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Financial Institutions in the Global Financial Crisis

全球金融危机对金融机构的影响研究
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内容提要

本书以金融危机为研究视角,分析了金融危机中各类金融机构所面临的变化,重点分析了金融衍生品的使用对银行控股集团风险管理的影响,资本充足率对银行信贷增长的作用,以及清算和托管业务的发展。通过对比金融危机前后金融机构的变化,为金融机构金融衍生品使用、资本充足率管理和清算及托管业务发展提供一定的实证支持。

本书可为金融学领域相关人士提供参考借鉴。

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Preface

The book studies the role of financial institutions in the financial markets in normal times and during the global financial crisis. The global financial crisis forced a large number of financial institutions to restructure their core operations, rely substantially on the government support, or even enter insolvency procedures. This raises concerns about solvency and liquidity of financial institutions and indicates that special attention should be devoted to analyzing the impact of the financial crisis on financial institutions. Such analysis could substantially improve the responses of regulators, policy makers, and financial institutions themselves to the adverse events in the future. To that end, this book evaluates the role of financial derivatives, bank capital, and clearing and settlement services in normal times and during the global financial crisis.

By using the most recent data from US bank-holding companies, Chap. 2 examines the impact of financial derivatives on risk exposures of BHCs in normal times and during the global financial crisis. The empirical analysis employs a two-stage time series cross-sectional regression model to examine the relationship between risk exposures and the use of financial derivatives. In the first stage, the stock return of each BHC is regressed against the changes in the market return, interest rate, exchange rate, and credit spread. In this way, risk betas that measure the BHC's systematic (i.e., non-diversifiable) exposure toward market risk, interest rate risk, exchange rate risk, and credit risk can be obtained. In the second-stage regression, the risk betas are regressed against the on-balance sheet variables and financial derivatives variables. The results show that financial derivatives are positively and significantly related to systematic risk exposures of BHCs. Higher use of interest rate derivatives, exchange rate derivatives, and credit derivatives corresponds to greater systematic interest rate risk, exchange rate risk, and credit risk. The positive relationship strengthens with the size of a BHC. Our analysis also confirms a positive relationship between trading derivatives and systematic risks, as well as between hedging derivatives and systematic risks.

Chapter 3 aims to investigate whether and how different types of bank capital affect bank lending and whether this relation changes in times of the global financial crisis compared to normal times. This chapter focuses on the decline in credit growth due to the 2008–2010 global financial crisis and also studies the impact of other variables on lending growth in normal times and in the times of a financial crisis. Also of an interest is how the level of deposits affects lending growth and the decline in lending in the times of a financial crisis. The impact of the size of a bank on credit growth is also studied. Several other dimensions that may influence the decline in credit growth during the financial crisis are also analyzed. The analysis shows a significant and positive effect of the Tier 1 capital ratio on bank loan growth during the global financial crisis. This positive effect seems to be more pronounced for small banks and for banks in the non-OECD and BRIC countries. Customer deposits also positively affected bank lending during the global financial crisis. Furthermore, the results also indicate some (but weak) evidence that the Tier 2 capital ratio and interbank deposits positively affect loan growth in normal times and that interbank deposits negatively affected bank lending during the global financial crisis. The evidence highlights a sharp contrast on the impact of different funding sources on bank lending during the global financial crisis. Whereas Tier 1 capital and customer deposits acted as a stable source of funding during the global financial crisis, Tier 2 capital and interbank deposits spurred bank lending during normal times but did not do so during the global financial crisis. During normal times, a bank lends more if the Tier 1 capital ratio of competing banks is high. This relationship reversed during the global financial crisis; during the global financial crisis, a bank lends more if the Tier 1 capital ratio of competing banks was low.

