ISSN 1518-3548

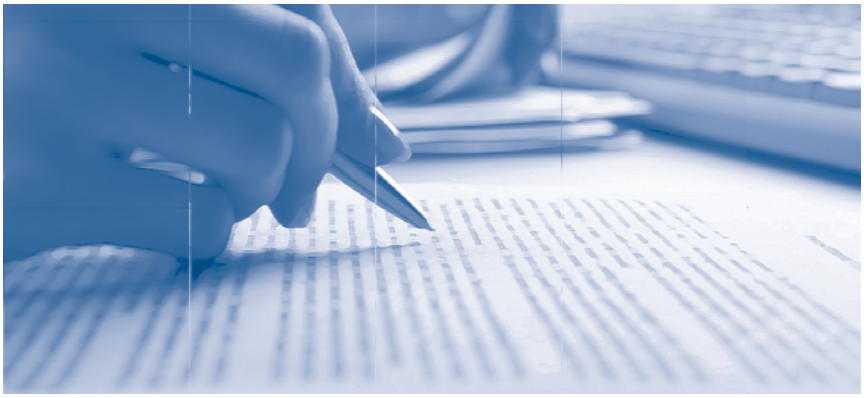
BANCO CENTRAL DO BRASIL

Do Capital Buffers Matter? A Study on the Profitability and Funding Costs Determinants of the Brazilian Banking System

Benjamin Miranda Tabak, Denise Leyi Li, João V. L. de Vasconcelos and Daniel O. Cajueiro

November, 2013

Working Papers



333

ISSN 1518-3548
CNPJ 00.038.166/0001-05

Working Paper Series	Brasília	n. 333	November	2013	p. 1-36

Working Paper Series

Edited by Research Department (Depep) – E-mail: workingpaper@bcb.gov.br

Editor: Benjamin Miranda Tabak – E-mail: benjamin.tabak@bcb.gov.br
Editorial Assistant: Jane Sofia Moita – E-mail: jane.sofia@bcb.gov.br
Head of Research Department: Eduardo José Araújo Lima – E-mail: eduardo.lima@bcb.gov.br

The Banco Central do Brasil Working Papers are all evaluated in double blind referee process.

Authorized by Carlos Hamilton Vasconcelos Araújo, Deputy Governor for Economic Policy.

General Control of Publications

Banco Central do Brasil

Comun/Dipiv/Coivi

SBS – Quadra 3 – Bloco B – Edifício-Sede – 14º andar

Caixa Postal 8.670

70074-900 Brasília – DF – Brazil

Phones: +55 (61) 3414-3710 and 3414-3565

Fax: +55 (61) 3414-1898

E-mail: editor@bcb.gov.br

Citizen Service Division

Banco Central do Brasil

Deati/Diate

SBS – Quadra 3 – Bloco B – Edifício-Sede – 2º subsolo

70074-900 Brasília – DF

Toll Free: 0800 9792345

Fax: +55 (61) 3414-2553

Internet: <http//www.bcb.gov.br/?CONTACTUS>

Do Capital Buffers Matter? A Study on the Profitability and Funding Costs Determinants of the Brazilian Banking System *

Benjamin Miranda Tabak[‡]
Denise Leyi Li[§]
João V. L. de Vasconcelos[¶]
Daniel O. Cajueiro[‖]

Abstract

This paper consists of an empirical investigation of Brazilian banks' profitability determinants. The panel data is composed of quarterly information for 71 banks between the first quarter of 2002 and the second quarter of 2012. Using data from the Brazilian banking system, we study the traditional determinants of bank profitability - controlling for macroeconomic environment, bank-specific characteristics and industrial structure of the banking sector - and contribute by analyzing the effects of capital buffers on bank profitability. We find that capital buffers have a positive impact on Brazilian banks' profitability. This result reinforces the hypothesis that buffers signalize stability and safety, reducing costs of fund raising. Other findings include a negative effect of high default rates on profitability; the positive effect of higher liquid assets ratios and, finally, the higher profitability of smaller, domestic private banks. The results are important to comprehend Brazilian banking institutions and can also help formulating and conducting monetary and regulatory policies.

