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Empirical essays on the stability of the Brazilian financial system

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Chapter 1

Introduction

The global financial crisis of 2007-09 was the most severe crisis since the Great Depression of the 1930s. It was preceded by the collapse of the U.S. housing markets, which directly affected highly leveraged financial institutions. The effects of the crisis eventually spread to other economies and proved to be so severe that major financial institutions would have failed in the absence of substantial government intervention. Reinhart and Rogoff (2008) analyze a long historical database on financial crises and find some common patterns of the latest and previous crises. The recent crisis was preceded by a bubble in the housing market that was followed by profound declines in asset prices, output and employment.

The housing expansion of the early 2000s in the U.S., which is considered one of the main causes of the crisis, is explained by a number of factors such as a prolonged period of low interest rates, availability of credit, and financial innovations and deregulations that weakened credit standards in housing lending. The reversal of the housing prices affected financial institutions that were exposed directly or indirectly to the U.S. housing market. In addition, large write-downs on mortgage related assets and growing bank losses had a negative effect on the confidence of investors and creditors in financial markets. Eventually, many funding mechanisms used by banks experienced disruptions, with borrowing rates reaching record highs and some funding markets freezing completely (Yorulmazer, 2014).

The bankruptcy of Lehman Brothers on September 15, 2008, was the pinnacle of the crisis, spreading uncertainty about the solvency of U.S. and other global financial institutions. The fear of contagion among financial institutions led governments of several countries to provide large financial support to distressed banks and to extend insurance to liabilities other than banks' retail deposits (Allen et al., 2015). One example was the blanket guarantee provided by the U.S. government to all investors

in order to stop the run on Money Market Funds (MMFs), which were an important provider of short-term funding to financial institutions.

This thesis presents three empirical studies that are broadly connected to financial crises and the stability of the financial system. We apply different methodological approaches and use diverse data sets to investigate some vulnerabilities of the financial system that have become apparent during the global financial crisis, such as the interconnectedness of financial institutions, the link between credit supply and house price growth, and the run on nonbank financial intermediaries.

Our empirical studies use Brazilian datasets to investigate the effect of shocks on financial intermediaries and on the housing market. Considering that most studies focus on developed countries such as the U.S., we aim to fill this gap and to provide new insights using data from a middle income country with a less sophisticated, but highly regulated financial system.

In Chapter 2, “Dynamic interbank network analysis using latent space models”, we present a model to handle dynamic network data based on the latent space approach. The dynamic network data consist of a set of banks (nodes) and a set of links which represent the existence of lending or borrowing operations between banks observed over one year. The latent space refers to a space of unobserved characteristics of banks that affect link formation. The model assumes that each node has a position in this latent space and the closer two nodes are, the more likely they will form a link. The positions of banks in the latent space and other parameters of the model are estimated within a Bayesian framework.

We apply this methodology to analyze two different datasets: the unsecured interbank network and the repo (secured) interbank network of Brazilian financial institutions. In the model we include variables that measure characteristics of the banks to investigate how they affect the probability of a lending connection between banks. We also compare the goodness-of-fit of the latent space model and the model without such structure. Our main results show that the model which incorporates observed bank’s characteristics and a latent space is able to capture some features of the network data such as transitivity. We show that the inclusion of a latent space is essential to account for dependencies that exist among banks. Furthermore, the distribution of network statistics for the model with a latent space is much closer to the observed values than the model without a latent space. On the other hand, the model in which the probability of forming a tie depends only on the observed characteristics of banks has a poor fit.

In Chapter 3, “The effect of bank credit supply on house prices: Evidence from Brazil”, we estimate the effect of changes in credit supply on house prices at different

municipalities in Brazil. To deal with the endogeneity problem, we develop a novel identification strategy in which changes in savings deposits at the parent banks are used as an instrument for changes in credit supply at the local level. First, the results of the first stage regressions show that changes in savings deposits have a significant positive effect on credit supply at municipalities where banks have branches. We base our results on a sample of 409 municipalities that account for more than 80% of the bank branches' total assets. These results hold even if we control for several municipality characteristics and locality and quarter fixed effects.

In a second step of the analysis, we investigate the effect of the increase in credit supply on house price growth. We show that the increase in supply of credit has a significant impact on house prices. A one percent increase in loan origination growth leads to a 0.17 percent increase in the growth rate of house prices. When we estimate the effect of credit supply on loan terms such as interest rate and loan maturity, we find that a one percent increase in the growth rate of credit supply results in 0.28 percentage point (p.p.) decrease in the mean spread between loan interest rates and the benchmark rate. We do not find a significant impact of credit supply on loan maturities, which may be explained by a prudential limit on the maximum amortization period for loans that are underwritten. Finally, using the minimum loan loss provisions that banks make at the moment of loan origination, we investigate whether the expansion of credit supply has led to a relaxation of lending standards. We show that an increase in credit supply is associated with an increase in provisions for loan losses due to an expansion of lending to riskier borrowers. Taken together, our results show the dependence of the supply of housing credit on savings deposits and its influence on house prices, risk taking and on the cost of credit.

In Chapter 4, "Investors' behavior and mutual fund portfolio allocations during the financial crisis in Brazil", I study the run on some mutual funds during the financial crisis in Brazil. Following the default of Lehman Brothers on September 2008, small banks that had relied on wholesale funding were severely impacted by the increased risk aversion of institutional investors. They experienced a considerable outflow of term deposits while large banks that were perceived to be "too big to fail" increased their deposit balances. I investigate whether the run on some funds can be explained by their holdings of deposits of banks affected by the financial crisis. Then, I study how mutual funds exposed to small banks changed their portfolio after the shock and whether the extended guarantee to new wholesale term deposits has altered the portfolio allocations of funds.

I start the analysis by studying the drivers of fund flows. Consistent with previous studies, I find that fund inflows are positively related to recent past performance.

I show that past performance predicts inflows in funds for retail investors, but the results are not significant for professional investors. I further analyze the effect of large outflows on fund performance. I find that outflows of more than 10% of the total net assets (TNA) affected the returns of the funds in the following month. This effect is significant for equity funds and to a lesser degree for fixed income funds.

To examine the effect of the small banks' distress on mutual funds, I concentrate on the crisis period that starts with the default of Lehman Brothers and ends with the introduction of term deposits with an extended guarantee to institutional investors. I find that funds exposed to certificates of deposit and securities issued by these banks experienced larger outflows. To examine the extent to which fund returns were affected by their asset holdings, I compare the returns of funds with different exposures to small banks. I find that one p.p. increase in the fund exposure to small banks as the share of fund's total net assets leads to reduction in fund's excess return over benchmark by almost 0.60 p.p., which is economically significant. Finally, I study how fund portfolios changed after Lehman's default and increase of the deposit coverage limit. I find evidence that banks first reduced their holdings of certificates of deposit of small banks and then increased their exposure to those banks after the deposit guarantee extension. My findings suggest that as the banking system and the mutual funds become more interconnected, fund's asset holdings may become a key channel of shock transmission.