BOFIT Discussion Papers
29 • 2013

Irina Andrievskaya and Maria Semenova

Market discipline and the Russian interbank market

EUROJÄRJESTELMÄ
EUROSYSTEMET

Bank of Finland, BOFIT
Institute for Economies in Transition

BOFIT Discussion Papers
Editor-in-Chief Laura Solanko

BOFIT Discussion Papers 29/2013
29.11.2013

Irina Andrievskaya and Maria Semenova: Market discipline and the Russian interbank market

ISBN 978-952-6699-53-0 (online)
ISSN 1456-5889 (online)

Suomen Pankki
Helsinki 2013

Contents

Irina Andrievskaya and Maria Semenova

Market discipline and the Russian interbank market

Abstract

The interbank market plays an important role in the overall function of the financial system. The efficiency of the interbank market, in turn, depends largely on its inherent disciplining mechanisms. This paper investigates the discipline mechanisms of Russia's interbank market, testing the hypothesis that market discipline in Russia was strong enough to constrain excessive risk-taking by participating banks before, during, and after the 2008–2009 financial crisis. The existence of quantity-based market discipline is investigated using Heckman's sample selection model and the efficiency of market discipline is studied with a panel data model. Our approach detects market discipline only during the financial crisis, not before or after. Even during the crisis, its efficiency in curbing bank risk-taking was rather low.

JEL Classification: G21, G01, P2.

Keywords: market discipline, interbank market, risk-taking, banks, Russia

Irina Andrievskaya, National Research University Higher School of Economics, Moscow, iandrievskaya@hse.ru

Maria Semenova, National Research University Higher School of Economics, Moscow, msemenova@hse.ru

1 Introduction

Market discipline plays an important role in banking regulation. According to Lane (1993), market discipline describes the situation where "financial markets provide signals that lead borrowers to behave in a manner consistent with their solvency." The significance of market discipline is recognized in major policy initiatives and seen as a necessary complement to macroprudential supervision (Nieto, 2012). Notably, the Basel Committee emphasizes enhancing market discipline through greater disclosure of bank risk information. This is enshrined in Pillar 3 of Basel II, entitled "Market Discipline," which pertains to disclosure requirements (BCBS, 2006). Scholars have also long argued that market discipline can come from such sources as the bank's own contingent liabilities.

Market discipline of banks is aimed to complement regulators' supervision, that may fail for such reasons as information asymmetry or a weak legal environment. When market discipline works, it is often described as providing banks with incentive to limit their risk-taking by imposing additional costs for pursuing less prudent strategies. The advantage of market discipline for the state is that it is less burdened with the need for regulatory intervention; prudent behavior is enforced partly by bank counterparties and other market participants such as insurers and brokers.

This may explain why a substantial part of the literature on market discipline is devoted to examining the roles of various market stakeholders such as retail and corporate depositors, subordinated debt providers, and bank stockholders. Yet the efficiency of the interbank market, although less explored, plays an important role in bringing stability to the financial system. Thus, it should be worthwhile to consider how effectively a particular interbank market provides market discipline, and if so, identify the disciplining mechanisms.

While most studies in this area focus on establishing the *existence* of market discipline, it makes sense that once market discipline is identified, they would take the next logical step of attempting to measure the strength or *degree* of market discipline. Notable efforts at measuring the degree of market discipline in the interbank market include the cross-country analysis of Nier and Baumann (2006), the examination of Central and Eastern European data by Dinger and von Hagen (2009), and the study of the Dutch interbank market by Liedorp et al. (2010). These first two papers find market discipline was effective in reducing bank risk, while the third suggests that the disciplining mechanism failed and

possibly contributed to contagion. Some of this discrepancy no doubt relates to the different risk measures and observation periods used in the analyses. The first two studies are based on data that precede the global financial crisis. The third study includes 2008 and captures the effects of the financial meltdown.

Our aim here is to examine market discipline in the interbank market of Russia. This large emerging economy provides a rich base for investigation as it had a banking sector with over 1,000 banks operating in the last decade. The main hypothesis tested here is that market discipline in the interbank market is efficient in constraining the risk-taking behavior of banks. For the purposes of our analysis, we use quarterly financial data of the Russian banks for the period 1Q2004–2Q2011. We examine the existence of quantity-based market discipline employing Heckman's sample-selection model and then test the efficiency of market discipline using a panel data model.

Previous studies devoted to market discipline in Russia focus largely on bank deposits.[1] To the best of our knowledge, our earlier study is the only one that considers market discipline in the Russian interbank market (Semenova and Andrievskaya, 2012). That paper looks at the post-crisis period and deals solely with determining the existence of market discipline. The efficiency of market disciplining mechanisms is not discussed.

In choosing the appropriate market discipline indicators for our estimations, we first consider the standard approach in the literature based on a snapshot of interbank borrowing at the end of a given reporting period. This measure may be misleading in the case of the interbank market, however, as it deals mostly with short-term borrowing and lending. Thus, we employ an alternative indicator, the natural logarithm of interbank borrowing volume.

This study seeks to contribute to the current literature in several ways. First, we cover a relatively long period (2004–2011) that includes the financial crisis, employing a precise indicator for market discipline. Second, we break new ground by attempting to measure the efficiency of market discipline in the Russian interbank market. As Russian regulators work to implement international standards in banking regulation, they will un-

[1] Various studies reach distinctly different conclusions. The existence of market discipline (price- and quantity-based) is confirmed in Karas et al. (2006) for 1999–2002 data, Peresetsky et al. (2007) for 2002–2004 data, and Semenova (2007) for 2006 data. Hosono et al. (2004), in contrast, find no evidence of market discipline in the period 1995–2002. Ungan et al. (2008) can only confirm quantity-based market discipline (i.e. no evidence of price-based market discipline) during 2000–2005.

doubtedly need to pay increased attention to enhancing market discipline.[2] This study contributes to the evolving policy discussion on market discipline in the Russian financial sector, and hopefully these findings provide insight that helps in shaping an appropriate regulatory framework.

The paper is organized as follows. In the next section, we review the related literature. Section 3 is devoted to the Russian interbank market. We explain our methodology in section 4. Section 5 describes our data and the major findings. Section 6 concludes.

2 Literature overview

Flannery (2001) discusses market discipline in terms of *market monitoring,* where investor assessments of the condition of a firm are reflected in its security prices and borrowing rates, and *market influence*, where the firm reacts (e.g. decreases or increases its risk exposure) to changes in security prices and borrowing rates.

Measuring market influence in the case of banks seems challenging enough that many empirical discussions avoid the issue altogether.[3] Instead, they focus on forms of market monitoring such as tracking of *price-based measures* to see how lenders raise or lower prices depending on borrower risk; *quantity-based measures*, where lenders restrict or extend access to credit on the basis of borrower risk; or evidence of *maturity shifting*, where the length of time the lender is willing to extend a loan is adjusted for borrower risk.

The existence of market discipline has been widely studied in the market of retail and corporate deposits. For example, Hannan and Hanweck (1988), and Ellis and Flannery (1992) take on price discipline; Jordan (2000) and Goldberg and Hudgins (1996) deal with quantity discipline; and Murata and Hori (2006) and Semenova (2007) examine maturity-shifting behavior. Other authors also consider evidence that market discipline is provided by equity prices (e.g. Brewer and Lee, 1986; Distinguin et al., 2006) and debt security prices (e.g. Ashcraft, 2008; Goyal, 2005).

Market discipline in the interbank market, in contrast, has received comparatively little attention. Theoretical models often assume frictionless competition, where banks act as price-takers (Ho and Saunders, 1985; Clouse and Dow, 2002). Price discipline is omit-

[2] Russia's launch of Pillar 3 of Basel II, "Market Discipline," was initially planned for 2013. The CBR now expects the release of the full set of appropriate documents in 2014 (Ernst & Young, 2013).
[3] Bliss and Flannery (2002) take on the topic, finding only weak evidence of market influence in the US banking system.

ted altogether. Forced liquidation, a quantity-based measure, is the only disciplining mechanism assumed present in the wholesale funding market (Calomiris, Kahn, 1991; Huang, Ratnovski, 2010).

Nevertheless, empirical research confirms the existence of both types of market discipline in the interbank market. Price discipline in the US interbank market was first noted by Furfine (2001). This was subsequently bolstered by the results of King (2008), using more recent US data. The existence of market discipline has also been identified in the Portuguese interbank market (Cocco et al., 2009) and the Italian interbank market (Angelini et al., 2009).

The existence of market discipline has traditionally been inferred by showing that borrowing rates or amounts lent correspond to bank risk. Ashcraft and Bleakley (2006) point out that this approach may be unreliable when deterioration of borrower creditworthiness increases leverage and leads to higher borrowing costs. Thus, even if there appears to be a positive correlation between borrowing rates and creditworthiness, it does not confirm the existence of market discipline.

To examine the efficiency of market discipline, we draw on Nier and Baumann (2006), who define efficiency as "the degree to which market discipline is effective as an incentive scheme." In other words, efficiency is the extent to which market discipline affects the risk-taking behavior of banks. Rochet and Tirole (1996) point out that increased government intervention tends to lower the efficiency of market discipline. Demirgüç-Kunt and Huizinga (2004) demonstrate empirically that market discipline in the deposit market is lower in the presence of an explicit deposit insurance scheme. Several other studies confirm that safety nets erode market discipline (e.g. Billett et al., 1998).

Bliss and Flannery (2002) observe that the type of market significantly affects the power of disciplining mechanisms. For example, if stockholders prefer to hold stocks of riskier firms in exchange for a promise of higher returns, the disciplining mechanism is likely to be fairly weak. Huang and Ratnovski (2010) also find the efficiency of market discipline in the wholesale funding market substantially decreases when there are costless public signals that affect the quality of bank projects such as a credit rating downgrade or upgrade.

There is little research dealing with market discipline efficiency in the interbank market. The most notable contributors in this area are Nier and Baumann (2006), Dinger and von Hagen (2009), and Liedorp et al. (2010). Dinger and von Hagen (2009) consider

credit institutions of Central and Eastern Europe during 1995–2004. Their finding that increased interbank borrowing coincides with lower perceived borrower risk supports the *peer-monitoring* hypothesis for market discipline in the interbank market and refutes the competing *contagion* hypothesis.

To test the hypothesis that market discipline gives banks incentive to limit their risk-taking behavior, Nier and Baumann (2006) ask whether market discipline has any effect on the capital buffers of banks. Analyzing a sample of 729 banks in 32 countries for the period 1993–2000, they find that market discipline is effective in limiting the risk-taking behavior of banks, while the moral hazard created by assurances of government bailouts reduces the efficiency of market discipline.

Liedorp et al. (2010) consider the Dutch interbank market for the period 1998–2008 and reach a different conclusion. Their main finding is that increased borrowing in the interbank market the increased bank risk. Adding to the evidence that supports the contagion hypothesis, they further identify a spillover effect from credit institutions lending to their sample borrower banks. Contagion is shown to be fairly pronounced in the German interbank market at a time no safety net is present (see Upper and Worms, 2004).

What emerges from these studies is that regulatory authorities need to be aware of how much they can rely on market discipline to ensure efficient functioning of the interbank market.

3 Russia's interbank market

It is worthwhile to note some of the features of Russia's relatively small and highly segmented interbank market. The Central Bank of the Russian Federation (CBR) reports that the 30 largest banks accounted for 68% of interbank lending and 74% of borrowing in June 2013 (CBR, 2013). Moscow banks dominate the Russian interbank market, accounting for 94% of all interbank borrowing and lending on July 1, 2013 (CBR, 2013). Some 80% of long-term borrowing and lending is conducted by Russia's state-controlled banks (Egorov and Kovalenko, 2013).

The recent financial crisis led to changes in the overall structure of interbank liabilities. Some 61% of interbank borrowing in the first half of 2013 was made by banks with investment-grade ratings (CBR, 2013), up from 38% in 2008 (CBR, 2010). As the financial situation deteriorated in 2008, banks with high ratings switched to placing se-

cured, rather than unsecured funds with other banks. The share of secured loans climbed to about 65% of total loans in 2009 (CBR, 2010). Low-rated banks were squeezed out of the interbank market and there were changes with respect to cross-border operations with non-residents. Banks reduced their net long-term borrowing from foreign counterparties and increased their net short-term lending to foreigners amidst the financial turmoil (Egorov and Kovalenko, 2013).

The CBR calculates six interbank interest rates with maturities from one day to one year:

- MIBID (Moscow InterBank Bid Rate),
- MIBOR (Moscow InterBank Offered Rate),
- MIACR (Moscow InterBank Actual Credit Rate),
- MIACR-IG (Moscow InterBank Actual Credit Rate: Investment Grade),
- MIACR-B (Moscow InterBank Actual Credit Rate: B-Grade), and
- RUONIA (Ruble Overnight Index Average).

Interest-rate dynamics reflect the liquidity of the banking system. The MIACR covers the largest number of banks. Looking at Figure 5 in Appendix I, we clearly see the decaying financial situation in mid-2008 tracking the 1-day MIACR. The MIACR begins to rise in July 2008 and peaks at 16% in January 2009. As the crisis abates, the MIACR falls to the 2–3% range in mid-2010. The rate spikes again in 2012 to around 5–6% as the Russian banking system again struggles with liquidity problems.

Average daily volume in the interbank market amounted to RUB 1.69 trillion (around EUR 39 billion) in April 2013.[4] Some 96% of all operations were deposit transactions with the remaining 4% repo deals (Fig. 1 in Appendix I). Interestingly, 71% of transactions were with non-residents (Fig. 2 in Appendix I), 99% of which in the form of deposits.