Chapter 4 aims to contribute to the scarce knowledge of competitive landscape in the clearing and settlement industry. This chapter uses the unbalanced annual data of 49 clearing and settlement institutions from 24 countries during 1989–2012, employs the Panzar and Rosse (1982, 1987) model; Lerner index (1934); and Boone indicator (2001, 2008), and examines the competitive conditions in the clearing and settlement industry. The findings suggest that monopoly equilibrium exists in the clearing and settlement industry. During the global financial crisis, the level of competition between clearing and settlement institutions is higher than in normal times. International CSDs face higher competition than CSDs in the local market. Our evidence also indicates that competition increases continuously over time, possibly due to the technological development and implementation of new clearing and settlement systems. The results reveal that competition increases with the size of clearing and settlement institutions and after mergers and acquisitions between clearing and settlement institutions. Our findings also suggest that competition between clearing and settlement institutions in the US market is higher than in the European market. This indicates that renewed initiative is necessary to enhance competition between clearing and settlement institutions in Europe.

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Chapter 1

Introduction

1.1 Background of This Study

Financial institutions are special as they provide a variety of financial services to individuals and other institutions, and the influence of financial institutions is fundamental to the development of economy. The purpose of this book is to study the role of financial institutions in the financial markets in normal times and during the global financial crisis. The global financial crisis, also known as the subprime crisis or the credit crisis, originated in the U.S. subprime mortgage market and spread to other financial markets and countries, and is considered to be the worst financial crisis since the Great Depression in 1930s. The global financial crisis led to a huge loss of economic output and financial wealth. Atkinson et al. (2013) indicate that the financial crisis led to the loss of around 40–90% of one year output of the U.S., an estimated \$6–\$14 trillion, which equals \$50,000–\$120,000 for each U.S. household.¹ Thakor (2014) estimates that the loss of the total U.S. wealth from the crisis, including human capital and the present value of future wage income, is as high as \$15–\$30 trillion, which is 100–190% of the 2007 U.S. output.

The crisis also brought the U.S. and the global financial system to the brink of collapse. As a consequence, this forced governments to provide a back stop through wide programs of state aid, restructuring programs and assisted mergers. For example, Bear Stearns, which was the sixth-largest investment bank in the U.S., was bought by JP Morgan Chase in March 2008. Meanwhile, Wells Fargo acquired Wachovia, Washington Mutual and many other small financial institutions that all failed as a consequence of the losses related to the subprime crisis. The consequences revealed to be even worse when Lehman Brothers filed for bankruptcy, Fannie Mae and Freddie Mac, which are government-sponsored enterprises and the key players in the securitization market, and AIG, were bailed out by the government. At the same time, many other large financial institutions were exposed to

¹The real GDP for 2007 was \$15.2 trillion in 2012 dollars (Atkinson et al. 2013).

huge losses because of the use of mortgage-backed securities products.² The subprime crisis forced a large number of financial institutions to restructure their core operations, rely substantially on the government support, or even enter insolvency procedures. This raises the concerns about solvency and liquidity of financial institutions and indicates that special attention should be devoted to the impact of the financial crisis on financial institutions' activities. Such knowledge could substantially improve the responses of regulators, policy makers and financial institutions themselves to the adverse events in the future.

Given the importance of financial institutions and the impact of recent subprime crisis on their behavior, the primary objective of this book is to evaluate the role of financial derivatives, bank capital, and clearing and settlement services in normal times and during the global financial crisis. To that end, this book proceeds from three perspectives:

- (1) explores the relationship between the risk exposures and the use of financial derivatives by bank holding companies (BHCs), and tests the difference between the impact of financial derivatives held for trading and financial derivatives held for hedging on risk exposures;
- (2) analyzes the effects of bank capital structure on bank lending activities, and tests the effect of different funding sources on credit growth;
- (3) examines the competitive conditions of clearing and settlement institutions, and investigates whether factors, including the global financial crisis, institutional structure, institutional size, mergers, technological development, and geographic location, affect the competitive conditions in the clearing and settlement industry.

1.2 Research Questions Addressed in This Study

This book is built on three main parts: Chap. 2 *focuses on a direct link between the use of financial derivatives and risk exposures of U.S. BHCs*. Because of the need of risk management for profitability of financial institutions, the innovative forms of financial instruments have grown rapidly in recent years. Banking is one of the most regulated industries in the U.S., and the rules on bank risk management are an integral part of the regulations. Risk management techniques that reduce return volatility are generally classified as hedging activities. Financial instruments that increase return volatility are classified as speculative activities. Since March 1995, BHCs are required to report whether their financial derivatives activity is for trading purpose (i.e., mainly for speculative purpose) or for purpose other than trading (i.e., for hedging purpose).