Keywords: Bank profitability; Capital Buffer
JEL Classification: G21, G28, C23, C26

*Benjamin M. Tabak and Daniel O. Cajueiro gratefully acknowledge financial support from CNPQ Foundation.
[†]Universidade Católica de Brasilia; Departamento de Estudos e Pesquisas, Banco Central do Brasil
[§]Universidade de Brasília (UnB).
[¶]Universidade de Brasília (UnB).
[‖]Departamento de Economia da Universidade de Brasília (UnB).

1 Introduction

This paper consists of an empirical investigation of the profitability determinants for Brazilian banks. The results show a positive relation between the profitability of Brazilian banks and GDP growth, loans-to-total-assets ratios, asset liquidity, expenses with financial intermediation and capital buffers. The negative determinants were total assets (proxy for size), share of public and foreign capital ownership, default rates, market concentration and base interest rates. Beyond the general analysis, we also investigate more specifically the effects of capital buffers, a possible determinant of profitability that's still quite unstudied. By definition, capital buffers are capital reserves above the minimum capital requirement imposed by the monetary authority. [1] The interest in these buffers derives from both the capital structure of Brazilian banks and the focus they are given by international financial regulation authorities.

The financial system, being a central pillar in the allocation of resources within an economy, has in its efficient functioning an essential structural condition for economic growth and dynamism. The recent global crisis, born and spread from the financial system, is an example of how the systemic consequences of its malfunctioning can be dire both domestically and internationally. An event of such scale once again draws attention to the relevance of constant and updated studies of the financial system and its institutions' behavior patterns, allowing for more efficient and effective regulation and monitoring.

As one of the main components of the financial sector, understanding banking institutions and their behaviors is essential to understand the system as a whole. In this context, a bank's profitability becomes a key variable to comprehend its dynamics and motivations. Such importance is related to the own nature of banking institutions and the financial system itself, whose behavior patterns are strongly conditioned by the natural goal of profit maximization. Investigating the determinants of bank profitability behavior is a way of comprehending bank's answers and decisions when faced with internal or external environmental fluctuations. Therefore, profitability reflects banks'competitive strategies and risk-management efficiency (García-Herrero *et al.*, 2009[14]).

Regarding the banking system as a whole, bank profitability is an indicator of an economy's financial intermediation system efficiency. As pointed by García-Herrero *et al.* [14], although high profitability is positive, it has to be viewed with precaution. While banking institutions with higher profitability may have better conditions to perform their funding role more efficiently, high profitability may come from a concentrated financial market and indicate possible inefficiencies due to the exercise of excessive market power by some institutions. Still, for most cases, a profitable banking system contributes significantly to the stability of the whole financial system (Dietrich e Wanzenried, 2011[11]). Low profitability, in turn, may indicate low attractiveness of the sector and the need for a better intermediation system.

This paper empirically analyzes the profitability determinants of the Brazilian banking system, notable for having a considerably high profitability when compared to other sectors of the Brazilian economy and even to other countries' banking systems. Table 1 presents the financial system profitability, represented by return on assets (RoA) and return on equity (RoE), of Brazil, The United States, Russia,

[1] The current international recommendation, determined by the Basel committee, is of a minimum ratio of 8% between Reference Equity and risks weighted following current regulation (Required Reference Equity). In Brazil, the central bank sets a 11% requirement.

India, China, Argentina, Paraguay and Uruguay. The level of profitability in Brazil and its neighbors is high when compared to that of other emerging countries like China. This difference is even more severe when compared to developed countries like the US. Figure 1 presents a graphical comparison between the profitability of the BRICs' and The United States' financial systems.

[Table 1]

As an answer to the global crisis, the Third Basel Accord was formulated with a set of recommendations for good practices related to the capital structure of financial institutions. Aiming to create a system more resilient to negative shocks, one of the main changes when compared to the previous accord relates to capital requirements, which have become much stricter with the introduction of anti-cyclical capital buffers.

When compared to other G20 countries, the capital structure of Brazilian banks seems favorable. The Brazilian Central Bank's requirements are higher than those of the Basel II accord. Moreover, the high capital reserve ratios of Brazilian banks indicate that the system may not need significant capital injections to fulfill the new requisites of Basel III before the 2019 deadline.[2] The maintenance of capital reserves above the minimum required threshold seems inefficient when considering opportunity costs. However, there are several rational explanations to justify the benefits of such an apparently counterproductive strategy in terms of profit maximization. One of them is based on the hypothesis that higher capital reserves signalize stability, which, in turn, may attract uninsured depositors and reduce interest expenses (García-Suaza *et al.*, 2012[15]). Through this channel, we find empirical evidence that supports the hypothesis that capital buffers may indeed contribute positively to the profitability of financial institutions.