Interbank transactions were mainly short-term (Fig. 4 in Appendix I); 91% with a 1-day maturity and 4% having a 1-week maturity. The prevailing currencies (Fig. 3 in Appendix I) were the US dollar (62%), the Russian ruble (30%), and the euro (8%). The cur-

[4] The data are taken from the "Money Market" (Денежный рынок) section of the CBR website http://www.cbr.ru/statistics/?Prtid=finr. The English translation uses the term "turnover" for the Russian "оборот," and includes operations unsecured by collateral or guarantees. For the purposes of this discussion, we use the more common term "volume."

rency breakdown changed as compared to January 2012, when 48% of operations were carried out in RUB, 29% in USD and 23% in EUR. To some extent, this behavior reflects the Russian public's distrust of the banking sector and banks' distrust of each other. Over the course of its existence, Russia's interbank market has experienced several stress events where the lack of trust among banks aggravated an already difficult situation. In particular, the interbank market was hobbled by trust issues in 1995, 1998, 2004, and 2008–2009.

While the interbank market trading freezes in 1995 and 1998 were part of larger systemic crises, the stress event in 2004 stemmed directly from a "crisis of trust" in the interbank market that arose after the CBR pulled licenses of several banks, causing negative rumors to swirl (CBR, 2005). Interbank volume fell 12% in May and 13% in June. Normal trading was not restored until the end of August (CBR, 2005).

The financial crisis from 2008 to 2010 also manifested distrust among banks. Bogetic (2008) notes that the Russian financial crisis can be divided into several phases, including a "investor liquidity and confidence crisis phase." Liquidity problems in the banking sector emerged between March and May 2008 (CBR, 2009) and intensified in September 2008 when the interbank market was virtually frozen. Interest rates spiked and there was practically no liquidity transfer from Russia's largest banks to other credit institutions on fears of increased counterparty risk (Bogetic, 2008). To stabilize the financial system, the CBR provided massive liquidity support through a variety of emergency measures such as:

- temporarily reducing the required reserves ratio (4-percentage-point cut in September 2008),
- extending unsecured loans to banks,
- expanding the capital base of the banking system (RUB 892 billion in subordinated loans were provided to the largest state-owned and private banks),5
- providing government guarantees for loans,
- expanding the list of shares accepted as a collateral for CBR loans,
- lowering requirements for bond ratings that could be included in the CBR Lombard list,
- introducing legislation authorizing the CBR to prevent bank insolvencies, and
- paying compensation for losses on interbank loans (CBR, 2009).

[5] Medium-sized and small banks increased their capital base mainly with profits.

Total CBR liquidity support corresponded to 10% of GDP (IMF, 2012). The measures were gradually withdrawn during 2010.

The above-described events evidence the low efficiency of market discipline in the Russian interbank market. Moreover, as Karas et al. (2008) observe, the Russian interbank market is characterized by significant "potential for contagion through indirect liquidity linkages," Abig reason is the lack of transparency in the market and the lack of trust among banks. To understand how to improve the efficiency of the interbank market, it is necessary to analyze whether and to what extent the internal disciplining mechanisms are present. In particular, the exercise could help in shaping the banking regulation related to the rollout of Pillar 3 of Basel II.

4 Methodology

4.1 Determining the existence of market discipline

Before analyzing the effect of market discipline on the risk-taking behavior of banks operating in the interbank market, we need to determine its presence. To determine how borrowing in this market is influenced by information about bank characteristics, including bank risk, we follow a standard approach widely used in the literature. Market sensitivity to bank fundamentals is tested with the following econometric model:

$$MD_{i,t} = \beta_i + \gamma BF_{i,t-1} + \rho I_{i,t-1} + \lambda C_t + \mu C_t * BF_{i,t-1} + \varepsilon_{it}$$

The dependent variable $MD_{i,t}$ is an indicator of market discipline. As noted earlier, we concentrate on quantity-based disciplining mechanisms measured by several indicators.[6] In line with the literature, we use the rate of growth of interbank borrowing. As noted in section 3, just reporting the end-period figure could be misleading as borrowing and lending in the interbank market are generally for the short term. Instead, we use the natural loga-

[6] We do not consider the price-based disciplining mechanism here. Establishing its existence requires data on interest rates paid for interbank borrowing. Available information only covers data on the total amount of interbank borrowing of a particular bank *i* at the end of each month, total interbank volume for each month of bank *i*, and the quarterly interest payments on interbank loans paid by bank *i*. There are no details on the maturity of interbank loans. Thus, the average interest rate paid, the usual proxy for analysis of price-based market discipline, cannot be correctly obtained from our data.

rithm of interbank borrowing volume.[7] This closely approximates how much a bank borrows on average during a given quarter.

We separately examine market discipline from non-resident lenders using growth of foreign interbank borrowing as a dependent variable and the natural logarithm of foreign interbank borrowing volume. Non-residents provide a substantial share of interbank loans (see section 3). Non-resident lenders could potentially be more efficient in disciplining Russian banks than their domestic counterparties as they are less sensitive to internal rumors and other non-financial information.

Our explanatory variables include bank fundamentals that characterize bank risk-taking ($BF_{i,t-1}$), an indicator of the bank's involvement in the interbank market ($I_{i,t-1}$), a dummy variable for the crisis period (C_t) that is equal to 1 for 2008–2009 and 0 otherwise, and bank fundamentals multiplied by the dummy variable for the crisis period ($C_t*BF_{i,t-1}$). This structural breakpoint in the first half of 2008 is when the CBR marks start of deteriorating conditions in the financial sector (CBR, 2009).[8] Although government measures to provide liquidity and stabilize the situation were fully withdrawn by the end of 2010, we use 2010 as the start of the post-crisis period as some indicators show the situation had already stabilized.[9]

To avoid the endogeneity problem, all variables (except the crisis dummy) are taken with a one-quarter lag. Furthermore, market participants receive information about their counterparties later than the reporting day. Thus, it seems reasonable to consider a one-period lag.

$BF_{i,t-1}$ consists of variables that correspond to the CAMEL[10] model plus an indicator of bank size. In particular, capital adequacy (C) is represented by the ratio of regulatory capital to risk-weighted assets of bank i. This indicator, N1, is calculated according to CBR guidelines (the minimum value of N1 should be 10%). Asset quality (A) is expressed as the ratio of reserves to total assets of bank i (RES_AS) following IMF definitions (IMF, 2012) as the level of non-performing loans (NPL) using Russian accounting standards underestimates the actual situation. For our robustness checks (Section 6), nevertheless, we consider

[7] Interbank transaction volume indicates how active a bank is in the market, not the value of its interbank borrowing. For example, if a bank borrows and repays one million rubles on five trading days in a row, the transaction volume is 5 million rubles not 1 million.
[8] See section 3 for details.
[9] The IMF reports Russia recovered from the crisis in 2010, when GDP growth recovered to over 4% a year (IMF, 2011).
[10] CAMEL stands for Capital adequacy, Asset quality, Management quality, Earnings, and Liquidity.

the models with a proxy for asset quality, namely the ratio of NPL to total loans of bank *i*. Management quality (*M*) is characterized by the ratio of personnel expenses to total revenues for bank *i*. For earnings (*E*), we use ROA. Finally, liquidity (*L*) is represented by the current liquidity ratio (N3 under CBR guidelines), which is a proxy for risk of losing liquidity during 30 operational days. (This is calculated as the ratio of assets with maturities of up to 30 days to liabilities with maturities up to 30 days corrected by the minimum balance of such liabilities from individuals and legal entities, and should equal or exceed 50%). Bank size is calculated as the natural logarithm of a bank's total assets. As a proxy for the bank's involvement in the interbank market ($I_{i,t-1}$), we use the ratio of the bank's interbank borrowing to total liabilities.

It should be emphasized that not all banks participate in the interbank market (see section 3 for more details), so what we are observing hers is the rates of borrowing growth and interbank borrowing volumes only of banks that participate in this market. This does not mean, however, that zero values for rate of borrowing growth or interbank borrowing volume for banks that do not enter the market represent their corner solution or that our data are censored at zero. The potential growth rate or the volume for these banks, obviously, is not necessarily zero. To overcome this sample selection problem, we must account for the non-random nature of the sample. We correct for the selection bias with Heckman's two-step estimation procedure. This approach is fully described in Wooldridge (see chapter 17, 2002). Following Disli et al. (2013), we first estimate the participation equation using the random effects panel Probit model. With the Mills ratios obtained from this equation, we carry out panel data estimations for our main model adding as an independent variable the Mills ratio. Following a set of appropriate tests (Hausman test, Breusch-Pagan test, and test for differing group intercepts), we select the fixed effects model from our three model options (pooled OLS, fixed effect, and random effect models).

The participation equation (PE) has as a dependent variable an indicator of bank's involvement in the interbank market (equal to 0 when a bank has no interbank borrowing and zero volume, and 1 when rate or volume of interbank borrowing are positive). Independent variables include the instant liquidity ratio N2,[11] the ratio of total loans over total assets, logarithm of total assets, and interbank borrowings over total assets. All variables

[11] N2 measures the risk of losing liquidity during one operational day and is calculated as the ratio of highly liquid assets to liabilities on demand corrected by the minimum balance of demand accounts of individuals and legal entities. It should not be less than 15%.

are one-quarter lagged and all indicators have explanatory value for participation of the bank in the market in the next period.[12]

4.2 Determining the efficiency of market discipline

Now we turn to the examination of the market discipline efficiency in the interbank market to study how a particular bank's risk levels and regulatory capital are influenced by its interbank borrowing.

We follow the logic of Nier and Baumann (2006). They consider an econometric model where the dependent variable is represented as the ratio of bank's equity capital to the bank's other liabilities. Independent variables include indicators associated with market discipline: support from the government expressed as the Fitch support rating, amount of uninsured interbank deposits borrowed by the bank, amount of subordinated debt issued by the bank, level of information disclosure by the bank (expressed using variables indicating whether a bank is listed on a US exchange, whether it has a rating and whether it provides information of the core disclosures in its published accounts), bank-level control variables (volatility of bank's weekly equity returns, ratio of loan loss reserves to total loans, bank size, and returns on equity), and country-level control variables.

The idea is to verify the hypothesis that market discipline relates to the bank's incentives to diminish its risk of default. As Nier and Baumann (2006) point out, the risk of default depends on the underlying asset risk and leverage, which, in turn, depends on the bank's capital buffer. Thus, they tested to see whether market discipline results in a higher capital buffer. If this hypothesis is not rejected, then market discipline is considered efficient in motivating banks to choose a lower probability of default.

Following the above-described reasoning, we examine the effect of market discipline on the level of bank capital and the level of bank asset risk (including level of credit risk, liquidity risk and overall risk). The econometric model employed is presented below:

$$Y_{it} = \beta_i + \gamma x_{it-1} + \alpha z_{it-1} + \mu C_t * x_{it-1} + \delta C_t * z_{it-1} + \varepsilon_{it}$$

Y_{it} includes indicators of bank's capital level, credit, liquidity, and overall bank risk.

[12] Interbank borrowing is also included as an explanatory variable. Banks with non-zero borrowing already are more likely to participate in the market in the next period due to their established reputation, contacts, etc.

Overall bank risk is approximated by the ratio of risk-weighted assets to total assets (*RWA*).[13]

A bank's capital level is represented by the capital adequacy ratio (*N1*). To reflect a bank's credit risk, we employ two proxies: non-performing loans (*NPL*) to total loans and the ratio of reserves to total assets of bank *i*.

As proxies for liquidity risk, we take two indicators prescribed by CBR guidelines.[14] These include the instant liquidity ratio N2 and the current liquidity ratio N3 described above in section 4.1.

To examine the effect of market discipline on the risk behavior of bank *i*, we use the following explanatory variables (x_{it-1}): the ratio of total interbank borrowing to total assets of bank *i*, the ratio of interbank foreign borrowing to total assets of bank *i*, the natural logarithm of the interbank borrowing volume of bank *i*, and the natural logarithm of the interbank foreign borrowing volume of bank *i*.

We also employ a set of bank-level control variables (z_{it-1}) that might influence risk-taking behavior of a bank to isolate the effects of our market discipline indicators. In particular, we consider the share of interest income to total revenues and the share of total loans to total assets (both indicators reflect the degree to which a bank is engaged in the traditional banking rather than speculative activity, and thus affect bank risk exposure), ROA (a measure of bank earnings that also indicates the effectiveness of bank operations), bank size,[15] and the rate of total asset growth, which could reflect the risk of expanding business too slowly or too quickly and thereby influence the risk characteristics of the bank.

The explanatory variables again are taken with a one-quarter lag. We also include the explanatory and control variables multiplied by the crisis dummy to examine the efficiency of market discipline during periods of distress.

We employ a panel data model for our estimations and use a set of appropriate tests to determine our selection of a pooled OLS, fixed effect, or random effect model.

[13] Das and Sy (2012) note that equity investors consider the ratio of risk-weighted assets to total regulatory capital (RWA) to be a credible measure of risk.
[14] CBR Instruction No. 110 "On Required Ratios for Banks," issued January 16, 2004 (Инструкция ЦБ РФ от 16 января 2004 г. N 110-И «Об обязательных нормативах банка»).
[15] This effect is ambiguous. On the one hand, large banks have more possibilities to diversify their risks. On the other hand, there may exist an implicit assumption in the market of too-big-to-fail policies that creates moral hazard for big banks to indulge in riskier behavior.