²Source: Deutsche Bank, "Global Markets Research," March 11, 2008.

The increased activity in financial derivatives markets was generally looked upon favorably before the global financial crisis. Greenspan (1999) noted that “the value added of derivatives themselves derives from their ability to enhance the process of wealth creation.” Trichet (2007) further explained that “[p]rice discovery in the credit derivatives market reduces the risk of mispricing loans.” Recently, however, the perspective has turned around as the risks of financial derivatives have become more evident. The Financial Stability Board (2010) concluded that “the crisis demonstrated the potential for contagion arising from the interconnectedness of OTC derivatives market participants and the limited transparency of counterparty relationships.” The importance of financial derivatives inspired the first research question in this study, which examines the impact of financial derivatives on systematic risk (systematic interest rate risk, exchange rate risk, and credit risk) of BHCs in normal times and during the global financial crisis. In addition we test whether there is any difference between the impact of financial derivatives held for trading and financial derivatives held for hedging on systematic risk. We employ a dynamic panel analysis on the sample of BHCs in the U.S. in the period between 1997 and 2012.

Chapter 3 *focuses on the relation between bank capital structure and bank credit growth in normal times and during the financial crisis.* The recent global financial crisis has brought several large financial institutions to the brink of collapse. They obtained government support or have been forced to raise new capital from private investors. The global financial crisis has highlighted the importance of bank capital not only for stability in the banking system, but also to increase credit supply in the financial market.

Bank capital needs to be sufficiently high and appropriately structured in order to prevent the future financial crisis (Kashyap et al. 2008; Acharya et al. 2010; Hart and Zingales 2011). The regulators pushed for enhanced capital regulation, incorporated in the revised Basel III capital regulatory framework (Basel Committee on Banking Supervision 2010). As Ben Bernanke, the former chairman of the Federal Reserve, put it, “this framework would require banking organizations to hold more and higher quality capital ... improving the resilience of the U.S. banking system in times of stress, thus contributing to the overall health of the U.S. economy.”³ In Europe, Andrea Enria, the chairman of the European Banking Authority, hailed improved capital positions of European banks by noting that “European banks are now in a stronger position, which should support lending to the real economy ...”⁴ In contrast, bankers strongly objected to this reasoning. Vikram Pandit, former CEO of Citigroup, argued that “double-digit ratios will undermine lending, slow capital formation, lower demand and restrict growth.”⁵

³Statement by Chairman Ben S. Bernanke, 7 June, 2012, <http://www.federalreserve.gov/newsevents/press/bcreg/bernanke20120607a.htm>.

⁴www.eba.europa.eu/News-Communications/Year/2012/Update-implementation-capital-exercise.aspx.

⁵Vikram Pandit, We must rethink Basel or growth will suffer, *Financial Times*, 10 November, 2010.

While some studies have considered the impact of bank capital on bank lending (e.g. De Haas and Van Lelyveld 2010; Jiménez et al. 2012), only a few have empirically examined the relation between the bank capital structure with bank lending. Chapter 2 examines the impact of bank capital and capital structure on bank lending behavior in normal times and during the global financial crisis. Specifically, the main hypothesis is that the higher quality of the bank funding side (i.e., a high tier 1 bank capital ratio, high proportion of customer deposits, and prevalent government support) better supports bank lending during crisis times. This analysis provides new insight into the relation between bank capital structure (and bank funding structure) and bank lending, and contributes to the difference between tier 1 bank capital and tier 2 bank capital.

Chapter 4 *focuses on the competitive conditions in the clearing and settlement industry*. The globalization and consolidation in capital markets have increased considerably, and trading on international capital markets grows faster. Well-developed clearing and settlement services are the essential ingredients of well-functioning capital markets. As the financial markets become more and more integrated (Boot 2011), the importance of clearing and settlement services [viewed as a subset of transaction costs that investors face in a banking system (Giddy et al. 1996; Schaper 2008)] is increasing. This indicates that an efficient clearing and settlement system is crucial to minimize the risks and costs involved in the transactions. The progress in financial innovations and standardization of regulatory environments make investors less restricted to their physical market locations. Therefore, clearing and settlement services are faced with increasing competition in domestic and international markets.

