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The Role of Interconnectedness in the Financial Contagion of the Interbank of Germany in 2007

Yilin Sha[1,a,*]

[1]*Department of Economics, Northeastern University, 360 Huntington Ave, Boston, MA 02115, United States*
a. sha.yil@northeastern.edu
**corresponding author*

Abstract: The collapse of the US housing market, which had cascading effects and spread to interbank lending markets, was what sparked the German financial crisis in late 2007. In light of this, the purpose of this paper is to investigate how interconnection influenced interbank financial contagion in 2007. This paper followed the methodology of first outlining the case study, covering the causes and effects of the financial crisis, and then assessing the effects of interconnection on the contagion process; finally, recommendations for future policymakers were developed and evaluated. The main conclusion was that interconnectedness makes it easier for systemic risks and liquidity shortages to happen in financial institutions. To make banks more resilient to shocks, the solutions were to lower the concentration of the banking sector and raise bank equity and transparency. The primary objective of this study was to validate the function of interconnectedness and networks in establishing a transmission channel for contagion, as well as to give recommendations to policymakers on potential future regulatory policies and actions.

Keywords: Interconnectedness, Financial Contagion, Financial Crisis

1. Introduction

1.1. Research Background

The worldwide financial crisis of 2007–2008, sometimes known as the Great Recession, was one of the most severe financial downturns since the Great Depression of the 1930s. It began with the collapse of the housing bubble in the United States, where banks had heavily invested in subprime mortgages. These dangerous loans were packaged into sophisticated financial products, which, when borrowers defaulted, caused a cascade failure of financial institutions. The crisis swiftly extended throughout the globe, affecting banks, financial markets, and economies worldwide. It resulted in several bank collapses, government bailouts, and widespread economic suffering, including high unemployment rates and a catastrophic recession in the world economy. The global financial crisis highlighted how borrowing and lending by banks and other financial intermediaries may spread across the financial system. The collapse of subprime mortgage lenders in the United States had a particularly large impact on the German interbank market [1]. As a result, Germany witnessed a significant economic slowdown, with commercial institutions undergoing bailouts and collapses. This

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was also seen in commercial banks' liquidity concerns, restricted loans, and a drop in investment and consumer expenditure.

In late 2007, investor confidence experienced a significant decrease. German banks, renowned for their soundness, were unexpectedly perceived as susceptible, resulting in a cascading impact on the stock market and the wider financial economy. Scholars have become interested in the impact of financial contagion on amplifying the consequences of shocks in the financial system. Memmel and Stein utilized a distinctive dataset that depicted the reciprocal connections among German banks in order to evaluate the susceptibility of the German financial system [2]. The results show that there is a low chance of contagion, depending on the features of the first big bank that started the chain reaction [2]. Chiba examined the financial spread of banks' obligations within a core-peripheral network from a conceptual standpoint [3]. The study concludes that the transmission of contagion occurs during periods of low asset prices. Allen and Gale elucidated the impact of network links among banks on the occurrence of financial contagion [4]. In a hypothetical situation where all banks are completely interconnected, the consequences of a financial shock are negligible and do not result in the spread of negative impacts, as the shock's influence is evenly distributed throughout all banks. In contrast, in a scenario where each bank has limited connections to other banks, the ones that are closely tied to the initially impacted bank experience substantial financial losses. This is especially accurate when they try to sell off assets that have been held for a long period of time, resulting in the transmission of financial contagion to other banks.

1.2. Research Gap

Although current research has indeed investigated the financial contagion of banks in Germany since 2007, the role of the network has been explored to a smaller extent. Thus, this paper aims to fill this research gap and seek to answer the research question: How does interconnectedness affect the financial contagion of interbanks in Germany since 2007? This is crucial, as the financial system involves multiple stakeholders and intermediaries. Understanding how banks are interconnected helps researchers and regulators better mitigate systemic risks, where the failure of one institution can lead to a cascade of failures across the financial system, thereby identifying the pathway through which shocks can propagate through the financial system.

1.3. Structure of the Paper

The subsequent parts will comprise three elements: a case narrative, an examination of the concerns, and a recommendation. The case section will provide a description of the financial contagion of Interbank in Germany in 2007. The analysis section will examine the role of the network and how the types of links between financial intermediaries contribute to financial contagion. The inclusion of data and figures will support this analysis. Finally, the Suggestion section will analyze the research implications and delve more into suggestions for mitigating such spread.