5 Empirical Analysis

5.1 Data

We use quarterly financial data of Russian banks for the period 1Q2004–2Q2011. The information is taken from the Mobile database "Banks and Finance" Analytical System, which is based, in turn, on individual bank financial statements prepared according to Russian accounting standards and compiled by the CBR. The 665 banks in our sample represented 86% of the total assets in the Russian banking system as of July 1, 2011.[16]

Table 1 Descriptive statistics

Variable name	Variable description	Model notation	Number of obs.	Mean	Std. Dev.	Min	Max
ld_mbkb	Rate of interbank borrowing growth	MD	6032.000	−0.034	0.703	−2.357	2.381
ld_fmbk	Rate of foreign interbank borrowing growth	MD	2846	−0.009	0.510	−1.929	1.889
LnTO1	Ln(interbank borrowing average volume during quarter)	MD. x	4626	12.858	2.864	6.502	19.350
LnTO3	Ln(interbank foreign borrowing average volume during quarter)	MD. x	1494	11.672	3.451	0.693	18.695
mbkb_as	Total interbank borrowing/assets	I. explanatory variable in PE. x	19530	0.053	0.105	0.000	0.917
fmbkb_as	Foreign interbank borrowing/assets	x	19530	0.018	0.076	0.000	0.846
particip	1 if bank borrows in interbank market, 0 otherwise	dependent variable in PE	19530	0.568	0.495	0.000	1.000
h1	N1	BF. Y	11923	48.226	33.437	0.000	115.000
h2	N2	Y. explanatory variable in PE	12827	64.009	49.327	0.000	344.000
h3	N3	BF. Y	12832	91.691	56.567	0.000	437.000
pe_profit	Personnel expenses / total profit	BF.	17772	8.294	146.835	−523.347	15718.000
bl_loan	Bad loans/assets	BF. Y	19292	0.023	0.032	0.000	0.173
res_as	Reserves/assets	BF. Y	19530	0.044	0.046	0.000	0.240
roa	ROA	BF. z	19530	0.011	0.023	−0.247	1.423
lnas	Ln(assets)	BF. explanatory variable in PE. z	19530	14.368	1.953	7.027	22.904
ld_lnas	Assets growth rate	z	18742	0.063	0.241	−6.483	6.667
tl_as	Total loans/assets	explanatory variable in PE. z	19530	0.614	0.212	0.000	1.000
in_rev	Interest income/total revenues	z	17772	0.175	0.131	−0.191	1.000
rwa	Risk weighted assets/assets	Y	19530	0.288	0.345	0.000	1.000

[16] The total number of banks in the observation period fluctuates from year to year between approximately 1,000 and 1,300. Credit institutions lacking financial statements for at least one quarter have been excluded from the sample.

Interbank borrowing volume data are taken directly from the CBR website. The data are available from 1Q2007, so the panel is unbalanced.

Table 1 above presents the descriptive statistics of the variables. We winsorize the variables at 1% in both tails to avoid the influence of outliers. Column 3 shows the title of the variable vector in which a particular variable is included.

5.2 Existence of market discipline

The results of the first step, estimation of the participation equation, are presented in Table A1 in Appendix II.

We now analyze the existence of quantity-based market discipline. As evident from Table 2 below, there are signs of market discipline for the entire sample during the full period under consideration. All variables representing bank fundamentals are jointly significant at the 1% confidence level.

As predicted, the results vary depending on the measure used for quantitative market discipline. The signs of market discipline for loan growth are scarce and unstable, while those for loan volume are more evident. Market discipline related to bank fundamentals, absent during stable times, emerges during the crisis. Financial instability seems to draw focus to the reserve levels of bank counterparties. This effect is stable when the dependent variable is represented by the interbank borrowing volume. The higher the ratio of a bank's reserves to total assets, the lower its interbank borrowing volume. This relationship is also seen during non-crisis times in some model specifications, but the result is not stable.

Interestingly, the size of the bank has a significant positive impact on the interbank volume during the entire observation period, as well as the rate of interbank loan growth during the crisis. This result confirms the existence of too-big-to fail policies in Russia's case. Larger banks find it easier to obtain funds as it is implicitly assumed that they will be bailed out by the state. Moreover, other bank fundamentals do not behave in line with the market discipline hypothesis.

The share of interbank borrowing to total assets, in line with expectations, has a negative sign in the model with growth of interbank borrowing and a positive sign in the model with the interbank borrowing volume. However, this variable has a negative sign in both models during the crisis.

It is important to emphasize that foreign lenders (see Table 3 above) mainly pay attention to bank size. No bank fundamentals behave in line with the market discipline hypothesis in models with interbank borrowing from foreign lenders as a dependent variable. The share of interbank borrowings to total assets again has a negative sign in the model with the rate of interbank borrowing growth and a positive sign in the model with interbank borrowing volume. During the crisis, however, this variable has a negative sign in the latter model.

5.3 Efficiency of market discipline

We now turn to the efficiency of market discipline. Our analysis of the influence of interbank borrowing on bank risk-taking behavior suggests that the efficiency of market discipline in Russia is rather low (see Tables 4 and 5). The only effect in line with the market discipline efficiency hypothesis is that a higher level of interbank borrowing in one period corresponds to a decline in the level of credit risk, i.e. we see fewer bad loans (model with rate of interbank borrowing growth) and lower reserves (model with interbank borrowing volume) in the following period. However, this tends to even out over time, including during the crisis period. Thus, the relationship of interbank borrowing, capitalization, liquidity risk, and the overall bank risk is ambiguous and does not evidence efficiency of market discipline. Importantly, when as independent variables the interbank foreign borrowings are used (Table 6 and 7 below), the results reveal the inefficiency of market discipline from non-residents. Banks borrowing from foreign counterparties has no impact on the risk-taking behavior of banks.

Table 2 Quantitative discipline, full sample (robust standard error in parentheses)

Variable	y = rate of IB loan growth						y = ln(IB loans volume)					
crisis	−0.501	−0.364	−0.394	−0.546**	−0.381	−0.285	0.708	0.894	0.121	0.242	0.385	0.211
	(0.330)	(0.329)	(0.269)	(0.260)	(0.262)	(0.267)	(0.721)	(0.762)	(0.583)	(0.599)	(0.580)	(0.590)
h1_1	0.003	0.002					−0.013*	−0.025***				
	(0.002)	(0.001)					(0.007)	(0.006)				
h1_1*crisis	0.000	0.000					−0.002	−0.006				
	(0.002)	(0.002)					(0.007)	(0.008)				
h3_1	−0.001*		−0.001*				−0.005***		−0.006***			
	(0.001)		(0.000)				(0.001)		(0.001)			
h3_1*crisis	0.000		0.000				0.000		−0.000			
	(0.001)		(0.000)				(0.002)		(0.002)			
pe_profit_1	−0.003**			−0.004**			−0.004			−0.006		
	(0.002)			(0.002)			(0.003)			(0.004)		
pe_profit_1*crisis	0.006**			0.008**			−0.010			−0.009		
	(0.003)			(0.003)			(0.007)			(0.007)		
res_as_1	−0.908*				−0.522		0.121				−3.123*	
	(0.497)				(0.447)		(1.947)				(1.859)	
res_as_1*crisis	0.721				0.717		−3.069**				−2.787*	
	(0.697)				(0.672)		(1.361)				(1.460)	
roa_1	−0.253					1.288	4.102					3.878
	(1.185)					(1.198)	(3.498)					(3.766)
roa_1*crisis	−4.515**					−5.132**	−7.376					−9.981
	(2.114)					(2.366)	(5.645)					(6.444)
lnas_1	−0.016	−0.030	−0.027	−0.037*	−0.027	−0.030	0.669***	0.523***	0.761***	0.621***	0.586***	0.623***
	(0.024)	(0.020)	(0.021)	(0.022)	(0.021)	(0.021)	(0.144)	(0.142)	(0.141)	(0.142)	(0.136)	(0.142)
lnas_1*crisis	0.032*	0.028	0.029*	0.037**	0.027*	0.026*	−0.028	−0.049	−0.009	−0.016	−0.019	−0.011
	(0.018)	(0.018)	(0.015)	(0.015)	(0.015)	(0.015)	(0.040)	(0.043)	(0.036)	(0.038)	(0.036)	(0.037)
mbkb_as_1	−1.487***	−1.275***	−1.290***	−1.472***	−1.298***	−1.310***	4.194***	4.524***	4.365***	5.023***	4.824***	4.927***
	(0.237)	(0.197)	(0.201)	(0.234)	(0.195)	(0.197)	(0.739)	(0.781)	(0.752)	(0.784)	(0.800)	(0.792)
mbkb_as_1*crisis	−0.294	−0.382**	−0.369**	−0.298	−0.362**	−0.386**	−0.972*	−1.005*	−0.925*	−1.050*	−1.090**	−1.085**
	(0.185)	(0.182)	(0.184)	(0.188)	(0.180)	(0.176)	(0.497)	(0.539)	(0.531)	(0.551)	(0.534)	(0.544)
mills	34.751***	−0.002***	0.002	39.788***	−0.003***	−0.002**						
	(3.192)	(0.001)	(0.003)	(1.594)	(0.001)	(0.001)						
Constant	0.495	0.562*	0.619*	0.748**	0.584*	0.584*	3.235	5.327**	1.601	3.243	3.976*	3.166
	(0.381)	(0.320)	(0.328)	(0.357)	(0.330)	(0.332)	(2.264)	(2.278)	(2.226)	(2.261)	(2.141)	(2.251)
Observations	3,955	4,311	4,314	3,960	4,315	4,315	3,069	3,074	3,074	3,071	3,075	3,075
R-sq-within	0.035	0.024	0.024	0.031	0.024	0.025	0.113	0.086	0.099	0.071	0.073	0.067
Number of banks	410	419	419	410	419	419	466	466	466	466	466	466

*** p<0.01, ** p<0.05, * p<0.1; IB - interbank

Table 3 Quantitative discipline, borrowing from foreign lenders (robust standard error in parentheses)

Variable	y = rate of IB loan growth						y = ln(IB loan volume)					
crisis	0.902***	0.864***	0.454*	0.431*	0.628***	0.437*	0.684	1.234	0.777	1.298	1.789	1.295
	(0.256)	(0.253)	(0.231)	(0.241)	(0.218)	(0.227)	(1.934)	(1.933)	(1.684)	(1.612)	(1.705)	(1.665)
h1_1	0.002	0.002					−0.002	−0.019*				
	(0.002)	(0.002)					(0.012)	(0.012)				
h1_1*crisis	−0.006***	−0.007***					0.007	0.008				
	(0.002)	(0.002)					(0.019)	(0.017)				
h3_1	−0.000		−0.000				−0.006***		−0.006***			
	(0.000)		(0.000)				(0.002)		(0.002)			
h3_1*crisis	0.000		−0.000				0.003		0.003			
	(0.000)		(0.000)				(0.002)		(0.003)			
pe_profit_1	0.001			0.001			−0.013			−0.013		
	(0.001)			(0.001)			(0.009)			(0.009)		
pe_profit_1*crisis	−0.004			−0.003			−0.005			−0.007		
	(0.003)			(0.003)			(0.011)			(0.011)		
res_as_1	−1.180***				−1.203***		−1.377				−3.731	
	(0.413)				(0.389)		(3.596)				(3.650)	
res_as_1*crisis	−0.745				−1.098		−2.621				−0.773	
	(0.797)				(0.735)		(4.165)				(4.036)	
roa_1	−0.321					0.281	−0.438					−1.931
	(1.115)					(0.996)	(7.120)					(8.028)
roa_1*crisis	0.587					−0.028	7.443					7.660
	(1.790)					(1.857)	(7.751)					(8.195)
lnas_1	−0.022	−0.034*	−0.030	−0.038*	−0.019	−0.033	0.768**	0.635*	0.804**	0.616*	0.656*	0.639*
	(0.023)	(0.020)	(0.021)	(0.022)	(0.021)	(0.021)	(0.344)	(0.341)	(0.343)	(0.319)	(0.338)	(0.336)
lnas_1*crisis	−0.046***	−0.043***	−0.025*	−0.024*	−0.034***	−0.025*	−0.021	−0.040	−0.026	−0.036	−0.065	−0.041
	(0.014)	(0.013)	(0.013)	(0.014)	(0.012)	(0.013)	(0.099)	(0.102)	(0.091)	(0.093)	(0.094)	(0.095)
mbkb_as_1	−1.013***	−0.974***	−0.975***	−1.000***	−0.978***	−0.968***	3.288**	3.307**	3.084**	3.352**	3.183**	3.401**
	(0.217)	(0.201)	(0.203)	(0.210)	(0.197)	(0.198)	(1.364)	(1.444)	(1.352)	(1.357)	(1.405)	(1.420)
mbkb_as_1*crisis	0.174	0.208	0.220	0.195	0.165	0.189	−2.248***	−2.113**	−2.134***	−2.016**	−2.089**	−2.045**
	(0.161)	(0.146)	(0.145)	(0.153)	(0.147)	(0.146)	(0.800)	(0.885)	(0.795)	(0.835)	(0.813)	(0.881)
mills	dropped											
Constant	0.595	0.690**	0.687**	0.795**	0.533	0.696*	−1.110	0.803	−1.851	0.821	0.345	0.378
	(0.400)	(0.342)	(0.348)	(0.375)	(0.354)	(0.356)	(5.926)	(5.922)	(5.871)	(5.479)	(5.844)	(5.790)
Observations	2,135	2,317	2,316	2,136	2,317	2,317	1,198	1,201	1,200	1,199	1,201	1,201
R-sq-within	0.035	0.028	0.027	0.027	0.032	0.025	0.068	0.048	0.060	0.050	0.048	0.045
Number of banks	165	169	169	165	169	169	165	165	165	165	165	165

*** p<0.01, ** p<0.05, * p<0.1; IB - interbank

Table 4 Disciplining by interbank market, full sample (robust standard error in brackets)