Previous studies show that economies of scale, technological development, cost and revenue efficiency, and mergers and acquisitions affect the performance of stock exchanges and clearing and settlement industry (Hasan and Malkamäki 2001; Hasan et al. 2003; Hasan and Schmiedel 2004; Schmiedel 2001). Therefore, the focus of Chap. 4 is to examine the competitive conditions in the clearing and settlement industry. We also test whether other factors (i.e., the global financial crisis, institutional structure, institutional size, mergers, technological development, and geographic location) affect competition in the clearing and settlement industry. The empirical analysis covers the clearing and settlement institutions in the U.S. and European market in the sample period from 1989 to 2012.

1.3 Structure and Contents of This Study

Apart from the Introduction and Conclusion, this book is organized in three chapters. Chapter 2 gives an analysis of the relationship between the use of financial derivatives and systematic risk exposures of U.S. bank holding companies. This part tries to answer the following questions: (1) Does the use of financial derivatives

have a significant impact on systematic risk exposures of BHCs? (2) Is there any difference between the impact of financial derivatives held for trading and financial derivatives held for hedging? (3) Do the BHCs' size and capital ratio significantly change the relation between the financial derivatives and systematic risk exposures? (4) Does the relation between financial derivatives and systematic risk exposures change during the global financial crisis?

Chapter 2 starts with an overview of previous studies on the theoretical models and empirical studies, followed by research design and sample selection, results of empirical analysis, and ends with discussion and conclusion. In order to extend earlier studies on the relationship between financial derivatives and risk exposures, the research design considers the previous work and studies the joint effect of different risk factors. In this part, the research makes several improvements in research design and sample selection: (1) we use the extended four-factor model that analyzes the joint effect of market risk, interest rate risk, exchange rate risk, and credit risk; (2) we employ the recent sample period (1997–2012) and include a representative sample of BHCs; (3) we take into account the effect of macroeconomic conditions (financial crisis, GDP growth, and income tax rate); (4) we control for the impact of size and capital ratio on systematic risk exposures; and (5) we distinguish between financial derivatives held for trading and financial derivatives held for hedging.

The analysis employs a two-stage time-series cross-section regression model and examines the relationship between systematic risks and the use of financial derivatives. The regression proceeds in two stages (consistent with Fama and French 1992). In the first stage, the excess stock returns of each BHC are regressed against changes in the market return, interest rate, exchange rate, and credit spread. In this way, risk betas that measure the BHC's systematic (i.e., nondiversifiable) risk exposures towards market risk, interest rate risk, exchange rate risk, and credit risk can be generated. In the second-stage regression, the risk betas generated in the first stage are regressed against the on-balance-sheet variables and financial derivatives variables. The main findings indicate that the use of financial derivatives is positively and significantly related to the BHCs' systematic risk exposures. More specifically, higher use of interest rate derivatives, exchange rate derivatives, and credit derivatives corresponds to greater systematic interest rate risk, exchange rate risk, and credit risk. In addition, the positive relationship between financial derivatives and risks persists for financial derivatives for trading as well as for financial derivatives for hedging.

Chapter 3 provides empirical analysis of the relation between bank capital structure and bank lending in normal times and during the global financial crisis. Financial crises, including the most recent one, have shown that instabilities in banking systems negatively affect real economy. In particular, banks may cut back on lending and this may constrain small and medium businesses and therefore be further detrimental for the economy as a whole. Understanding the determinants of credit growth would enable us to better act in times of a banking crisis or even before the crisis by setting the regulatory standards that would minimize cyclicity

of credit growth. The question is whether and, if so, why banks responded differently during the financial crisis 2008–2010 in their credit growth strategies.