[Figure 1]

In this context, the present paper contributes with empirical information that leads to new enlightenments regarding the impact of economic environment fluctuations (inflation, GDP growth), industrial structure (market concentration indices), capital control (public, private, foreign), monetary policies (base interest rate (Selic)) and risk management (liquidity and credit risk) on the high profitability of Brazilian banks.

This paper is divided in seven sections, including this introduction. Section 2 briefly reviews the literature dealing with the determinants of banking profitability, highlighting buffers. Section 3 debates some characteristics of Brazilian banking institutions. Section 4 describes the data and variables used in the empirical model. Section 5 presents both the econometric technique and the model used. Section 6 presents the main outputs of the conducted estimations and robustness tests. Finally, section 7 concludes this paper.

[2]Basel III determines a ratio between Reference Equity and Required Reference Equity between 10,5% and 13%, to be progressively achieved between 2014 and 2019).

2 Literature Review and Theoretical Framework

The empirical literature dealing with the determinants of bank profitability is substantial and diversified. After the seminal works of Short (1979)[25] and Bourke (1989)[8], many recent studies were conducted, differing mostly in the object of study. Some, like Dietrich and Wanzenried (2011)[11] and García-Herrero *et al.* (2009)[14] focused on banking institutions within the same country (Sweden and China, respectively), while Micco *et al.* (2007)[20] e Lee e Hsieh (2013)[19], for example, generalized results by using a simultaneous multi-country analysis. This geographical and temporal scope diversity may naturally lead to differing results between works, however, they still share common parallels. While the accounting measures used to commonly represent profitability are return on assets (ROA) and return on equity (ROE), some studies (Bolt *et al.*, 2012 [7]; Albertazzi e Gambacorta, 2009[2]), use net interest income (NII) while others (Chen e Liao, 2011[9]; Havrylchyk e Jurzyk, 2006[17]) use net income margin (NIM) as the dependent variables.

These measures of profitability are modeled as functions of variables that are traditionally classified in three groups: 1) Bank specific (variables that represent capital control, expenses, revenues, risks, assets, equity and restrictions imposed by banking regulations); 2) Macroeconomic (variables that control external macroeconomic effects like growth, inflation and interest rates); and 3) Industrial organization (concentration measures for the banking system as the Herfindahl-Hirschman Index).

Due to being controlled individually by each banking institution, bank-specific variables are considered internal determinants that are related to assets, equity and individual risk-taking. The most commonly studied bank characteristics are bank size (represented by total assets), capitalization (measured by the ratio of equity to assets), administrative costs, quality and liquidity of assets and the juridical nature of banks.

In terms of size, studies point to the occurrence of economies of scale (Pasiouras e Kosmidou, 2007 [24]) and diseconomies of scale (Dietrich e Wanzenried, 2011 [11]), or still, to non-significant effects (Panayiotis *et al.*, 2008[3]).

Regarding capitalization, which is normally calculated as the ratio between equity and assets, the literature often finds that it is positively and significantly correlated with profitability (Dietrich e Wanzenried, 2011[11]; Goodard *et al.*, 2011[16]; e García-Herrero *et al.*, 2009[14]). Arguably, banks with higher equity to assets ratios tend to incur in lower financing costs due to the higher stability and lower risk this ratio seems to indicate to depositors and shareholders. Although there are not many empirical evidences in literature, another hypothesis states a negative relation between capitalization and profitability. This relation would be explained by risk and return, where higher leverage (lower equity to assets ratio) would represent higher risk, consequently resulting in higher returns (Ommeren, 2011 [23]).