VARIABLES	Disciplining by loan amount						Disciplining by transactional volume					
	h1	h2	h3	res_as	bl_loan	rwa_as	h1	h2	h3	res_as	bl_loan	rwa_as
crisis	−11.42	−68.752***	−32.105*	0.049***	0.022	0.156	−14.463	−77.940**	−66.792**	0.044**	0.031*	0.441***
	(12.683)	(21.027)	(17.488)	(0.017)	(0.014)	(0.140)	(12.292)	(33.011)	(29.134)	(0.020)	(0.017)	(0.167)
mbkb_as_1	0.445	8.818	−16.613	−0.022	−0.018*	0.210**						
	(11.418)	(16.777)	(18.262)	(0.015)	(0.010)	(0.104)						
mbkb_as_1*crisis	−5.939	11.886	36.094**	−0.005	0.008	0.256**						
	(10.591)	(19.927)	(14.295)	(0.014)	(0.012)	(0.106)						
LnTO1_1							0.93	−1.998**	−3.542***	−0.001*	−0.001	−0.003
							(0.570)	(0.833)	(1.171)	(0.001)	(0.001)	(0.007)
LnTO1_1*crisis							−0.233	−1.009	−0.861	−0.001	−0.001	0.007
							(0.585)	(1.166)	(1.370)	(0.001)	(0.001)	(0.006)
in_rev_1	−16.659	−49.889**	−21.691	−0.108***	−0.028**	0.526***	20.538	−4.294	−60.088**	−0.126***	−0.083***	−0.119
	(11.133)	(19.715)	(15.370)	(0.017)	(0.012)	(0.132)	(15.369)	(44.464)	(24.165)	(0.026)	(0.019)	(0.223)
in_rev_1*crisis	40.922**	2.204	−22.814	−0.022	−0.042**	−0.839***	23.137	−20.48	7.714	−0.014	0	−0.109
	(16.584)	(24.922)	(20.594)	(0.019)	(0.018)	(0.169)	(16.868)	(34.871)	(33.086)	(0.023)	(0.023)	(0.262)
tl_as_1	29.304***	−19.498**	−33.718***	0.049***	−0.015**	0.172***	39.361***	−23.544	−33.251**	0.030***	−0.020**	0.208**
	(5.819)	(9.460)	(9.732)	(0.009)	(0.008)	(0.066)	(8.748)	(15.410)	(14.291)	(0.012)	(0.010)	(0.087)
tl_as_1*crisis	−5.061	2.283	−6.139	0.004	0.001	−0.204***	−18.852**	18.484	38.013**	−0.001	−0.004	−0.157*
	(7.438)	(9.200)	(11.141)	(0.011)	(0.009)	(0.075)	(8.917)	(13.754)	(17.015)	(0.011)	(0.011)	(0.084)
roa_1	−165.601***	−56.459	−96.097	−0.203**	−0.308***	1.751***	−162.156***	−19.28	31.573	−0.157	−0.313***	0.255
	(43.744)	(70.269)	(71.280)	(0.080)	(0.073)	(0.522)	(50.600)	(148.719)	(143.587)	(0.138)	(0.109)	(0.638)
roa_1*crisis	2.069	348.736**	517.186***	0.051	0.079	−2.918***	−40.788	688.578***	584.805**	0.328*	0.225	−1.529**
	(70.236)	(155.608)	(161.335)	(0.253)	(0.136)	(0.615)	(72.319)	(234.386)	(268.669)	(0.189)	(0.139)	(0.750)
lnas_1	8.867***	2.43	5.993***	0.005***	0.008***	−0.209***	6.302**	10.682***	11.350***	−0.002	0.001	−0.109***
	(1.204)	(1.598)	(1.494)	(0.002)	(0.001)	(0.014)	(2.799)	(4.118)	(4.305)	(0.004)	(0.003)	(0.024)
lnas_1*crisis	0.498	4.136***	2.066**	−0.003***	−0.001	0.008	1.447	4.966**	2.966	−0.003*	−0.002	−0.018
	(0.777)	(1.231)	(0.973)	(0.001)	(0.001)	(0.009)	(0.917)	(2.200)	(2.289)	(0.001)	(0.001)	(0.012)
ld_lnas_1	2.932	−12.590***	−13.421***	−0.017***	−0.018***	0.110***	0.747	−15.184*	−5.908	−0.016**	−0.014***	0.107***
	(2.594)	(3.833)	(4.101)	(0.004)	(0.003)	(0.024)	(3.237)	(9.104)	(7.467)	(0.006)	(0.004)	(0.036)
ld_lnas_1*crisis	8.594*	−4.837	−2.693	−0.006	−0.01	−0.051	10.866**	−8.234	−15.562	−0.001	−0.009	−0.121**
	(4.564)	(13.570)	(7.904)	(0.007)	(0.007)	(0.045)	(5.447)	(15.389)	(11.234)	(0.010)	(0.009)	(0.056)
mills	516.009***	2,383.594***	4,259.320***	0.317***	0.434***	−3.860***	dropped					
	(76.320)	(91.324)	(99.498)	(0.106)	(0.075)	(0.788)						
Constant	21.941	−95.383***	−0.036	3.467***	−76.211*	−64.661	−11.139	−76.030*	0.11	1.924***	−96.013***	45.438*
	(23.343)	(19.708)	(0.029)	(0.228)	(45.123)	(72.434)	(73.416)	(45.249)	(0.069)	(0.419)	(19.210)	(27.007)
Observations	5,571	5,378	5,571	5,571	2,511	2,554	2,555	2,511	2,555	2,555	5,378	5,57
R-squared	0.056	0.088	0.124	0.32	0.062	0.057	0.069	0.06	0.124	0.108	0.089	0.047
Number of banks	550	540	550	550	412	417	417	412	417	417	540	550

*** p<0.01, ** p<0.05, * p<0.1

Table 5 Disciplining by interbank market, borrowing from foreign lenders (robust standard error in brackets)

VARIABLES	Disciplining by loan amount						Disciplining by transactional volume					
	h1	h2	h3	res_as	bl_loan	rwa_as	h1	h2	h3	res_as	bl_loan	rwa_as
crisis	−12.938	−65.778***	−28.528	0.050***	0.021	0.232	−4.591	−148.052***	−125.652***	0.054	0.026	0.292
	(12.799)	(22.315)	(18.285)	(0.018)	(0.015)	(0.150)	(23.696)	(53.743)	(44.369)	(0.040)	(0.041)	(0.351)
mbkb_as_1	−6.557	31.454	22.993	−0.032	−0.016	−0.023						
	(19.477)	(28.033)	(25.531)	(0.026)	(0.024)	(0.167)						
mbkb_as_1*crisis	−7.52	16.428	24.754	−0.009	−0.004	0.557***						
	(12.253)	(30.468)	(21.944)	(0.022)	(0.020)	(0.142)						
LnTO1_1							0.023	−0.031	−1.888*	−0.001	−0.002	0.002
							(0.714)	(0.935)	(1.036)	(0.001)	(0.001)	(0.007)
LnTO1_1*crisis							0.268	0.489	1.171	−0.001	0.001	0.003
							(0.676)	(1.210)	(1.446)	(0.001)	(0.001)	(0.008)
in_rev_1	−16.992	−50.271***	−19.043	−0.106***	−0.026**	0.502***	44.110*	−71.259*	−104.830*	−0.178***	−0.186***	−0.318
	(10.957)	(19.410)	(14.853)	(0.017)	(0.012)	(0.133)	(26.460)	(37.986)	(60.614)	(0.043)	(0.044)	(0.249)
in_rev_1*crisis	41.827**	1.09	−29.871	−0.022	−0.044**	−0.874***	13.339	78.008	5.431	−0.014	0.041	0.014
	(16.314)	(23.967)	(20.140)	(0.019)	(0.018)	(0.173)	(30.005)	(71.038)	(89.345)	(0.043)	(0.042)	(0.305)
tl_as_1	29.529***	−19.410**	−36.215***	0.048***	−0.016**	0.196***	27.070**	−36.916*	−27.845	0.027	−0.025	0.198
	(5.692)	(9.360)	(9.606)	(0.009)	(0.008)	(0.066)	(13.593)	(21.276)	(23.258)	(0.017)	(0.020)	(0.123)
tl_as_1*crisis	−4.903	1.527	−5.328	0.005	0.002	−0.218***	−14.776	0.203	9.356	−0.011	−0.021	−0.005
	(7.397)	(9.166)	(11.589)	(0.010)	(0.009)	(0.074)	(18.207)	(25.690)	(26.234)	(0.022)	(0.022)	(0.157)
roa_1	−163.896***	−59.421	−98.792	−0.200**	−0.307***	1.736***	−102.775	138.626	−89.949	−0.289	−0.604***	0.025
	(43.714)	(70.030)	(70.436)	(0.080)	(0.073)	(0.522)	(64.168)	(151.251)	(220.212)	(0.232)	(0.158)	(0.936)
roa_1*crisis	−1.033	354.954**	531.244***	0.053	0.082	−3.060***	−64.756	729.737**	982.396***	0.573*	0.362	−0.762
	(70.381)	(156.714)	(164.783)	(0.254)	(0.138)	(0.644)	(96.173)	(299.112)	(307.108)	(0.300)	(0.225)	(0.974)
lnas_1	8.921***	2.112	5.944***	0.005***	0.009***	−0.210***	2.231	16.238***	14.318*	0.001	0.004	−0.166***
	(1.180)	(1.680)	(1.432)	(0.002)	(0.001)	(0.014)	(3.650)	(5.034)	(8.424)	(0.007)	(0.005)	(0.041)
lnas_1*crisis	0.563	4.022***	1.999**	−0.003***	−0.001	0.004	0.337	8.023**	5.745	−0.002	−0.002	−0.014
	(0.777)	(1.311)	(1.013)	(0.001)	(0.001)	(0.009)	(1.403)	(3.920)	(3.661)	(0.003)	(0.003)	(0.024)
ld_lnas_1	2.909	−12.559***	−13.728***	−0.018***	−0.018***	0.112***	0.848	−12.769	14.546	−0.018	−0.020**	0.141*
	(2.587)	(3.830)	(4.090)	(0.004)	(0.003)	(0.024)	(5.678)	(15.528)	(19.454)	(0.013)	(0.010)	(0.077)
ld_lnas_1*crisis	8.670*	−4.85	−2.718	−0.006	−0.01	−0.049	11.026	−27.185	−44.852**	0.001	−0.011	−0.051
	(4.535)	(13.528)	(7.852)	(0.007)	(0.007)	(0.045)	(10.538)	(25.916)	(19.583)	(0.018)	(0.015)	(0.091)
mills	528.071***	2,328.151***	4,235.430***	0.393***	0.476***	−4.830***	dropped					
	(67.111)	(98.281)	(82.277)	(0.103)	(0.070)	(0.803)						
Constant	21.888	−96.108***	−0.042	3.498***	12.632	−184.797**	12.632	−184.797**	−98.371	0.053	0.025	3.102***
	(22.007)	(19.243)	(0.029)	(0.235)	(65.000)	(88.168)	(65.000)	(88.168)	(148.510)	(0.116)	(0.093)	(0.737)
Observations	5,571	5,378	5,571	5,571	1,053	1,059	1,053	1,059	1,059	1,059	1,059	1,059
R-squared	0.056	0.088	0.123	0.319	0.053	0.105	0.053	0.105	0.097	0.194	0.271	0.103
Number of banks	550	540	550	550	153	155	153	155	155	155	155	155

*** p<0.01, ** p<0.05, * p<0.1

5.4 Robustness checks

Our first robustness check considers models where the ratio of non-performing loans to total assets is used as the proxy for credit risk (Tables A2–A3 in Appendix II). The second robustness check corrects our data for outliers and examines if this changes the findings (Tables A4–A7 in Appendix II).

Our results do not change qualitatively when we use an alternative proxy for credit risk. In particular, all bank fundamentals remain jointly significant at the 1% confidence level. The only stable result is for credit risk during the crisis when the dependent variable is represented by interbank borrowing volume. The higher the NPL ratio to total loans, the lower the interbank borrowing volume. The statistically significant size variable again suggests the existence of too-big-to-fail policies in Russia. The size of a bank has a positive impact on interbank borrowing volume during the full observation period, as well as on the rate of interbank borrowing growth during the crisis. Again, there is no sign of market discipline coming from non-resident lender. Their main lending criterion seems to be bank size.

Table 6 Descriptive statistics, restricted sample

Variable name	Number of obs.	Mean	Std. Dev.	Min	Max
ld_mbkb	5149	0.049	0.845	−7.211	6.058
ld_fmbk	1989	0.057	0.561	−6.100	5.168
LnTO1	3535	13.226	2.962	−1.099	20.338
LnTO3	1302	11.894	3.452	−1.099	19.635
mbkb_as	10271	0.062	0.105	0.000	0.917
fmbkb_as	10271	0.022	0.075	0.000	0.817
particip	10271	0.677	0.468	0.000	1.000
h1	10271	25.778	20.075	0.000	198.000
h2	10269	61.996	91.750	0.000	7649.000
h3	10271	87.274	44.279	0.000	499.000
pe_profit	10271	7.268	86.998	−286.573	4574.409
bl_loan	10264	0.024	0.040	0.000	0.842
res_as	10271	0.048	0.051	0.000	0.847
roa	10271	0.010	0.017	−0.242	0.386
lnas	10271	14.816	2.028	7.839	22.904
ld_lnas	9758	0.004	0.013	−0.171	0.166
tl_as	10271	0.633	0.188	0.000	1.000
in_rev	10271	0.161	0.119	−0.191	0.913
rwa_as	10271	0.437	0.341	0.000	0.999

We now turn to the analysis of the restricted sample. To correct the data for outliers, we use the following criteria: observations are excluded if N1 is greater than 200, N3 is greater

than 500, the share of reserves in total assets is greater than 1, the share of RWA to total assets is greater than 1, and the share of bad loans to total loans is greater than 1. Table 6 below presents the descriptive statistics after correction for outliers. The results of the estimations are presented in Tables A4–A7 in Appendix II.

