



# The systemic risk of European banks during the financial and sovereign debt crises <sup>☆</sup>



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## ARTICLE INFO

### Article history:

Received 12 February 2015

Accepted 14 September 2015

Available online 8 October 2015

### JEL classification:

G15

G21

G28

### Keywords:

Banking systemic risk

European debt crisis

Too-big-to-fail

Leverage

Correlation

Credit default swap

Macroprudential regulation

## ABSTRACT

European banks became a source of risk to global financial markets during the financial crisis and attention to the European banking sector increased during the sovereign debt crisis. To measure the systemic risk of European banks, we calculate a distress insurance premium (DIP), which integrates the characteristics of bank size, probability of default, and correlation. Based on this measure, the systemic risk of European banks reached its height in late 2011 around €500 billion. We find that this was largely due to sovereign default risk. The DIP methodology is also used to measure the systemic contribution of individual banks. This approach identifies the large systemically important European banks, but Italian and Spanish banks as a group notably increased in systemic importance during the sample period. Bank-specific fundamentals like capital-asset ratios predict the one-year-ahead systemic risk contributions.

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<sup>☆</sup> We benefited from discussions with Viral Acharya, Tobias Adrian, Jens Christensen, Robert Engle, Paul Glasserman, Michael Gordy, Galina Hale, Philipp Hartmann, Joel Hasbrouck, Erik Heitfield, Jia Li, Nellie Liang, Andrew J. Patton, George Tauchen, Skander Van den Heuvel, David Veredas, and from comments of seminar and conference participants at Duke University, New York University QFE Seminar, University of California Santa Cruz, University of Illinois Chicago, Federal Reserve Board of Governors, Federal Reserve Bank of San Francisco, Peking University National School of Development, WU Gutmann Center Symposium on Sovereign Credit Risk and Asset Management, 12th Annual Darden International Finance Conference at University of Virginia, FDIC/JFSR 12th Annual Bank Research Conference, G-20 Conference on “Financial Systemic Risk”, Bocconi CAREFIN Conference on Banking with Tighter Regulatory Requirements, Federal Reserve “Day Ahead” Conference, and Temple University Workshop on Systemic Risk and the Insurance Industry. We would like to thank Clara Vega and Rob Capellini for kindly providing the SRISK and CoVaR data. Michael Carlson and Jason Goldrosen provided excellent research assistance. The analysis and conclusions set forth are those of the authors and not necessarily those of the Federal Reserve or its staff.

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## 1. Introduction

In late 2011, the European financial system appeared to be on the brink of a major crisis. Investors were faced with the possibility of a Greek default while European leaders wrestled with a fiscal situation that had no clear precedent. As contagion fears spread to Italy and Spain, market participants began to consider the worst-case scenarios. One of the greatest concerns was the systemic risk of the European banking system. If a sovereign default were to lead to a failure of a systemically-important European bank, the resulting financial instability could be disastrous. This type of scenario highlights the need for identifying and understanding the contribution of banks to systemic risk in the financial system.

In this paper, we provide a measure of systemic risk for a broad range of European banks and examine contributing factors. Our systemic risk measure is a distress insurance premium (DIP), which integrates the characteristics of bank size, probability of failure, and correlation. These components capture the main characteristics of systemic risk (Huang et al., 2009, 2012). Based

on this measure, we show that European banks posed a significant systemic risk, which reached its peak in November 2011. At that point in the unfolding of the European sovereign debt crisis, the problems faced by the European banking system and the potential for global spillovers were clearly the main focus of all market participants and bank regulators.

Our analysis builds on the recent literature attempting to measure systemic risk using publicly available information (see, e.g., [Adrian and Brunnermeier, 2014](#); [Acharya et al., 2010](#); [Brownlees, 2012](#)).<sup>4</sup> We empirically measure the hypothetical insurance premium to cover distressed losses in the European banking system based on the inputs of total balance-sheet liabilities, credit default swap (CDS) spreads, and equity return correlations.

After developing this measure of systemic risk, we explore the determinants of systemic risk as well as the contributions from individual banks and countries. The ultimate goal is to understand the sources of systemic risk. The main findings provide a number of insights into the nature of European banks' systemic risk and the policy implications.

First, the systemic risk indicator for European banks is elevated in both the financial crisis and sovereign debt crisis, but the determinants of systemic risk during these periods appear to differ. In 2008 and 2009, the movement in the indicator for European banks reflects spillovers from the U.S. financial crisis. All banks across the region felt the stress produced by the failure of Lehman Brothers in 2008. During this stage of the global financial crisis, market perception of the systemic risk of European banks appears to have been mainly driven by the risk premium component. This suggests that the stress was mostly due to heightened risk aversion and liquidity hoarding in global financial markets.