2. Case Description

Since 2007, the global financial market has been in turmoil, especially in Germany. The crisis is mostly ascribed to the boom in the US housing market, which is seen as the first wave of the crisis. The financial system began to demonstrate volatility. As the federal funds rate rises, so do mortgage rates, resulting in higher debt servicing costs for families [5]. Loan defaults increased dramatically, and the housing bubble finally crashed in 2007. Financial intermediaries suffered losses as asset values fell. Lehman Brothers' August 2008 bankruptcy, which occurred while it was one of the biggest investment banks in the country and a significant underwriter of mortgage-backed securities, set off

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the second wave of the crisis [6]. Borrowers of funds or organizations that specialize in investment (hedge funds) were severely impacted and faced liquidity issues such as a lack of assets and liabilities.

The German financial sector was significantly impacted. Major banks like SachsenLB and Deutsche Industriebank AG faced significant write-downs and liquidity issues, like a decline in assets and liabilities. For instance, the Scahsen LB lost €1.8 billion by the end of 2008 [7].

Throughout 2008, when contagion spread at a faster rate, private banks and other types of assets were affected. Deutsche Bank incurred the largest losses among German commercial banks due to its size and global presence. Dresdner Bank and Commerzbank also faced significant write-downs, but these were lower in comparison to their assets. Hypo Real Estate, a specialized bank, was most at risk of insolvency in 2008, with write-downs of €4 billion and refinancing challenges through its subsidiary Depfa [7]. As the write-downs reduced the equity and amount of funds in the banks, the ability to lend money to ordinary citizens decreased, thus reducing investment activities and thereby negatively affecting aggregate demand. Generally, economic growth slowed down in the third quarter of 2008. At its lowest, the German GDP shrank by 7.9% in the second quarter of 2009 [8].

3. Analysis of the Effectiveness of Interconnectedness on the Financial Contagion

3.1. Systemic Risks

The interconnectivity among various financial institutions within the system can lead to a chain reaction, causing the spread of financial contagion across multiple countries, such as from the United States to Germany. This, in turn, amplifies the overall risks to the system.

Figure 1 illustrates the interbank lending network in Germany before the crisis. The network consists of 19 banks, forming a core group that is closely connected and serves as an intermediary for lending and borrowing with peripheral banks. German citizens deposit their money into banks, which act as lenders represented by the green node, and entrust it to intermediaries represented by the blue node. These prominent intermediaries subsequently transfer the funds to specialized investment banks (shown as borrowers, depicted by the yellow node) operating within the hedge fund business, with the aim of generating enhanced returns on the invested assets.

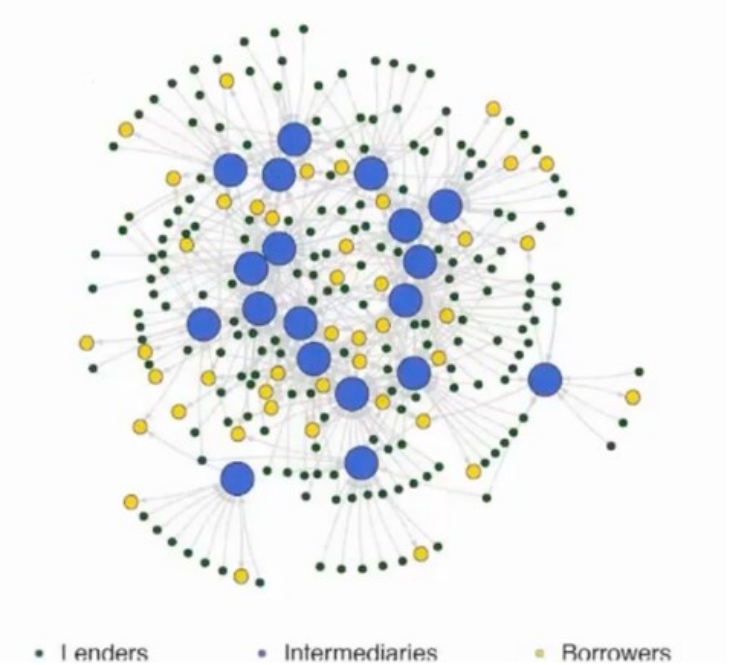

Figure 1: Pre-crisis interbank lending network in Germany [6].

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As stated in the earlier case description section of this article, one of the primary causes of the German financial crisis was the bankruptcy of Lehman Brothers. However, how did the contagion extend from the United States to Germany and impact the interbank lending market? It turned out that many hedge fund organizations utilize Lehman Brothers as a broker, or someone who ensures the money is valid and in existence prior to the transaction. When Lehman Brothers crashed, the money tied up with the broker became unreachable. And this had a significant impact on the US hedge fund business, resulting in a lack of liabilities and liquidity concerns. This has now extended to Germany, hurting hedge fund institutions such as the German Hypo Real Estate Group.