The effect of bank ownership on performance also plays an important role in banking literature. State and law intervention, as institutional conditionants of bank behavior, may affect their performance in several manners and degrees. Studies like Micco *et al.*, 2007[20]; García-Herrero *et al.*, 2009[14]; Chen e Liao, 2011[9]; Dietrich e Wanzenried, 2001[11] compare the performance of foreign, domestic and public banks. Micco *et al.* (2007) [20], for example, conclude that, in developing countries, public banks are less

profitable than their private counterparts; with increased performance differences during election years. In developed countries, however, there is no indication of a significant correlation between ownership and performance. García-Herrero *et al.* (2009)[14] investigate the low profitability of Chinese banks and find that state intervention does not affect bank profits positively. Furthermore, public commercial banks are deemed responsible for compromising the profitability of the Chinese banking system as a whole.

Macroeconomic variables are considered external determinants of profitability. Due to not having enough power to change these variables, banks become mere passive agents inserted in the macroeconomic environment, whose volatility may exercise a strong influence on bank profitability. Many works focus specifically in studying this nexus between the macroeconomic scenario and bank profitability. Bolt *et al.* (2012)[7] study how bank profitability reacts to recession periods and find a stronger effect than usually reported in literature. Using data from various countries, the paper concludes that banks' profits are pro-cyclical to the economy's performance and that this synchronous movement is specially strong in deeper periods of recession. Also, between the different determinants of profitability, non-performing loans are the main cause of this pro-cyclical relation in recession phases. Albertazzi e Gambacorta (2009)[2] also find evidence pointing to the idea of pro-cyclical bank profits.

Regarding the relation between profitability and concentration in the banking market, there are two main hypotheses for competition in industrial economics: the Structure-Conduct-Performance (SCP) and Efficiency-Structure (ES). The first hypothesis argues that in a concentrated market situation, banks tend to acquire higher than normal profits, sacrificing the well-being of consumers and the system's total efficiency. In this case, concentration positively affects profits, and, if suspecting of SCP, the regulator's interference is justifiable. The second hypothesis argues that more efficient banks use their resources better and tend to have higher profits and to expand more, gaining market share. In this case, the positive relation between profitability and market concentration is spurious, as both factors are, in truth, determined by efficiency. If the ES hypothesis holds there is evidence that the market is operating efficiently. Considering the banking market, the results are once again heterogeneous in literature, García *et al.* (2009)[14] find that a less concentrated banking system is favorable to bank profitability. Other works, such as Athanasoglou *et al.* (2008) [3], however, point that market variables are not important in explaining bank profitability and, for such, none of the hypotheses explained above are valid.

Interest rates are macroeconomic variables essential to banking activities. When market interest rates change, generally due to monetary policy strategies, changes in bank assets and equity are expected (Flannery, 1980[12]). This characteristic makes the effect of interest rates on bank profitability controversial. While common sense believes in the positive effect of higher base interest rates over spreads, resulting in higher profits for bankers, there is, in theory, the possibility of null or negative effects of interest rates over profits (Flannery, 1980 [12]). The net effect of interest rate changes over profitability will depend on each bank's assets and liabilities. Specifically, the mean maturity of banking liabilities and assets is the main responsible in determining if there will be an increase or reduction in profits (Flannery, 1980 [12]). With a portfolio of assets and liabilities with the same maturity and similar values, the elevation of the interest rate would not alter bank profitability significantly. On the other hand, a portfolio with heterogeneous and unbalanced maturities will increase profit opportunities, specially when market interest rates are expected to vary. Having assets with maturity lower than that of liabilities, for example, has positive effects on profits.

A review of the empirical literature on the determinants of bank profitability also reveals variations on econometric estimation techniques. The most popular method is the use of a GMM estimator for dynamic panel data [3], followed by the estimation process suggested by Arellano and Bond (1991). Among these examples, we may cite Athanasoglou *et al.* (2008)[3], García-Herrero *et al.* (2008) [14], Albertazzi and Gambacorta (2006)[2] and Lee and Hsieh (2013)[19]. However, static panels [4] are also used. In these cases, fixed effect models (Micco *et al.*, 2007 [20]; Hirtle and Stiroh (2006)) or random effect models (Chen and Liao, 2011[9]) are used with instrumental variables for solving endogeneity problems. The choice between static or dynamic panels is conditioned by the persistence of the dependent variable.