The findings remain qualitatively similar. There are some indication that market discipline exists during the crisis. The level of reserves and non-performing loans negatively influence interbank borrowing volume during the crisis. The negative effect of non-performing loans is present during the full period when the dependent variable is the rate of rate of interbank borrowing growth. The signs of other banks fundamentals that appear statistically significant do not evidence the existence of market discipline. Foreign lenders again pay most attention to bank size rather than risk characteristics. However, a higher level of reserves leads to a lower rate of growth in interbank borrowing from foreign lenders, especially during the crisis.

When the data is corrected for outliers without winsorizing, market discipline is found too inefficient to influence the risk-taking behavior of banks.

6 Conclusions

The interbank market is crucial to a well-functioning financial system. It helps in distributing liquidity among banks and links them to each other. Such linkage, however, creates the possibility of contagion in a crisis that can aggravate financial instability. Thus, regulators need to understand whether the interbank market functions efficiently and when regulatory intervention is appropriate.

This study considers market discipline in the Russian interbank market between 2004 and 2011. We first sought to establish the existence of market discipline using Heckman's sample selection model. We then analyzed the efficiency of market discipline on borrower bank risk-taking behavior using a panel data model. Our findings suggest that quantitative market discipline was present in the market only during the financial crisis, and even then its efficiency in reducing bank risk-taking during that period was rather low. One explanation could be that government intervention during the crisis inhibited efficient functioning of the interbank market.

Nier and Baumann (2006) note three conditions that should be satisfied for efficient market discipline:

- bank creditors should be at risk of loss if the bank defaults,
- changes in the bank's risk profile should lead to market responses that are costly for the bank, and
- the market should have access to adequate information concerning the risk profile of the bank.

These conditions are not fully satisfied in the case of Russian banks. For example, it was evident during the recent crisis period that the first condition (creditor exposure to risk in a bank default) was not fully satisfied. The government also intervened to avoid the default of many banks in order to restore the stability of the banking sector and indirectly bailed out bank creditors. Finally, as noted by the IMF, Russia's banking system still has a relatively low level of transparency (IMF, 2011). This was evident from our analysis.

References

Angelini, P., A. Nobili, and M.C. Picillo (2009), "The interbank market after August 2007: What has changed and why?" Banca d'Italia Working Paper No. 731.

Ashcraft, A., and H. Bleakley (2006), "On the Market Discipline of Informationally Opaque Firms: Evidence from Bank Borrowers in the Federal Funds Market," Federal Reserve Bank of New York Staff Reports No. 257.

Ashcraft, A. (2008), "Does the market discipline banks? New evidence from regulatory capital mix," Journal of Financial Intermediation, 17(4), 543−561.

Basel Committee on Banking Supervision (2006), Basel II: International Convergence of Capital Measurement and Capital Standards: A Revised Framework, BIS.

Billett, M.T., J.A. Garfinkel, and E.S. O'Neal (1998), "The Cost of Market Versus Regulatory Discipline in Banking," Journal of Financial Economics, 48(3), 333−358.

Bliss, R., and M. Flannery (2002), "Market Discipline in the Governance of U.S. Bank Holding Companies: Monitoring versus Influencing," European Finance Review, 6, 361−395.

Bogetic, Z. (2008), "Russian economic report," World Bank Report No. 17.

Brewer, E., and C.F. Lee (1986), "How the market judges bank risk," Economic Perspectives, Federal Reserve Bank of Chicago, 10, 25−31.

Calomiris C., and Kahn C. (1991), "The Role of Demandable Debt in Structuring Optimal Banking Arrangements", American Economic Review, 81(3), 497−513.

CBR (2005), "Report on banking sector and banking regulation development in 2004" (Отчет о развитии банковского сектора и банковского надзора в 2004 году).

CBR (2009), "Report on banking sector and banking regulation development in 2008" (Отчет о развитии банковского сектора и банковского надзора в 2008 году).

CBR (2010), "Financial Stability Review 2009," http://www.cbr.ru/eng/today/publications_reports/F-ST_2009.pdf

CBR (2013), "Overview of financial market" (Обзор финансового рынка), No. 75.

Clouse, J.A., and J.P. Dow Jr. (2002), "A computational model of banks' optimal reserve management policy," Journal of Economic Dynamics & Control, 26, 1787−1814.

Cocco, J.F., F.J. Gomes, and N.C. Martins (2009), "Lending relationships in the interbank market," Journal of Financial Intermediation, 18, 24−48.

Das, S., and A.N.R. Sy (2012), "How Risky Are Banks' Risk Weighted Assets? Evidence from the Financial Crisis," IMF Working Paper 12/36.

De Bandt, O., and P. Hartmann (2000), "Systemic risk: a survey," ECB Working Paper No. 35.

Demirgüç-Kunt, A., and H. Huizinga (2004), "Market Discipline and Deposit Insurance," Journal of Monetary Economics, 51, 375−399.

Dinger, V., and J. von Hagen (2009), "Does Interbank Borrowing Reduce Bank Risk?" Journal of Money, Credit and Banking, 41(2−3).

Dislia, V., K. Schoors, and M. Meira (2013), "Political connections and depositor discipline," BOFIT Discussion Papers No. 6.

Distinguin, I., P. Rous, and A. Tarazi (2006), "Market Discipline and the Use of Stock Market Data to Predict Bank Financial Distress," Journal of Financial Services Research 30(2), 151−176.

Egorov, A., and O. Kovalenko (2013), "Structural Features and Interest-Rate Dynamics of Russia's Interbank Lending Market," BOFIT Discussion Paper No. 23.

Ellis, D.M., and M.J. Flannery (1992), "Does the debt market assess large banks' risk? Time series evidence from money center CDs," Journal of Monetary Economics, 30, 481−502.

Ernst & Young (2013), "Implementing Basel II/III in Russia," brochure. http://www.ey.com/Publication/vwLUAssets/Implementing-Basel-in-Russia-Eng/$FILE/Implementing-Basel-in-Russia-Eng.pdf

Flannery, M.J. (2001), "The Faces of 'Market Discipline'," Journal of Financial Services Research 2−3(20), 107−119.

Furfine, C. (2001), "Banks as Monitors of Other Banks: Evidence from the Overnight Federal Funds Market," Journal of Business, 74(1), 33−57.

Goldberg, L.G., and S.C. Hudgins (1996), "Response of Uninsured Depositors to Impending S&L Failures: Evidence of Depositor Discipline," Quarterly Review of Economics and Finance, 36(3), 311−325.

Goyal, V. (2005), "Market discipline of bank risk: Evidence from subordinated debt contracts," Journal of Financial Intermediation, 14(3), 318−350.

Hannan, T., and G. Hanweck (1988), "Bank Insolvency Risk and the Market for Large Certificates of Deposit," Journal of Money Credit and Banking, 20(2), 203−211.

Ho, T.S.Y., and A. Saunders (1985), "A Micro Model of the Federal Funds Market," Journal of Finance, 40(3), 977−988.

Hosono, K., H. Iwaki, and K. Tsuru (2004), "Bank Regulation and Market Discipline around the World," RIETI Discussion Paper No. 04−E−031.

Huang, R., and L. Ratnovski (2010), "The Dark Side of Bank Wholesale Funding," IMF Working Paper No. 10/170.

IMF (2011), "Russian Federation: Financial System Stability Assessment," IMF Country Report No. 11/291.

IMF (2012), "Russian Federation: Selected Issues," IMF Country Report No. 12/218.

Jordan, J.S. (2000), "Depositor Discipline at Failing Banks," New England Economic Review, March/April, 15−28.

Karas, A., W. Pyle, and K. Schoors (2006), "Sophisticated Discipline in Nascent Deposit Markets: Evidence from Post-Communist Russia," Middlebury College Economics Discussion Paper No. 06−07.

Karas, A., K. Schoors, and G. Lanine (2008), "Liquidity matters: Evidence from the Russian interbank market," BOFIT Discussion Paper No. 19/2008.

King, T.B. (2008), "Discipline and Liquidity in the Interbank Market," Journal of Money, Credit and Banking, 40(2−3), 295−317.

Lane, T.D. (1993), "Market Discipline," International Monetary Fund Staff Papers, 40(1), 53−88.

Liedorp, F.R., L. Medema, M. Koetter, R.H. Koning, and I. van Lelyveld (2010), "Peer Monitoring or Contagion? Interbank Market Exposure and Bank Risk," De Nederlandsche Bank Working Paper No. 248.

Murata, K., and M. Hori (2006), "Do Small Depositors Exit from Bad Banks? Evidence from Small Financial Institutions in Japan," Japanese Economic Review, 57(2), 260−278.

Nier, E., and U. Baumann (2006), "Market discipline, disclosure and moral hazard in banking," Journal of Financial Intermediation, 15, 332−361.

Nieto, M.J. (2012), "What Role, If Any, Can Market Discipline Play in Supporting Macroprudential Policy?" Banco de Espana Occasional Paper No. 1202.

Peresetsky A.A., A.M. Karminsky, and S.V. Golovan (2007), "Russian banks' private deposit interest rates and market discipline," BOFIT Discussion Papers No. 2/2007.

Rochet J-C., and J. Tirole (1996), "Interbank Lending and Systemic Risk," Journal of Money, Credit and Banking, 28(4), 733−762.

Semenova, M. (2007), "How depositors discipline banks: the case of Russia," Economics Education and Research Consortium Working Paper No. 07/02.

Semenova, M., and I. Andrievskaya (2012), "Are banks peer disciplined? Evidence from post-crisis Russia," Higher School of Economics Research Paper No. BRP 07/FE/2012.

Upper C., and A. Worms (2004), "Estimating bilateral exposures in the German interbank market: Is there a danger of contagion?" European Economic Review, 48(4), 827−849.

Ungan, A.E., S. Caner, and S. Ozyildirim (2008), "Depositors' Assessment of Bank Riskiness in the Russian Federation," Journal of Financial Services Research, 33(2), 77−100.

Wooldridge, J.M. (2002), Econometric Analysis of Cross Section and Panel Data, MIT Press.

Appendix I Russian interbank market

Figure 1 Russian interbank operations by transaction type (April 2013)

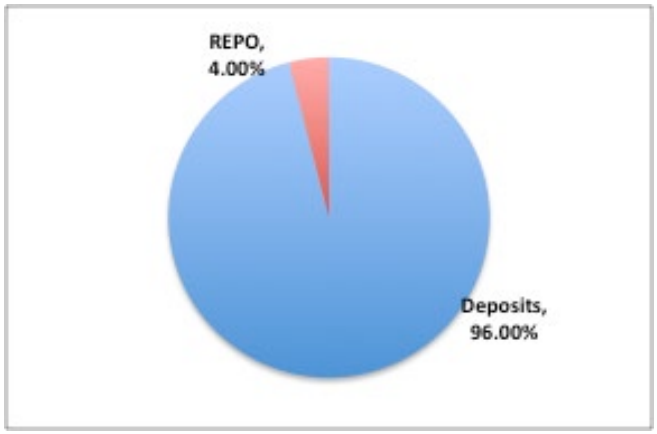


Figure 2 Russian interbank operations by counterparty type (April 2013)

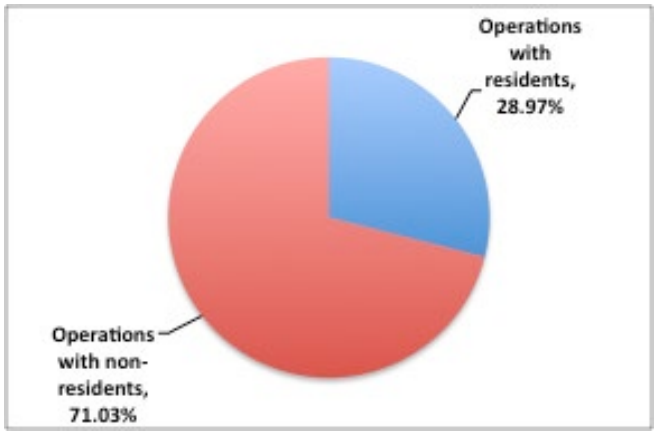


Figure 3 Russian interbank operations by currency (April 2013)

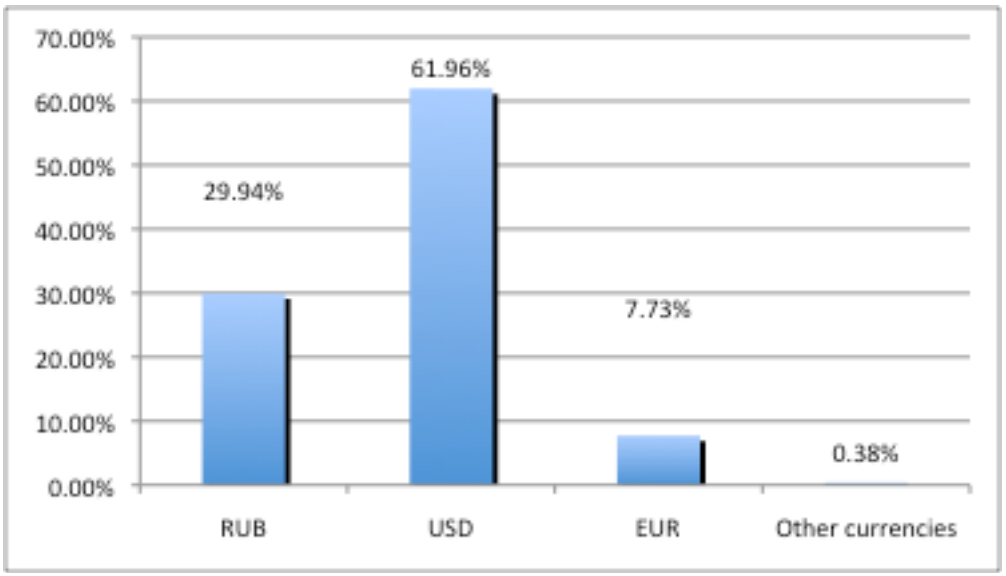


Figure 4 Russian interbank operations by maturity (April 2013)