As shown in Figure 2, several of Germany's hedge fund institutions were affected, with the yellow node turning orange. When their assets were diminished as a result of Lehman Brothers' bankruptcy, they lacked the funds to repay the financial intermediaries (shown as the blue node). Finally, lenders and financial institutions that hold consumer money would suffer, as would ordinary residents, resulting in an economic slowdown. In this situation, the network serves as a transmission vector for financial contagion across international borders. This has increased the risk of a systemic breakdown, rather than the failure of a single institution. Because of this interdependence, problems in one bank might quickly spread to others, jeopardizing the overall banking system's viability. Individual banks were not the only ones at risk; the entire network was, highlighting the collective vulnerability inherent in a highly linked financial system.

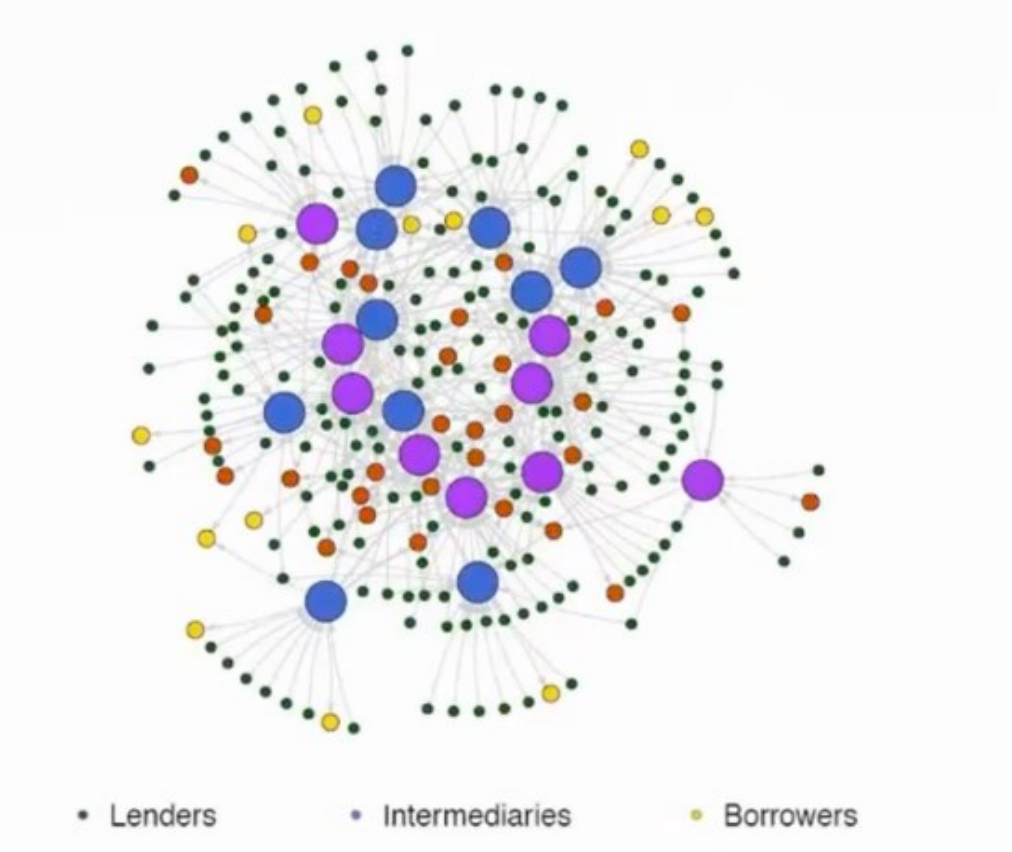

Figure 2: Post-crisis interbank lending network in Germany [6].

3.2. Liquidity Shortages

Given the numerous participants in the financial market, the interdependence of the financial system can result in a liquidity crisis. According to financial intermediaries in the United States, this happens

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when banks become hesitant to lend to one another because of uncertainty regarding their exposure to risky assets, such as credit card debt, corporate loans, and derivative products [5].

