the transmission of macroeconomic or monetary policy shock to bank risk. Buch, Eickmeier, and Prieto (2010) assess the transmission of macroeconomic shocks through the banking sector and conclude that risk of one-third of the sampled 1,500 U.S. commercial banks rises in response to a loose monetary policy. In addition, in response to the increasing concern of the sustainability of the pace of recovery, quantitative easing has been implemented for an extended period of time.

Monetary policy for the past two years is summarized in Chairman Bernanke's testimony: "The target range for the federal funds rate has been near zero since December 2008, … economic conditions are likely to warrant an exceptionally low target rate for an extended period. Consequently, another means of providing monetary accommodation has been necessary ….the Federal Reserve has eased monetary conditions by purchasing longer-term Treasury securities, agency debt, and agency mortgage-backed securities on the open market…. The FOMC (Federal Open Market Committee) authorized a policy of reinvesting principal payments … into longer-term Treasury securities" (Bernanke, 2011). Further study of the consequences of the quantitative easing and the prolonged close-to-zero interest rate policy on the risk exposure in banking and financial sectors has to be done.

Conclusions

The increasing risk of financial institutions has taken a toll on the economy. We have experienced bankruptcies of major financial institutions and severe market illiquidity followed by a financial meltdown. Given the severity in terms of social costs and the magnitude of the late financial crises, researchers appear increasingly concerned about the new challenges of potential risk exposure in the banking system.

Research surveys the literature of current financial crisis provides new insights in explaining why commercial banks in the United States failed in the most recent financial crisis. Aiming to pinpoint the channels of various risk exposure and the challenges faced by the regulatory agencies, this study provides a guideline for researchers to improve the predictive accuracy of the early warning systems of banking crisis and bank failures.

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Note: The title graphic is by Carole E. Scott