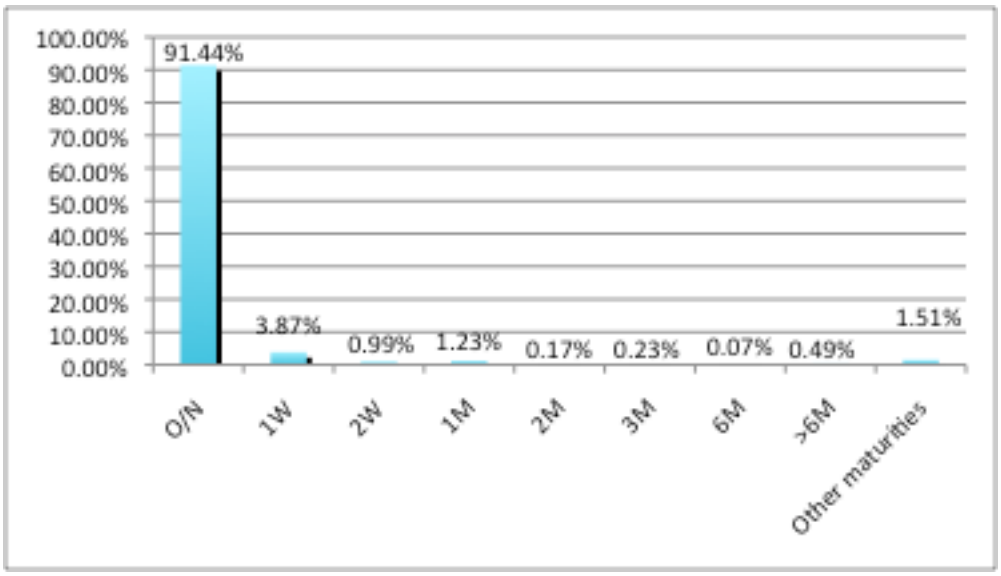


Figure 5 Interbank interest rate dynamics (MIACR)

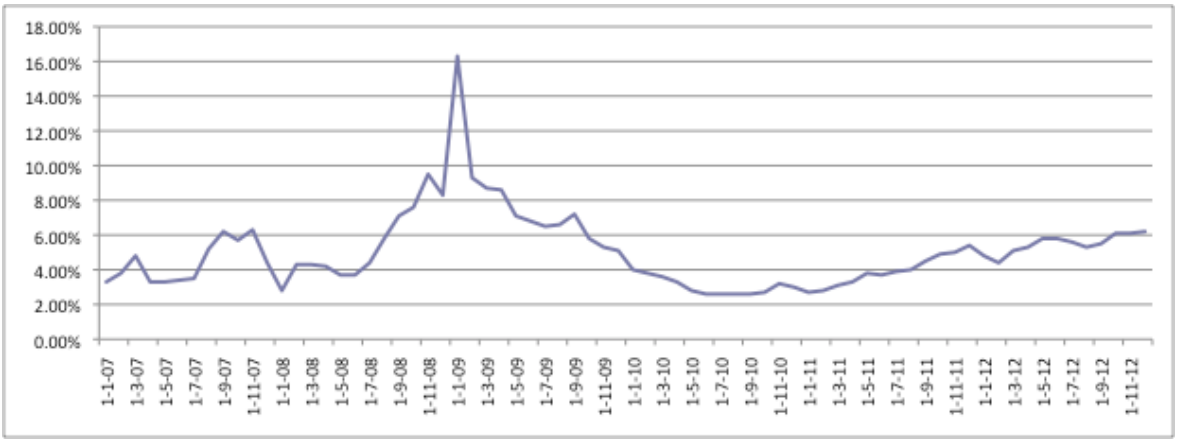
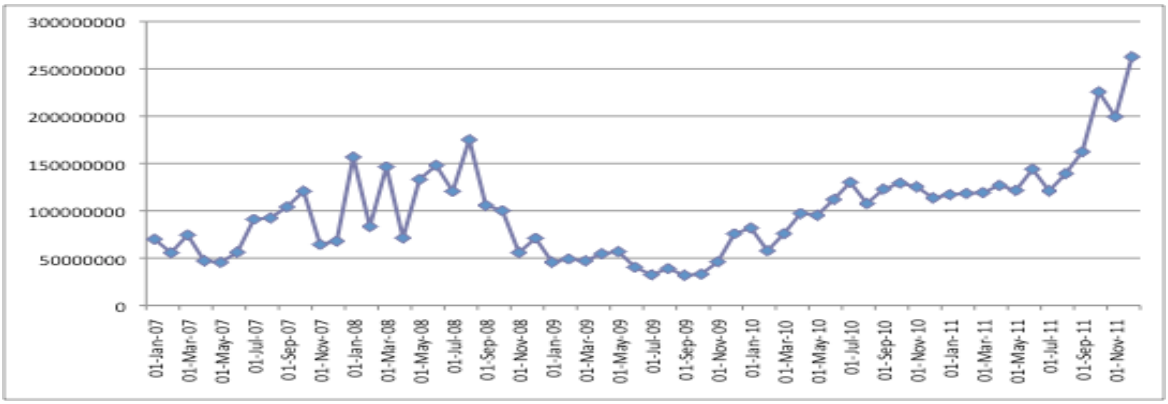


Figure 6 Short-term funds from non-residents



Appendix II Tables

Table A1 Participation equation (robust standard error in parentheses)

Variables	Winsorized sample	Restricted sample
h2_1	−0.002***	−0.005***
	(0.000)	(0.001)
mbkb_as_1	21.721***	15.860***
	(1.167)	(0.765)
lnas_1	0.720***	0.528***
	(0.045)	(0.025)
tl_as_1	1.465***	0.844***
	(0.249)	(0.165)
Observations	7,792	8,661
Number of banks	444	650

*** p<0.01, ** p<0.05, * p<0.1

Table A2 Market discipline: full sample, credit risk from non-performing loans (NPL) (robust standard error in parentheses)

Variable	y = rate of IB loan growth						y = ln(IB loan volume)					
crisis	−0.547	−0.364	−0.394	−0.546**	−0.354	−0.285	0.509	0.894	0.121	0.242	0.192	0.211
	(0.345)	(0.329)	(0.269)	(0.260)	(0.260)	(0.267)	(0.737)	(0.762)	(0.583)	(0.599)	(0.570)	(0.590)
h1_1	0.003	0.002					−0.011*	−0.025***				
	(0.002)	(0.001)					(0.006)	(0.006)				
h1_1*crisis	0.001	0.000					−0.002	−0.006				
	(0.002)	(0.002)					(0.008)	(0.008)				
h3_1	−0.001*		−0.001*				−0.005***		−0.006***			
	(0.001)		(0.000)				(0.001)		(0.001)			
h3_1*crisis	0.000		0.000				0.001		−0.000			
	(0.001)		(0.000)				(0.002)		(0.002)			
pe_profit_1	−0.003**			−0.004**			−0.004			−0.006		
	(0.002)			(0.002)			(0.003)			(0.004)		
pe_profit_1*crisis	0.006*			0.008**			−0.010			−0.009		
	(0.003)			(0.003)			(0.007)			(0.007)		
bl_loan_1	−0.781				−0.748*		−0.393				−3.733*	
	(0.534)				(0.430)		(2.014)				(2.120)	
bl_loan_1*crisis	−0.188				0.209		−6.810***				−6.092**	
	(0.808)				(0.649)		(2.494)				(2.431)	
roa_1	−0.327					1.288	4.318					3.878
	(1.242)					(1.198)	(3.697)					(3.766)
roa_1*crisis	−4.625**					−5.132**	−10.743*					−9.981
	(2.270)					(2.366)	(6.159)					(6.444)
lnas_1	−0.016	−0.030	−0.027	−0.037*	−0.023	−0.030	0.685***	0.523***	0.761***	0.621***	0.622***	0.623***
	(0.024)	(0.020)	(0.021)	(0.022)	(0.021)	(0.021)	(0.148)	(0.142)	(0.141)	(0.142)	(0.141)	(0.142)
lnas_1*crisis	0.036**	0.028	0.029*	0.037**	0.027*	0.026*	−0.019	−0.049	−0.009	−0.016	−0.010	−0.011
	(0.018)	(0.018)	(0.015)	(0.015)	(0.015)	(0.015)	(0.041)	(0.043)	(0.036)	(0.038)	(0.036)	(0.037)
mbkb_as_1	−1.488***	−1.275***	−1.290***	−1.472***	−1.308***	−1.310***	4.239***	4.524***	4.365***	5.023***	4.919***	4.927***
	(0.240)	(0.197)	(0.201)	(0.234)	(0.196)	(0.197)	(0.751)	(0.781)	(0.752)	(0.784)	(0.789)	(0.792)
mbkb_as_1*crisis	−0.304	−0.382**	−0.369**	−0.298	−0.365**	−0.386**	−0.922*	−1.005*	−0.925*	−1.050*	−0.958*	−1.085**
	(0.186)	(0.182)	(0.184)	(0.188)	(0.181)	(0.176)	(0.480)	(0.539)	(0.531)	(0.551)	(0.517)	(0.544)
mills	35.064***	−0.002***	0.002	39.788***	−0.003***	−0.002**						
	(3.210)	(0.001)	(0.003)	(1.594)	(0.001)	(0.001)			dropped			
Constant	0.457	0.562*	0.619*	0.748**	0.506	0.584*	2.981	5.327**	1.601	3.243	3.342	3.166
	(0.385)	(0.320)	(0.328)	(0.357)	(0.338)	(0.332)	(2.345)	(2.278)	(2.226)	(2.261)	(2.229)	(2.251)
Observations	3,955	4,311	4,314	3,960	4,315	4,315	3,069	3,074	3,074	3,071	3,075	3,075
R-sq-within	0.035	0.024	0.024	0.031	0.024	0.025	0.117	0.086	0.099	0.071	0.079	0.067
Number of banks	410	419	419	410	419	419	466	466	466	466	466	466

*** p<0.01, ** p<0.05, * p<0.1

Table A3 Market discipline: borrowing from foreign lenders, credit risk from non-performing loans (NPL), (robust standard error in parentheses)

Variable	y = rate of IB loan growth						y = ln(IB loan volume)					
crisis	0.810***	0.864***	0.454*	0.431*	0.469**	0.437*	0.706	1.234	0.777	1.298	1.661	1.295
	(0.272)	(0.253)	(0.231)	(0.241)	(0.219)	(0.227)	(1.952)	(1.933)	(1.684)	(1.612)	(1.628)	(1.665)
h1_1	0.002	0.002					−0.000	−0.019*				
	(0.002)	(0.002)					(0.013)	(0.012)				
h1_1*crisis	−0.007***	−0.007***					0.005	0.008				
	(0.002)	(0.002)					(0.018)	(0.017)				
h3_1	−0.000		−0.000				−0.004**		−0.006***			
	(0.000)		(0.000)				(0.002)		(0.002)			
h3_1*crisis	0.000		−0.000				0.002		0.003			
	(0.000)		(0.000)				(0.002)		(0.003)			
pe_profit_1	0.001			0.001			−0.012			−0.013		
	(0.001)			(0.001)			(0.009)			(0.009)		
pe_profit_1*crisis	−0.004			−0.003			−0.007			−0.007		
	(0.003)			(0.003)			(0.010)			(0.011)		
bl_loan_1	−1.069*				−1.157**		−6.505				−7.938	
	(0.634)				(0.505)		(5.655)				(5.208)	
bl_loan_1*crisis	−0.042				−0.458		2.249				3.539	
	(1.058)				(0.903)		(5.196)				(4.714)	
roa_1	−0.131					0.281	−4.555					−1.931
	(1.193)					(0.996)	(5.940)					(8.028)
roa_1*crisis	0.702					−0.028	9.152					7.660
	(1.946)					(1.857)	(9.052)					(8.195)
lnas_1	−0.017	−0.034*	−0.030	−0.038*	−0.014	−0.033	0.803**	0.635*	0.804**	0.616*	0.740**	0.639*
	(0.024)	(0.020)	(0.021)	(0.022)	(0.022)	(0.021)	(0.340)	(0.341)	(0.343)	(0.319)	(0.339)	(0.336)
lnas_1*crisis	−0.042***	−0.043***	−0.025*	−0.024*	−0.027**	−0.025*	−0.029	−0.040	−0.026	−0.036	−0.070	−0.041
	(0.015)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.101)	(0.102)	(0.091)	(0.093)	(0.092)	(0.095)
mbkb_as_1	−1.033***	−0.974***	−0.975***	−1.000***	−0.990***	−0.968***	3.367**	3.307**	3.084**	3.352**	3.266**	3.401**
	(0.212)	(0.201)	(0.203)	(0.210)	(0.194)	(0.198)	(1.346)	(1.444)	(1.352)	(1.357)	(1.373)	(1.420)
mbkb_as_1*crisis	0.220	0.208	0.220	0.195	0.207	0.189	−2.129***	−2.113**	−2.134***	−2.016**	−2.030**	−2.045**
	(0.160)	(0.146)	(0.145)	(0.153)	(0.142)	(0.146)	(0.793)	(0.885)	(0.795)	(0.835)	(0.814)	(0.881)
mills	dropped											
Constant	0.480	0.690**	0.687**	0.795**	0.413	0.696*	−1.679	0.803	−1.851	0.821	−1.038	0.378
	(0.415)	(0.342)	(0.348)	(0.375)	(0.367)	(0.356)	(5.857)	(5.922)	(5.871)	(5.479)	(5.811)	(5.790)
Observations	2,135	2,317	2,316	2,136	2,317	2,317	1,198	1,201	1,200	1,199	1,201	1,201
R-sq-within	0.033	0.028	0.027	0.027	0.029	0.025	0.072	0.048	0.060	0.050	0.057	0.045
Number of banks	165	169	169	165	169	169	165	165	165	165	165	165