Due to the financial network involves many stakeholders and has different types of connections associated with it, financial insolvency can spread from borrowers to banks to lenders to many other players that conduct business with them within the entire economy. Direct and indirect contagion are two categories of contagion, as mentioned in the paper by Mikropoulou and Vouldis [9]. Direct contagion is characterized as those that happen due to contractual obligations between institutions, such as loans to partnerships, where the value of one party is owed to another and is dependent upon the other party [9]. On the other hand, indirect contagion is characterized as those arising from broader market dynamics, such as asset price changes or liquidity shifts [9]. In this paper, it is found that indirect contagion tends to exhibit a more substantial and abrupt impact [9]. In other words, contagion spreads at a faster rate when banks or institutions have liquidity links with each other, such as relationships that involve one's purchase of another's investment (e.g., mortgages) or bonds issued by another firm or have claims on the assets of the counterparties.

There are several reasons why interconnectedness can lead to liquidity shortages and thus cause widespread contagion. Firstly, banks often engage in interbank lending, where they borrow and lend to each other for short-term liquidity needs. This interdependence means that if a significant bank faces a liquidity crisis, it may suddenly withdraw its funds from the market or fail to renew loans to other banks. This action can disrupt the normal flow of liquidity, creating a ripple effect where multiple banks discover themselves short on liquid assets as they rely on these interbank loans for their short-term liquidity needs. Secondly, fear and uncertainty in the financial market can have cascading effects. The health of one bank can significantly impact the perceived stability of other banks, especially in a highly interconnected system. If a bank faces financial trouble, it can lead to a loss of confidence among investors and counterparties in other banks, who fear similar unseen problems. This fear can result in a widespread withdrawal of funds, a refusal to roll over credit, and an overall tightening of liquidity as everyone tries to reduce their risk exposure, leading to a systemic liquidity crisis.

4. Suggestions for Future Financial System Policies

4.1. Suggestions on How to Reduce Systemic Risks

In response to how interconnection contributed to systemic risks in Germany's financial system, this article discovered that reducing concentration in the banking sector is critical in preventing the failure of one significant firm, which would have cascading repercussions on the rest of the financial system. This meant that no single organization should operate as a monopoly or have excessive market power. As Bleuel stated, the concept of "too big to fail" is emphasized as a significant worry [5]. When banks grow so huge and integrated into the financial system that their failure threatens the entire market, they generate a significant systemic risk. The collapse of Lehman Brothers serves as a case study to demonstrate this argument. Its bankruptcy had a substantial systemic impact because of its significant involvement in the financial markets as the primary underwriter of mortgage-backed securities, influencing the housing market, hedge fund market, and money market. He also claims that great concentration in the financial business might lead to little competition. When a few major enterprises dominate a market, they have a sizable share of its resources, customers, and revenue. This dominance makes it harder for smaller enterprises to compete effectively, as large firms frequently have more resources, economies of scale, and market power. High concentrations can raise entrance barriers for new enterprises while also limiting expansion for current, smaller firms. Large, dominating corporations may have created strong customer ties, brand loyalty, and control over vital infrastructure or technology, making it difficult for competitors to enter or grow in the market. As a

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result, more rivalry is critical, as low competitiveness frequently leads to complacency, resulting in less innovation and operational inefficiencies. This can make the entire financial system more vulnerable to shocks since banks may not use the most efficient or up-to-date risk management procedures and technologies.

Moreover, reducing the concentration of the banking system can enhance risk diversification. In a less concentrated financial system with a greater number of players, the risk is spread among different players. When risk is diversified, the overall banking system and network are more resilient and adaptive to challenges. Thus, a lower concentration, implying a more diversified banking sector, would likely result in greater stability. This is because the failure of any single institution would be less likely to disrupt the entire system.

A highly concentrated banking sector can increase the risk of contagion, where problems in one bank quickly spread to others. In a less concentrated system, banks are more independent of each other, reducing the likelihood that issues in one bank will directly impact others. Nonetheless, there is an interesting trade-off in the financial contagion. Initially, as companies start interlinking through various trades, securities, contracts, and obligations, the risk of financial contagion heightens due to their growing interdependence, forming a complex network. For example, if each company is primarily connected to two or three other major entities, the network becomes significantly interconnected, creating a vast component. This interconnectedness also implies a higher risk for each company if one of its main partners defaults or fails to fulfill a commitment. However, as more connections are added to this network, the systemic risk eventually diminishes. This is because each institution's risk exposure becomes more diversified, reducing the likelihood of failure due to the collapse of any single connected entity. Thus, even as the network grows denser, the probability of risk cascading through these links' decreases.

4.2. Suggestions on How to Reduce Liquidity Shortages

Although there is debate about the potential for a liquidity crisis to cause extensive contagion in the interbank lending market, this study determined that enhancing bank equity and openness are essential to reducing the likelihood of future contagion within the system.