To address this question, Chap. 3 first examines whether and how different types of bank capital affect bank lending and whether this relation changed during the 2008–2010 global financial crisis compared to normal times. In addition, the impact of deposits, bank size, state ownership, and implicit of government guarantees on lending growth in normal times and during the times of the global financial crisis are also examined. The results imply that the high quality of bank funding strategy (tier 1 bank capital and retail deposits) and prevalent government backing were crucial to continuous bank lending during the crisis period. The results also indicate that the higher use of tier 2 capital and interbank deposits could be important for increased lending during a normal period, but did not support lending activities during the financial crisis. This chapter concludes by suggesting that in crisis periods high-quality bank capital is a bank's competitive strength.

Chapter 4 focuses on the competitive conditions in the clearing and settlement industry. The exiting literature that investigates the competitive conditions in the clearing and settlement industry is scarce. This chapter employs the Panzar-Rosse model (Panzar and Rosse 1982, 1987), Lerner index (Lerner 1934), and Boone indicator (Boone 2001, 2008), and analyzes the competitive landscape within the clearing and settlement industry. Chapter 4 starts with a description of the role and industry structure in clearing and settlement services, and the measures of competition. It then continues with a research design, including Panzar-Rosse model, the Lerner index, and Boone indicator, followed by the data statistical analysis, and empirical analysis. The chapter analyzes competition in the clearing and settlement industry, and tests how competition is affected by several factors including (1) the global financial crisis; (2) institutional structure; (3) institutional size; (4) mergers; (5) technical development, and (6) geographic location.

The findings under the Panzar-Rosse model, Lerner index, and Boone indicator are consistent. The results show that clearing and settlement institutions operate in monopoly markets. International CSDs face higher competition than national CSDs. The level of competition has increased over time, possibly due to the technological development and implementation of new clearing and settlement systems. The results reveal that competition increases with size and after mergers of clearing and settlement institutions. The competition between clearing and settlement institutions in the U.S. market is higher than in the European market.

The rest of this book proceeds as follows: Chap. 2 addresses the relationship between financial derivatives and systematic risks of the U.S. BHCs and is entitled *The Use of Financial Derivatives and Risks of U.S. Bank Holding Companies*. Chapter 3 analyses the relationship between bank capital and lending and is entitled *Quality of Bank Capital and Bank Lending Behavior during the Global Financial Crisis*. Chapter 4 investigates competition landscape in clearing and custody services and is entitled *Competition in the Clearing and Settlement Industry*. Chapter 5 concludes the analysis.