*** p<0.01, ** p<0.05, * p<0.1

Table A4 Market discipline: all banks, restricted sample (robust standard error in parentheses)

Variable	y = rate of IB loan growth								y = ln(IB loan volume turnover)							
crisis	−0.577*	−0.537*	−0.509	−0.734***	−0.695***	−0.673***	−0.605**	−0.690***	0.226	0.355	0.712	−0.125	−0.225	−0.200	0.045	−0.210
	(0.316)	(0.316)	(0.313)	(0.262)	(0.254)	(0.252)	(0.260)	(0.255)	(0.681)	(0.663)	(0.737)	(0.539)	(0.576)	(0.553)	(0.572)	(0.582)
h1_1	0.003	0.002	0.001						−0.009	−0.010	−0.022***					
	(0.002)	(0.002)	(0.002)						(0.007)	(0.008)	(0.007)					
h1_1*crisis	−0.003	−0.003	−0.003						−0.006	−0.004	−0.011					
	(0.003)	(0.003)	(0.003)						(0.008)	(0.008)	(0.008)					
h3_1	−0.001	−0.001		−0.001					−0.005***	−0.005***		−0.006***				
	(0.001)	(0.001)		(0.001)					(0.001)	(0.001)		(0.001)				
h3_1*crisis	0.001	0.001		0.001					−0.001	−0.002		−0.003				
	(0.001)	(0.001)		(0.001)					(0.002)	(0.002)		(0.002)				
pe_profit_1	−0.000	−0.000			−0.000				−0.000	−0.000			−0.000			
	(0.000)	(0.000)			(0.000)				(0.000)	(0.000)			(0.000)			
pe_profit_1*crisis	0.000	0.000			0.000*				−0.000	−0.000			0.000			
	(0.000)	(0.000)			(0.000)				(0.000)	(0.000)			(0.000)			
bl_loan_1	−1.038**					−1.239**			0.311					−2.063		
	(0.510)					(0.480)			(1.553)					(1.784)		
bl_loan_1*crisis	−1.251					−0.955			−6.222***					−6.501***		
	(1.078)					(0.939)			(2.256)					(2.166)		
res_as_1		−0.032					−0.173			−0.063					−2.669*	
		(0.503)					(0.486)			(1.662)					(1.606)	
res_as_1*crisis		−0.820					−0.872			−3.351**					−3.440**	
		(0.713)					(0.689)			(1.368)					(1.428)	
roa_1	1.760	1.944*						2.104*	5.022	4.255						5.101
	(1.073)	(1.136)						(1.164)	(3.343)	(3.281)						(3.298)
roa_1*crisis	−1.478	−0.772						−0.811	−4.707	−1.220						−3.949
	(1.664)	(1.617)						(1.582)	(5.839)	(4.635)						(5.716)
lnas_1	−0.047	−0.060*	−0.073***	−0.071**	−0.075***	−0.062**	−0.075***	−0.072**	0.660***	0.646***	0.494***	0.713***	0.559***	0.553***	0.521***	0.561***
	(0.030)	(0.030)	(0.028)	(0.028)	(0.028)	(0.029)	(0.029)	(0.028)	(0.149)	(0.143)	(0.144)	(0.146)	(0.144)	(0.144)	(0.137)	(0.144)
lnas_1*crisis	0.042**	0.042**	0.042**	0.050***	0.050***	0.049***	0.047***	0.050***	0.008	0.003	−0.032	0.019	0.011	0.017	0.005	0.012
	(0.017)	(0.017)	(0.017)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.039)	(0.038)	(0.041)	(0.034)	(0.036)	(0.035)	(0.035)	(0.036)
mbkb_as_1	−2.668***	−2.651***	−2.651***	−2.656***	−2.643***	−2.669***	−2.650***	−2.638***	3.251***	3.194***	3.359***	3.271***	3.570***	3.564***	3.392***	3.567***
	(0.326)	(0.327)	(0.324)	(0.327)	(0.324)	(0.323)	(0.324)	(0.325)	(0.896)	(0.885)	(0.967)	(0.903)	(1.042)	(1.026)	(1.037)	(1.041)
mbkb_as_1*crisis	−0.174	−0.208	−0.160	−0.195	−0.184	−0.164	−0.211	−0.185	−0.968*	−1.003*	−1.075**	−0.922*	−1.137**	−1.078**	−1.178**	−1.126**
	(0.267)	(0.271)	(0.271)	(0.277)	(0.274)	(0.267)	(0.271)	(0.273)	(0.500)	(0.517)	(0.531)	(0.527)	(0.555)	(0.521)	(0.539)	(0.545)
mills	0.150*	0.149*	0.150*	0.152*	0.151*	0.154*	0.151*	0.151*	−0.631	−0.629	−0.755	−0.644	−0.847	−0.830	−0.841	−0.850
	(0.088)	(0.088)	(0.086)	(0.088)	(0.086)	(0.087)	(0.086)	(0.086)	(0.416)	(0.412)	(0.491)	(0.423)	(0.546)	(0.536)	(0.541)	(0.546)
Constant	1.045**	1.234**	1.411***	1.452***	1.469***	1.292***	1.481***	1.391***	3.493	3.752	5.988**	2.548	4.509*	4.680**	5.291**	4.448*
	(0.491)	(0.497)	(0.467)	(0.458)	(0.453)	(0.468)	(0.466)	(0.459)	(2.394)	(2.289)	(2.339)	(2.336)	(2.342)	(2.329)	(2.198)	(2.345)
Observations	4,756	4,756	4,756	4,756	4,756	4,756	4,756	4,756	3,012	3,012	3,012	3,012	3,012	3,012	3,012	3,012
R-sq-within	0.080	0.079	0.077	0.077	0.077	0.078	0.077	0.078	0.118	0.116	0.090	0.106	0.076	0.087	0.084	0.077
Number of banks	475	475	475	475	475	475	475	475	463	463	463	463	463	463	463	463

*** p<0.01, ** p<0.05, * p<0.1

Table A5 Market discipline: borrowing from foreign lenders, restricted sample (robust standard error in parentheses)

Variable	y = rate of IB loan growth								y = ln(IB loan volume)							
crisis	0.650***	0.764***	0.740***	0.449*	0.452*	0.480**	0.625**	0.472**	0.803	0.899	1.271	0.784	1.274	1.395	1.615	1.289
	(0.246)	(0.243)	(0.247)	(0.246)	(0.243)	(0.233)	(0.254)	(0.238)	(1.593)	(1.592)	(1.586)	(1.419)	(1.372)	(1.383)	(1.451)	(1.381)
h1_1	−0.002	−0.002	−0.004						−0.007	−0.008	−0.024					
	(0.004)	(0.004)	(0.004)						(0.015)	(0.016)	(0.015)					
h1_1*crisis	−0.005*	−0.005	−0.006**						0.006	0.008	0.009					
	(0.003)	(0.003)	(0.003)						(0.018)	(0.019)	(0.019)					
h3_1	−0.001*	−0.001**		−0.001**					−0.005**	−0.006***		−0.007***				
	(0.001)	(0.001)		(0.000)					(0.002)	(0.002)		(0.002)				
h3_1*crisis	0.000	0.001		−0.000					0.003	0.005		0.004				
	(0.001)	(0.001)		(0.001)					(0.003)	(0.003)		(0.003)				
pe_profit_1	−0.001	−0.001			−0.001				−0.003	−0.003			−0.003			
	(0.001)	(0.001)			(0.001)				(0.002)	(0.002)			(0.002)			
pe_profit_1*crisis	0.000	0.001			0.001				0.003	0.003			0.003			
	(0.002)	(0.001)			(0.001)				(0.002)	(0.002)			(0.002)			
bl_loan_1	−0.657					−0.987*			−4.892					−6.093		
	(0.579)					(0.559)			(4.057)					(3.931)		
bl_loan_1*crisis	−0.876					−0.783			1.898					2.410		
	(0.838)					(0.815)			(4.529)					(3.636)		
res_as_1		−0.538					−0.746*			−0.568					−2.649	
		(0.403)					(0.424)			(2.995)					(2.985)	
res_as_1*crisis		−1.467*					−1.497*			−2.701					−1.146	
		(0.870)					(0.861)			(4.063)					(3.772)	
roa_1	0.139	0.085						0.451	−3.250	0.023						0.107
	(0.440)	(0.471)						(0.489)	(4.138)	(4.707)						(4.924)
roa_1*crisis	−0.629	−0.694						−0.726	4.701	1.833						2.253
	(1.193)	(1.296)						(0.974)	(7.019)	(5.707)						(5.045)
lnas_1	−0.080**	−0.084***	−0.105***	−0.089***	−0.101***	−0.086***	−0.094***	−0.101***	0.698**	0.679**	0.524*	0.691**	0.530*	0.596**	0.544*	0.527*
	(0.032)	(0.030)	(0.029)	(0.031)	(0.029)	(0.032)	(0.029)	(0.029)	(0.307)	(0.311)	(0.297)	(0.302)	(0.293)	(0.296)	(0.297)	(0.294)
lnas_1*crisis	−0.031**	−0.035***	−0.033**	−0.022*	−0.023*	−0.024*	−0.029**	−0.023*	−0.038	−0.038	−0.043	−0.031	−0.037	−0.053	−0.054	−0.039
	(0.013)	(0.013)	(0.013)	(0.013)	(0.014)	(0.013)	(0.013)	(0.013)	(0.079)	(0.078)	(0.082)	(0.074)	(0.077)	(0.077)	(0.078)	(0.078)
mbkb_as_1	−1.354***	−1.348***	−1.346***	−1.312***	−1.312***	−1.336***	−1.326***	−1.311***	2.958**	2.943**	3.036**	2.838**	3.018**	2.912**	2.903**	3.046**
	(0.326)	(0.330)	(0.328)	(0.336)	(0.336)	(0.328)	(0.332)	(0.335)	(1.356)	(1.370)	(1.422)	(1.324)	(1.378)	(1.362)	(1.390)	(1.408)
mbkb_as_1*crisis	0.140	0.091	0.135	0.154	0.131	0.142	0.092	0.126	−2.027***	−2.220***	−2.028**	−2.039***	−1.905**	−1.842**	−1.961**	−1.913**
	(0.188)	(0.190)	(0.184)	(0.188)	(0.186)	(0.181)	(0.186)	(0.185)	(0.733)	(0.744)	(0.822)	(0.746)	(0.791)	(0.747)	(0.758)	(0.803)
mills	−0.127	−0.130	−0.156	−0.108	−0.145	−0.139	−0.146	−0.143	−0.326	−0.316	−0.449	−0.277	−0.472	−0.431	−0.440	−0.456
	(0.098)	(0.098)	(0.102)	(0.098)	(0.106)	(0.105)	(0.105)	(0.104)	(0.416)	(0.420)	(0.461)	(0.388)	(0.516)	(0.483)	(0.491)	(0.505)
Constant	1.780***	1.861***	2.138***	1.884***	1.986***	1.757***	1.906***	1.978***	0.192	0.477	2.809	0.114	2.282	1.385	2.205	2.315
	(0.575)	(0.542)	(0.516)	(0.538)	(0.518)	(0.554)	(0.519)	(0.523)	(5.316)	(5.379)	(5.179)	(5.174)	(5.056)	(5.082)	(5.118)	(5.074)
Observations	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,985	1,183	1,183	1,183	1,183	1,183	1,183	1,183	1,183
R-sq-within	0.058	0.059	0.053	0.053	0.050	0.052	0.053	0.049	0.063	0.060	0.044	0.054	0.043	0.050	0.043	0.040
Number of banks	157	157	157	157	157	157	157	157	165	165	165	165	165	165	165	165

*** p<0.01, ** p<0.05, * p<0.1

Table A6 Discipline in the interbank market: restricted sample (robust standard error in parentheses)