Regarding capital buffers, considering capital requirements imposed by monetary authorities, there is an extensive discussion in literature regarding the costs and benefits of institutions financing their assets with more equity (capital that absorbs losses) and less liabilities or debts. Modigliani and Miller (1958) [22], a reference study on capital costs, conclude that the costs of higher capital requirements are close to zero for banking institutions. Subsequent works as those of Miles *et.al* (2013)[21] test the Modigliani-Miller theorem and point to more significant costs. They argue that an individual and general cost-benefit evaluation of these requirements must take into account the effects of a consequent variation of financing costs, its impacts on the taxing system and expected returns on equity and debts, bank risk and the decrease in cost scales caused by the adoption of these requirements.

As García-Suaza *et al.*, 2012[15] remark, an argument used to contest higher capital requirements is that these restrictions are costly to banking institutions and the economy as a whole, as an increase in the ratio of equity seems to imply a decrease in funds available for loans. The decrease in the supply of loanable funds may compromise economic activity by making financing and investment harder and more expensive and by reducing the interest revenues of financial institutions. It's worth noting that this assumption relies on the scarcity and the costs associated with acquiring equity. Miles *et al.* (2013)[21] and Admati *et al.* (2010)[1], however, argue against both the scarcity and cost hypotheses, making the whole causal nexus aforementioned logically questionable. Both papers go further when defending even higher capital requirements than those imposed by financial authorities. Admati *et al.* (2010)[1] argue that equity is not socially costly and that more capitalized banks take less distorted loan decisions and perform better (higher profitability).

[3] A modeling technique that includes lagged forms of the dependent variable as an independent variable with the purpose of investigating the persistence of the modeled variable.

[4] Modeling technique that doesn't include lagged forms of the dependent variable to explain it in the present.

These studies and discussions become more relevant in the recent context of international banking regulation reforms. The 2007 financial crisis and its repercussions alarmed researchers and authorities to the necessity of reforming banking regulations with a focus on capital requirements. The crisis was triggered by some banks' incapacity of covering their risks, which was mostly caused by the low level and quality of their equity and insufficient reserves to survive liquidity crises. To avoid such scenarios, Basel III includes a series of banking regulation reforms. The main recommendations include the increase of minimum high-quality equity (from 2% to 4.5% of assets weighted by risk) and the exigency of two capital buffers: 1) Capital Conservation Buffer and 2) Counter-Cyclical Capital Buffer [5]. Considering all three requisites, capital requirements may correspond to over 13% of assets weighted by risk.

3 The Brazilian Banking System

The Brazilian financial system is made of 2088 authorized financial institutions, of which 180 compose the banking system (BC, 2013[6]). Publicly and privately controlled banks are both significant in this system. In December 2012, 42% of banking agencies were publicly controlled, 41.4% were privately controlled and 16.6% foreignly controlled. Considering credit operations, public banks had a share of 42.5%; national privately owned banks had a 39.6% share and foreign banks had a 17.9% share of these credit operations. In the last semester of 2012, public banks had a period of distinguished activity, overtaking the lead in credit operations from private banks for the first time.

Despite such a relevant activity of Brazilian public banks, their mean profitability, represented by RoA in Figure 2, is still lower than that of private banks. For most of the period, national private banks presented profitability higher than the mean of the remaining categories individually. Such scenario may be due to public banks being subjected to laws and restrictions imposed by the government, possibly causing administrative inefficiencies as differentiated labor contract regulations and certain demands for banking services by the government which are not resulting of free competition, for example.

[Figure 2]

Brazilian banks are very profitable and charge high banking spreads. Several hypothesis have been used to explain this phenomenon such as high tax burden and high banking concentration (which would evince low competition)[6]. However, there is very little empirical evidence that links concentration to profitability in the Brazilian banking system. Figure 3 shows the mean behavior of RoA and RoE between the first quarter of 2002 and the second quarter of 2012.

[Figure 3]

Considering the Brazilian banking system's concentration, the Brazilian Central Bank uses three indices to monitor concentration levels: the Herfindahl-Hirschmann index, the concentration ratio for the

[5] This capital buffer is the main new feature of the Basel III accord. With a very macroprudential trait, it aims to guarantee the stability of the banking system as a whole, in addition to the individual protection against insolvency in stress periods assured by the past two exigencies. This buffer's course of action is based on acting in a counter-cyclical manner to the credit cycle , being implemented under the judgement of regulatory authorities (BCBS,2010)[13]