Higher bank equity is critical to the overall stability of the financial system, preventing banks from experiencing liquidity shortages. As Bleuel has stressed, increased equity means banks have a stronger capital buffer to withstand losses [5]. In times of financial stress, such as a market slump or the default of a big debtor, banks with more equity are better able to endure these shocks without going bankrupt. This resilience can keep a bank's problems from turning into a systemic disaster. Second, increased equity lowers a bank's reliance on debt. Lower leverage indicates that a bank is less reliant on short-term borrowing and can satisfy its obligations even in unfavorable situations. This stability decreases the likelihood of a bank run, in which depositors or lenders suddenly demand their funds, resulting in liquidity problems. Third, investors, depositors, and other financial institutions often regard banks with larger equity as more dependable and stable. This view can boost trust in the banking system, lowering the possibility of panic withdrawals or refusals of interbank lending, both of which can cause liquidity crises. Fourth, when a low-equity bank experiences difficulties, the distress can swiftly spread to other financial institutions via interrelated lending and investment arrangements. Higher equity levels make it less likely that one bank's problems may jeopardize the solvency of others, lowering the risk of contagion. Finally, increased equity positions can help banks achieve regulatory capital requirements more easily, resulting in improved compliance and risk management processes. Regulators frequently demand banks maintain enough equity levels in order to absorb potential losses and continue functioning without external assistance.

Increased transparency can also minimize contagion and reduce liquidity crises for banks. As Hayek has pointed out in his research, transparency enables the functioning of pricing mechanisms,

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which is crucial in helping institutions process information [10]. During the financial crisis, the interbank lending market dried up, and nobody was sure which banks were solvent and had liquidity, which caused liquidity shortages in the system. In these situations, there was a lack of network transparency, which resulted in market participants having incomplete information about the network. As such, there are several advantages to increased transparency. Firstly, enhanced transparency allows banks and financial institutions to better understand their own risk exposures as well as those of their counterparts. With more accurate and comprehensive information, they can manage risks more effectively. This improved risk management helps prevent situations where unknown or misunderstood risks lead to sudden financial distress. Secondly, transparency boosts confidence among investors, depositors, and other market participants. When stakeholders have a clear understanding of a bank's financial health, asset quality, and risk exposure, they are less likely to engage in panic withdrawals or sell-offs, which can trigger liquidity crises. Thirdly, in uncertain financial environments, misinformation and rumors can spread quickly, exacerbating panic and leading to contagion. Transparency ensures that accurate and timely information is available, helping to quell unfounded fears and prevent market overreactions. Lastly, increased transparency aids regulatory bodies in monitoring the financial health and practices of institutions. Regulators equipped with comprehensive and accurate information can more effectively identify and address systemic risks before they lead to contagion. They could bail out initial and large institutions to avoid further contagion of risks in the network, minimizing the negative effects.

5. Conclusion

This article examined the implications of interconnection on the financial contagion of interbanks in Germany in 2007, during the 2008 global financial crisis, and following Lehman Brothers' bankruptcy. This report also made recommendations for how to mitigate such an impact in the future, in accordance with each effect. First, interconnection raises the systemic hazards of interbanking. The interdependence of financial intermediaries, borrowers, and lenders created a dense and closely related network, which means that distress in one party spreads throughout the entire system and multiplies the scope and effect of systemic hazards. The associated recommendation is to limit banking sector concentration, preventing one institution from wielding large market power or assets, while diversifying risks across all other smaller banks. Second, interconnection can cause liquidity shortages as financial institutions become more cautious in lending owing to uncertainty, resulting in money leaving the market or not renewing loans. The remedy to this problem is to increase bank equity and openness in the market, strengthen banks' resilience to shocks, and eliminate information asymmetries.

This work is significant because it adds to the current body of knowledge by offering a sophisticated understanding of how interconnection influences the spread of shocks in the interblending market. This paper validates the role of networks in financial contagion. However, this study has drawbacks. One important constraint may be the scope of the data employed, with a lack of primary data analysis thereby lowering the credibility of the paper's generalizations and findings. Another issue could be the insufficient use of mathematical models in analyzing the consequences of systemic contagion hazards.

Looking forward, the report lays the groundwork for future research into the consequences of various network architectures in different economic environments and financial systems. Future research could broaden the scope to cover a wider range of financial institutions and time periods, providing a more comprehensive knowledge of financial contagion dynamics. Furthermore, there is a chance to learn more about the role of regulatory policies and interventions in structuring network architecture and mitigating systemic risks. The findings of this article establish the groundwork for

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more informed policymaking targeted at improving the stability and resilience of the global financial system.

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