VARIABLES	Disciplining by loan amount						Disciplining by transaction volume					
	h1	h2	h3	res_as	bl_loan	rwa_as	h1	h2	h3	res_as	bl_loan	rwa_as
crisis	3.473	72.959	−30.778*	0.051***	0.033**	0.135	12.223***	31.467	−76.969***	0.039*	0.031*	0.482***
	(4.222)	(92.633)	(17.974)	(0.016)	(0.014)	(0.142)	(3.192)	(89.660)	(27.319)	(0.021)	(0.016)	(0.161)
mbkb_as_1	3.522	255.340	−6.234	−0.010	−0.000	0.186*						
	(3.884)	(191.924)	(13.212)	(0.017)	(0.013)	(0.100)						
mbkb_as_1*crisis	0.070	−98.213	35.155***	−0.014	0.003	0.248**						
	(2.768)	(82.801)	(13.192)	(0.015)	(0.014)	(0.107)						
LnTO1_1							−0.419***	−1.118	−2.690***	−0.001	−0.001	−0.003
							(0.148)	(0.898)	(0.927)	(0.001)	(0.001)	(0.006)
LnTO1_1*crisis							0.091	−3.174	−0.758	−0.001	−0.001	0.010
							(0.171)	(2.179)	(1.030)	(0.001)	(0.001)	(0.006)
in_rev_1	1.684	35.061	−35.501**	−0.116***	−0.017	0.587***	−11.404**	215.590	−93.730***	−0.136***	−0.069***	−0.110
	(5.163)	(53.873)	(16.108)	(0.019)	(0.024)	(0.141)	(4.659)	(222.050)	(33.644)	(0.027)	(0.022)	(0.185)
in_rev_1*crisis	−9.352*	−200.144	6.970	−0.016	−0.059**	−0.892***	−3.106	−356.615	69.015	−0.005	−0.008	−0.104
	(4.769)	(198.663)	(29.358)	(0.021)	(0.026)	(0.165)	(4.615)	(297.294)	(45.066)	(0.027)	(0.027)	(0.228)
tl_as_1	−4.097	−5.762	−25.700**	0.059***	−0.020	0.164**	−3.496	−20.318	−33.387***	0.042***	−0.019*	0.203**
	(2.798)	(33.151)	(10.073)	(0.010)	(0.016)	(0.068)	(2.790)	(15.068)	(12.472)	(0.014)	(0.011)	(0.086)
tl_as_1*crisis	−1.733	37.923	−7.667	0.000	0.010	−0.205***	−0.223	15.859	30.206**	−0.005	−0.000	−0.148*
	(2.836)	(34.998)	(10.787)	(0.011)	(0.013)	(0.078)	(2.443)	(14.397)	(14.861)	(0.012)	(0.013)	(0.086)
roa_1	−3.002	−5.313	−99.433**	−0.203***	−0.138	0.831*	34.377***	−139.303	−144.448	−0.136	−0.297***	0.226
	(13.399)	(51.647)	(43.000)	(0.044)	(0.084)	(0.440)	(12.720)	(133.465)	(130.370)	(0.120)	(0.102)	(0.472)
roa_1*crisis	26.957	83.961	150.970	−0.133	−0.203	−1.392***	−18.381	374.665**	114.832	−0.011	−0.034	−0.577
	(24.957)	(153.476)	(134.183)	(0.181)	(0.140)	(0.512)	(28.765)	(170.988)	(196.623)	(0.155)	(0.167)	(0.648)
lnas_1	−2.479***	17.092	6.889***	0.006***	0.010***	−0.202***	−2.976***	18.281***	8.309**	−0.002	0.002	−0.101***
	(0.517)	(10.625)	(1.467)	(0.002)	(0.001)	(0.015)	(0.908)	(6.856)	(3.538)	(0.004)	(0.003)	(0.024)
lnas_1*crisis	0.008	−4.070	1.978**	−0.003***	−0.002**	0.009	−0.698***	2.549	3.645**	−0.002	−0.001	−0.025**
	(0.217)	(5.557)	(0.940)	(0.001)	(0.001)	(0.009)	(0.242)	(2.996)	(1.734)	(0.001)	(0.001)	(0.011)
ld_lnas_1	−61.675**	−335.512**	−173.359***	−0.183***	−0.247***	1.528***	−39.587*	−123.820	−60.685	−0.220**	−0.188***	1.550***
	(24.134)	(141.615)	(60.216)	(0.060)	(0.048)	(0.364)	(21.542)	(169.179)	(108.132)	(0.091)	(0.069)	(0.539)
ld_lnas_1*crisis	−38.942	13.727	−23.286	−0.040	−0.143	−0.585	−58.648*	−334.236	−171.892	0.048	−0.198	−1.576**
	(37.501)	(218.212)	(111.519)	(0.110)	(0.113)	(0.615)	(34.649)	(322.109)	(163.440)	(0.155)	(0.163)	(0.785)
mills	3.645***	186.250	9.895**	0.011***	0.014**	0.000	1.953**	26.314**	16.516***	0.009***	0.003	−0.001
	(1.023)	(147.313)	(4.026)	(0.003)	(0.006)	(0.022)	(0.816)	(10.715)	(5.194)	(0.003)	(0.003)	(0.047)
Constant	61.336***	−278.360	−0.549	−0.065**	−0.117***	3.386***	76.743***	−228.471*	24.933	0.095	0.042	1.811***
	(8.492)	(237.980)	(23.192)	(0.032)	(0.023)	(0.245)	(15.519)	(121.706)	(58.220)	(0.071)	(0.053)	(0.424)
Observations	5,412	5,411	5,412	5,412	5,412	5,412	2,541	2,540	2,541	2,541	2,541	2,541
R-squared	0.099	0.162	0.062	0.133	0.082	0.317	0.116	0.089	0.090	0.118	0.109	0.107
Number of banks	538	538	538	538	538	538	417	417	417	417	417	417

*** p<0.01, ** p<0.05, * p<0.1

Table A7 Discipline in the interbank market: borrowing from foreign lenders, restricted sample (robust standard error in parentheses)

VARIABLES	Disciplining by loan amount						Disciplining by transaction volume					
	h1	h2	h3	res_as	bl_loan	rwa_as	h1	h2	h3	res_as	bl_loan	rwa_as
crisis	2.699	38.096	−25.670	0.051***	0.030**	0.171	5.528	−130.268**	−88.107**	0.052	0.031	0.492
	(4.451)	(83.055)	(18.801)	(0.016)	(0.014)	(0.151)	(4.215)	(54.802)	(37.458)	(0.032)	(0.032)	(0.308)
fmbkb_as_1	6.771	102.407	22.651	−0.034	−0.012	−0.090						
	(4.997)	(82.747)	(17.963)	(0.025)	(0.023)	(0.167)						
fmbkb_as_1*crisis	−1.249	−21.815	35.456**	−0.009	−0.004	0.485***						
	(4.344)	(51.622)	(17.744)	(0.021)	(0.021)	(0.164)						
LnTO3_1							−0.098	1.415	−1.898*	−0.001	−0.002*	−0.001
							(0.141)	(1.109)	(0.964)	(0.001)	(0.001)	(0.006)
LnTO3_1*crisis							−0.113	−0.204	1.885	−0.002	0.001	0.009
							(0.135)	(1.385)	(1.186)	(0.001)	(0.001)	(0.008)
in_rev_1	1.730	25.534	−34.056**	−0.117***	−0.017	0.581***	−25.519***	−33.522	−111.711**	−0.186***	−0.216***	−0.349
	(5.163)	(53.772)	(16.041)	(0.018)	(0.024)	(0.141)	(8.158)	(44.908)	(45.773)	(0.045)	(0.042)	(0.289)
in_rev_1*crisis	−9.121*	−174.737	2.454	−0.015	−0.061**	−0.923***	6.299	5.573	103.596**	0.010	0.082**	0.098
	(4.698)	(189.082)	(28.753)	(0.021)	(0.026)	(0.172)	(7.386)	(69.839)	(52.278)	(0.044)	(0.036)	(0.312)
tl_as_1	−4.172	3.076	−27.012***	0.060***	−0.019	0.173***	2.649	−22.691	−21.560	0.030*	−0.021	0.227*
	(2.833)	(38.851)	(9.951)	(0.010)	(0.016)	(0.067)	(2.914)	(25.919)	(22.072)	(0.017)	(0.021)	(0.121)
tl_as_1*crisis	−1.760	33.085	−8.560	0.001	0.011	−0.218***	1.925	1.056	17.086	−0.013	−0.017	−0.009
	(2.831)	(33.002)	(10.832)	(0.011)	(0.013)	(0.078)	(3.779)	(22.292)	(20.962)	(0.023)	(0.022)	(0.163)
roa_1	−3.472	−30.502	−101.468**	−0.201***	−0.138	0.792*	48.284***	−88.476	−258.860*	−0.261*	−0.484***	0.029
	(13.395)	(54.574)	(42.552)	(0.044)	(0.084)	(0.458)	(13.486)	(134.072)	(132.698)	(0.140)	(0.091)	(0.555)
roa_1*crisis	27.390	65.147	154.112	−0.136	−0.205	−1.438***	−8.441	171.087	255.358**	0.006	−0.253	−0.182
	(25.076)	(153.241)	(134.771)	(0.182)	(0.140)	(0.534)	(26.049)	(241.257)	(103.718)	(0.235)	(0.181)	(0.807)
lnas_1	−2.580***	12.218*	6.769***	0.006***	0.010***	−0.205***	−0.811	18.193***	13.816**	0.003	0.005	−0.144***
	(0.506)	(7.270)	(1.468)	(0.002)	(0.001)	(0.015)	(1.154)	(5.025)	(6.800)	(0.006)	(0.005)	(0.041)
lnas_1*crisis	0.059	−2.234	1.847*	−0.003***	−0.002**	0.008	−0.282	8.067**	2.700	−0.002	−0.002	−0.030
	(0.227)	(4.803)	(0.990)	(0.001)	(0.001)	(0.009)	(0.376)	(3.606)	(2.373)	(0.002)	(0.002)	(0.020)
ld_lnas_1	−62.404***	−317.474**	−178.263***	−0.178***	−0.246***	1.566***	−9.887	−112.058	408.457	−0.228	−0.199	2.353*
	(23.576)	(125.141)	(58.305)	(0.061)	(0.049)	(0.353)	(67.188)	(233.174)	(340.168)	(0.239)	(0.213)	(1.379)
ld_lnas_1*crisis	−38.861	26.256	−26.961	−0.039	−0.144	−0.612	−100.628	−915.369**	−847.791**	−0.007	−0.527	−0.429
	(37.293)	(215.838)	(109.670)	(0.111)	(0.114)	(0.606)	(75.358)	(457.579)	(335.904)	(0.319)	(0.359)	(1.556)
mills	3.303***	161.405	10.124**	0.012***	0.014***	−0.023	3.127	337.915**	125.876***	0.009	−0.049	0.033
	(0.841)	(129.897)	(4.363)	(0.003)	(0.005)	(0.025)	(4.996)	(167.508)	(44.896)	(0.022)	(0.032)	(0.102)
Constant	63.132***	−181.241	0.684	−0.072**	−0.119***	3.457***	32.930	−261.731***	−102.432	0.013	0.016	2.758***
	(8.155)	(169.988)	(22.863)	(0.031)	(0.022)	(0.259)	(21.406)	(88.641)	(120.754)	(0.108)	(0.088)	(0.749)
Observations	5,412	5,411	5,412	5,412	5,412	5,412	1,052	1,052	1,052	1,052	1,052	1,052
R-squared	0.100	0.145	0.065	0.136	0.083	0.316	0.098	0.225	0.117	0.200	0.301	0.101
Number of banks	538	538	538	538	538	538	155	155	155	155	155	155

*** p<0.01, ** p<0.05, * p<0.1

BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.

2013

No 1 Aaron Mehrotra: On the use of sterilisation bonds in emerging Asia
No 2 Zuzana Fungáčová, Rima Turk Ariss and Laurent Weill: Does excessive liquidity creation trigger bank failures?
No 3 Martin Gächter, Aleksandra Riedl and Doris Ritzberger-Grünwald: Business cycle convergence or decoupling? Economic adjustment in CESEE during the crisis
No 4 Iikka Korhonen and Anatoly Peresetsky: What determines stock market behavior in Russia and other emerging countries?
No 5 Andrew J. Filardo and Pierre L. Siklos: Prolonged reserves accumulation, credit booms, asset prices and monetary policy in Asia
No 6 Mustafa Disli, Koen Schoors and Jos Meir: Political connections and depositor discipline
No 7 Qiyue Xiong: The role of the bank lending channel and impacts of stricter capital requirements on the Chinese banking industry
No 8 Marek Dabrowski: Monetary policy regimes in CIS economies and their ability to provide price and financial stability
No 9 Rajeev K. Goel and Michael A. Nelson: Effectiveness of whistleblower laws in combating corruption
No 10 Yin-Wong Cheung and Rajeswari Sengupta: Impact of exchange rate movements on exports: An analysis of Indian non-financial sector firms
No 11 Martin Feldkircher, Roman Horvath and Marek Rusnak: Exchange market pressures during the financial crisis: A Bayesian model averaging evidence
No 12 Alicia Garcia-Herrero and Le Xia: China's RMB bilateral swap agreements: What explains the choice of countries?
No 13 Markus Eller, Jarko Fidrmuc and Zuzana Fungáčová: Fiscal policy and regional output volatility: Evidence from Russia
No 14 Hans Degryse, Liping Lu and Steven Ongena: Informal or formal financing? Or both? First evidence on the co-funding of Chinese firms
No 15 Iikka Korhonen and Anatoly Peresetsky: Extracting global stochastic trend from non-synchronous data
No 16 Roman Horvath, Jakub Seidler and Laurent Weill: How bank competition influence liquidity creation
No 17 Zuzana Fungáčová, Laura Solanko and Laurent Weill: Does bank competition influence the lending channel in the Euro area?
No 18 Konstantins Benkovskis and Julia Wörz: What drives the market share changes? Price versus non-price factors
No 19 Marcel P. Timmer and Ilya B. Voskoboynikov: Is mining fuelling long-run growth in Russia? Industry productivity growth trends since 1995
No 20 Iftekhar Hasan, Liang Song and Paul Wachtel: Institutional development and stock price synchronicity: Evidence from China
No 21 Iftekhar Hasan, Krzysztof Jackowicz, Oskar Kowalewski and Łukasz Kozłowski: Market discipline during crisis: Evidence from bank depositors in transition countries
No 22 Yin-Wong Cheung and Risto Herrala: China's capital controls – Through the prism of covered interest differentials
No 23 Alexey Egorov and Olga Kovalenko: Structural features and interest-rate dynamics of Russia's interbank lending market
No 24 Boris Blagov and Michael Funke: The regime-dependent evolution of credibility: A fresh look at Hong Kong's linked exchange rate system
No 25 Jiandong Ju, Kang Shi and Shang-Jin Wei: Trade reforms and current account imbalances
No 26 Marco Sanfilippo: Investing abroad from the bottom of the productivity ladder – BRICS multinationals in Europe
No 27 Bruno Merlevede, Koen Schoors and Mariana Spatareanu: FDI spillovers and time since foreign entry
No 28 Pierre Pessarossi and Laurent Weill: Do capital requirements affect bank efficiency? Evidence from China
No 29 Irina Andrievskaya and Maria Semenova: Market discipline and the Russian interbank market

ISSN 1456-6184, online