[6] Based on the Brazilian Preferential Rate (BPR) method of calculation, the Report on Banking Economy and Credit of 2011[5] separates banking spread in 4 components: Defaults; Reserve Requirements+cross-subsidies+tax burdens and FGC; direct taxes; net margin, errors and omissions. In 2011, direct taxes are estimated as 26.27% of spread. This share was larger than that of defaults (22.5%) and reserve requirements (11.81%), but lower than that of net margin (39.41%).

four major banks (CR4) and the concentration ratio for the ten major banks (CR10) in terms of credit operations share, total deposits and total assets [7]. The estimated values for December 2012 are described in Table 2. The increase in concentration in 2008 stands out when analyzing the past 10 years. From the second semester of 2011 and beyond, there's also a sharp increase in the HHI and CR4 indices for credit operations and total deposits, mainly due to the increased activity of the two major Brazilian banks. Even so, the indices' values reveal that the Brazilian banking market is only moderately concentrated[8].

[Table 2]

The Brazilian Banking System's liquidity index is considered high, demonstrating the system's safety against eventual resource restrictions in stress scenarios. As indicated by the Financial Stability Report of March 2013 ([6]), the system's liquidity increase in the last semester of 2012 can be explained by the increase in the mean term of bank fund raising and high-liquidity assets. In the same period, when compared to other institutions, public banks had a high amount of free resources that could be ceded as loans, granting the maintenance of their liquidity. Another particular trait of the system is its low dependence on external funding (approximately 11% of credit portfolio), in which the low participation of Euro Zone credit stands out.

The Brazilian National Financial System (NFS) stands out due to its robust solvency capacity, strong supervision and conservative regulation. The Brazilian banking system already adopts Basel II's reforms and is currently implanting Basel III's norms. One of the main measures of the third accord is the enforcement of banks' capital bases, with the creation of two types of capital buffer that incentivize the accumulation of additional capital reserves during periods of economic boom (rapid credit expansion) in order to achieve a safer position in subsequent stress or bust periods. According to the first Financial Stability Report (FSR) of 2013 [6], the last measure of the system's Basel Index remained stable in 16.4%, considerably superior to the minimum threshold of 11%. Another capitalization variable, the system's equity over assets is also stable in an internationally high level. Due to these characteristics, banking regulation authorities believe that Brazilian banks are more than sufficiently capitalized to face eventual financial and economic risk scenarios, being also able to easily adapt to the new capital requirements.

4 Data and Variables

We use data from the Brazilian Central Bank's database, which compiles accounting information of authorized Brazilian financial institutions. The construction of the pertinent variables was based on this data, which follows the criteria and accounting procedures presented by the Brazilian Accounting Plan of the National Financial System's Institutions.

The database is in panel form and contains quarterly information of 180 Brazilian banks for the period between the first quarter of 2002 and the second quarter of 2012 (42 quarters in total). The panel used is unbalanced, as some banks have no information available for all periods (40 banks have complete data and the bank with least observations has information for 6 quarters only). From the complete database,

[7] Source: Financial Stability Report - March 2013, National Financial System Organization, section 4.3, page 46.
[8] "Moderate concentration" HHI interval: 0.1 - 0.18, for HHI between 0 and 1.

we picked only the 71 banks that were classified as Independent Banking Institutions I [9]. The period studied encompasses the 2008 financial crisis, allowing us to analyze its impacts on banking institutions. Table 3 shows the definitions of the variables used and Table 4 includes the their descriptive statistics.

Considering the literature review on bank profitability and data availability, we selected the following variables:

[Table 3]

A) Dependent Variables

- **Return on Assets (*RoA*)** = $\frac{Net\,Profit}{Total\,Assets}$: it is the most commonly used accounting measure to represent bank profitability and will be, for such, the main dependent variable analyzed. It demonstrates the bank's capacity of generating profits from its assets.

- **Return on Equity (*RoE*)** = $\frac{Net\,Profit}{Equity}$: it is a secondary accounting measure for profitability. This measure reveals the institution's efficiency in using its equity. One disadvantage of this measure is in the fact that, differently from RoA, it does not consider the financial risks associated with an increase in leverage.