The elevated systemic risk of European banks during the sovereign debt crisis—reaching its height in 2011—was largely due to increased default risk. Systemic risk quickly increased with the Greek bailout agreement in May 2010 and, as the European sovereign debt crisis unraveled, the systemic risk of European banks rapidly rose to its highest peak in November 2011. Physical default probabilities of European banks rose substantially in the second half of 2011, which points to real solvency risk as a major contributor to systemic risk. This suggests that European banks were faced with real solvency threats from their balance sheets, likely due to their holdings of peripheral European sovereign debt. Systemic risk only began to decline at the end of 2011, which may be attributable to additional liquidity injections from the European Central Bank (ECB).

However, there was another huge run-up in the systemic risk measure in the second quarter of 2012, concerning potential default of a major European country—Spain. Ultimately, a sustained decline of European banking systemic risk only occurred after Mario Draghi's "courageous leap" speech in May and "whatever it takes" speech in July, followed by the announcement of the ECB's unconventional monetary policy—Outright Monetary Transactions (OMT) in August 2012. At the end of our data sample, January 2013, the European banking systemic risk measure roughly returned to the level of May 2010, the time of the first Greek bailout.

Second, the analysis on the marginal contribution of each bank (or bank group) to the systemic risk indicator suggests that bank size and correlation are very important in determining the systemic importance of individual banks, which is consistent with [Tarashev et al. \(2009b\)](#). This result supports the "too-big-to-fail"

concern from a macroprudential perspective. The increase in the systemic risk contributions of certain "small" banks can be largely attributed to the deterioration in credit quality (increases in default probability and/or correlation) of these banks.

In our country analysis, we find that the banking systems of certain countries played unique roles during recent periods. For instance, the systemic importance of U.K. banks rose and fell with the global financial crisis, corresponding to the United Kingdom's role as a global financial center. In the sovereign debt crisis, the largest increase in contributions to systemic importance came from the Italian and Spanish banks. This suggests that concerns regarding relatively smaller banks in these southern European countries can still have significant systemic risk implications for the rest of Europe, possibly due to the high correlation or contagion effect. These findings provide empirical support for the European-wide macroprudential regulation regime of systemically important banks and/or groups of banks.

We also demonstrate that bank-specific economic fundamentals do predict the one-year ahead systemic risk contribution of each bank in an economically meaningful way. For example, firm size and the leverage ratio forecast increases in systemic risk, while short-term funding adequacy and a favorable market valuation ratio forecast decreases in systemic risk. More importantly, Basel capital ratio and implicit government support actually lead to future increases in systemic risk, which suggests that the traditional microprudential regulation regime inadvertently gives banks strong incentives to take on more systemic risk.

Our study is motivated by the euro area's struggle since 2010 with the twin crises of sovereign and financial default. To decouple the vicious cycle of sovereign and financial stress, the euro area needs not only a fiscal union and a lender of last resort, but also a banking union with a common resolution regime, deposit insurance, and banking supervision and regulation. Our research contributes to the development of euro-area banking regulation—to monitor euro area-wide financial stability and to supervise the systemically important euro-area banks—as the ECB implements the Single Supervisory Mechanism (SSM). For instance, prior to the establishment of the SSM, policymakers debated whether the euro-area banking regulator should be responsible for 6000 banks or only the 25 largest banks. Our results point to something in between—not only the systemically-important largest banks but also the systemically-important banking systems of certain countries, which coincides with the ultimate approach followed by the SSM.<sup>5</sup> The appropriate macroprudential regulation of the euro area banking sector could help to secure Europe's need for financial stability.

Our research contributes to the global effort of macroprudential regulation. The global financial crisis of 2007–2009 led international regulators to adopt a system-wide macroprudential approach to bank regulation (see, [Borio, 2011](#), for a summary). The macroprudential perspective of regulation focuses on the soundness of the banking system as a whole and the interlinkages between financial stability and the real economy (see, e.g., [Bernanke et al., 1998](#); [Adrian and Boyarchenko, 2012](#); [He and Krishnamurthy, 2012](#)). Such an approach has become an overwhelming theme in the policy recommendations by international policy institutions, national stability regulators, and academic researchers (see, [Brunnermeier et al., 2009](#); [Basel Committee on Banking Supervision, 2009](#); [U.S. Congress, 2010](#), among others).

<sup>4</sup> For an overview of methodologies in systemic risk analysis, see [Bisias et al. \(2012\)](#). These systemic risk measures are useful complements to other balance sheet information—such as the IMF Financial Sector Assessment Program (FSAP)—and supervisors' stress tests based on confidential banking information—such as the 2009 Supervisory Capital Assessment Program (SCAP) by the U.S. regulators.

<sup>5</sup> Europe traditionally has more of a bank-based financial system than a market-based financial system like the United States, so the systemic importance of individual banks is even greater for financial stability ([Allen and Gale, 1995](#)). Also in Europe, the financial and economic integration in recent decades implies that the health of individual European banks has implications for the financial stability of the entire region ([Bolton and Jeanne, 2011](#)).

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