References

- [1] Acharya, V. V., Thakor, A. (2010). *Caught between Scylla and Charybdis? Regulating bank leverage* Mehran, H., and *when there is rent-seeking and risk-shifting*. Federal Reserve Bank of New York. New York.
- [2] Atkinson, T., Luttrell, D., and Rosenblum, H. (2013). *How bad was it? The costs and consequences of the 2007–09 financial crisis*. Federal Reserve Bank of Dallas Staff Papers No. 20.
- [3] Basel Committee on Banking Supervision (2010). Basel III: A global regulatory framework for more resilient banks and banking systems, from <http://www.bis.org/press/p100912.htm>.
- [4] Boone, J. (2001). Intensity of competition and the incentive to innovate. *International Journal of Industrial Organization*, 19(5), 705–726.
- [5] Boone, J. (2008). A New Way to Measure Competition. *The Economic Journal*, 118(531), 1245–1261.
- [6] Boot, A. W. A. (2011). Banking at the crossroads: How to deal with marketability and complexity? *Review of Development Finance*, 1(3–4), 167–183.
- [7] De Haas, R., and Van Lelyveld, I. (2010). Internal capital markets and lending by multinational bank subsidiaries. *Journal of Financial Intermediation*, 19(1), 1–25.
- [8] Fama, E. F., and French, K. R. (1992). The cross-section of expected stock returns. *The Journal of Finance*, 47(2), 427–465.
- [9] Giddy, I., Saunders, A., and Walter, I. (1996). Alternative models for clearance and settlement: the case of the single European capital market. *Journal of Money, Credit and Banking*, 28(4), 986–1000.
- [10] Greenspan, A. (1999). Financial Derivatives. Before the Futures Industry Association, Boca Raton, Florida. March 19, 1999.
- [11] Hart, O., and Zingales, L. (2011). A new capital regulation for large financial institutions. *American Law and Economics Review*, 13(2), 453–490.
- [12] Hasan, I., and Malkamäki, M. (2001). Are expansions cost effective for stock exchanges? A global perspective. *Journal of Banking & Finance*, 25(12), 2339–2366.
- [13] Hasan, I., Malkamäki, M., and Schmiedel, H. (2003). Technology, automation, and productivity of stock exchanges: International evidence. *Journal of Banking & Finance*, 27(9), 1743–1773.
- [14] Hasan, I., and Schmiedel, H. (2004). Networks and equity market integration: European evidence. *International Review of Financial Analysis*, 13(5), 601–619.
- [15] Jiménez, G., Ongena, S., Peydró, J. L., and Saurina Salas, J. (2012). Credit supply: identifying balance-sheet channels with loan applications and granted loans. *American Economic Review*, 102(5), 2301–2326.
- [16] Kashyap, A., Rajan, R., and Stein, J. (2008). *Rethinking capital regulation*. Federal Reserve Bank of Kansas City Symposium on Maintaining Stability in a Changing Financial System. Kansas City.
- [17] Lerner, A. P. (1934). The concept of monopoly and the measurement of monopoly power. *The Review of Economic Studies*, 1(3), 157–175.
- [18] Panzar, J. C., and Rosse, J. N. (1982). *Structure, conduct, and comparative statistics*. Economics Discussion Paper No.248. Bell Telephone Laboratories, Inc.
- [19] Panzar, J. C., and Rosse, J. N. (1987). Testing for “monopoly” equilibrium. *The Journal of Industrial Economics*, 35(4), 443–456.
- [20] Schaper, T. (2008). Trends in European Cross-Border Securities Settlement–TARGET2–Securities and the Code of Conduct. In D. Veit, D. Kundisch, T. Weitzel & F. Rajola (Eds.), *Enterprise Applications and Services in the Finance Industry* (Vol. 4, pp. 50–65): Springer.
- [21] Schmiedel, H. (2001). *Technological development and concentration of stock exchanges in Europe*. Bank of Finland Discussion Paper Series, 21/2001. Helsinki.
- [22] Thakor, A. V. (2014). The Financial Crisis of 2007–09: Why Did it Happen and What Did We Learn? Available at SSRN: <http://dx.doi.org/10.2139/ssrn.2372449>.

- [23] The Financial Stability Board (2010). Implementing OTC derivatives market reforms: Financial Stability Board.
- [24] Trichet, J. C. (2007). *Some reflections on the development of credit derivatives*. Keynote address at the 22nd Annual General Meeting of the International Swaps and Derivatives Association (ISDA), Boston.

Chapter 2

The Use of Financial Derivatives and Risks of U.S. Bank Holding Companies

2.1 Overview

This chapter examines the impact of financial derivatives on systematic risk of publicly listed U.S. bank holding companies (BHCs) from 1997 to 2012. We find that the use of financial derivatives is positively and significantly related to BHCs' systematic risk exposures. Higher use of interest rate derivatives, exchange rate derivatives, and credit derivatives corresponds to the greater systematic interest rate risk, exchange rate risk, and credit risk. The positive relationship between derivatives and risks persists for derivatives for trading as well as for derivatives for hedging. We also analyze the role of BHCs' size and capital and the impact of the global financial crisis on the relationship between derivatives and risks.

2.2 Introduction

Banks have drastically increased the use of financial derivatives in recent decades. The rose from less than \$18 trillion at the end of 1995 to nearly \$270 trillion at the end of 2012.¹ Increased activity in financial derivatives markets was generally looked upon favorably before the 2007–2010 global financial crisis. Greenspan (1999) noted that “the value added of derivatives themselves derives from their ability to enhance the process of wealth creation.” Trichet (2007) further explained that “price discovery in the credit derivatives market reduces the risk of mispricing loans.” Recently, however, the perspective has turned around because the risks of financial derivatives have become more evident. The Financial Stability

¹FRB of Chicago, holding company data, https://www.chicagofed.org/applications/bhc_data/bhcd_data_index.cfm.