B) Independent Variables

- **Equity over assets (*EqAs*)** = $\frac{Equity}{Total\,Assets}$: it is a measure representing a bank's capitalization. The effect of capitalization on profitability is not theoretically clear. On one hand, higher levels of capitalization may have a positive effect on profitability, as they may indicate that the bank in question might be better prepared to face adverse environments and crises, improving how its reputation with depositors, investors and the market in general, consequently decreasing costs related to capital attraction. On the other hand, considering the risk-return nexus, less capitalized banks tend to have higher expected returns when compared to institutions with higher capitalization and less risk.

- **Total Assets (*Size*)** : it is a variable used as proxy for bank size. Analyzing how this variable affects profitability involves an analysis of economies of scale and the obtention of an optimal bank size. Larger banks have the advantage of service and loan diversification, but may also face higher administrative costs than their smaller counterparts.

- **Loans over assets (*Riska*)** = $\frac{Total\,Loans}{Total\,Assets}$: it is a proxy for risk-taking. Its effects on profitability are ambiguous. An increase in this ratio, considering higher loan granting, may cause an increase in activities and profits, but may also compromise returns by signalizing higher risk and insecurity, harming the bank's credibility among the market and possibly increasing costs for attracting capital.

[9] One of the following independent financial institutions (not part of a conglomerate): Commercial Bank, Universal Bank holding a commercial bank portfolio or a Savings and Loans. ($http://www4.bcb.gov.br/top50/ingl/esc_met-i.asp$)

- **Net Assets**[10] **over total assets (*Liq*)**= $\frac{Net\ Assets}{Total\ Assets}$: it is a measure that represents a bank's liquidity risk management. In times of high uncertainty, increasing this ratio is a manner of reducing risk, while maintaining it low might compromise the institution's credibility, negatively affecting its profitability.

- **Non-performing assets over total assets (*Qualc*)** = $\frac{Ativos\ Inadimplentes}{Total\ de\ Empréstimos}$: it is a proxy variable for credit risk. Higher default rates compromises profitability, reducing the return on granted loans and inhibiting new credit emissions.

- **Personnel expenses (*PersEx*)** : are part of operational expenses, being composed of wages, benefits, fees, benefits and accrued charges paid to the institution's employees. Expenses are part of the costs included in the traditional microeconomic function of profits and affect profitability. Their relation with profitability involves efficiency and productivity questions. We believe that higher personnel expenses signalizes inefficiency, compromising profitability.

- **Administrative Expenses (*AdmEx*)** : are expenses involving administrative activities like operational maintenance and essential services (rent, water, power, communications, data processing, transport, security, financial services, technical support and consulting among others). In the same manner as personnel expenses and other expenses in general, administrative costs are related to profitability through an efficiency and productivity channel, where higher expenses may indicate inefficiencies and, consequently, lower profits. However, in the specific case of administrative expenses related to marketing and security, for example, there may be a positive effect on profitability, as brand exposition and a higher perception of safety may attract more costumers and increase profits.

- **Financial intermediation expenses (*FinEx*)** : this variable encompasses expenses with the raising of funds on the market, loans, leasing, exchange operations, loan loss provisions and the selling or transferring of financial assets. This variable is related to profitability in the same, seemingly negative manner as the other expenses.

- **Interest Expenses (*IntExp*)** : interest expenses are related to bank funding and encompass deposits (term deposits, inter-financial deposits and savings), buy-back transactions, credit and financial letters. This variable will be modeled with the intention of testing the hypothesis that it is related with capital buffers. *A priori*, we expect a negative causality relation.

- **Capital Buffers (*Buffers*)**: the Basel index establishes a 11% ratio between the reference equity of an institution and the Required Reference Equity. Reserves higher than this minimum threshold are considered capital buffers. The effects of this variable on profitability seem unexplored until now. We speculate a positive channel between them, as higher buffers tend to signalize a financially healthier institution that would be better prepared to face stress scenarios.

[10]Cash and reserves, public bonds and other tradable bonds.

- **Public Assets (*Pub*)** = $\frac{Public\,Assets}{Total\,Assets}$: it is a dummy variable that returns 0 if the bank is not public and, if it is indeed publicly controlled, the variable returns the percentage of public assets to total assets in the period [11]. It is a proxy to measure the effects of public capital control over bank profitability. Micco *et al.*, 2007 [20] find empirical evidence for developing countries that indicates lower profitability of public banks when compared to other domestic, privately owned institutions. The paper argues that this result is greatly explained by political interference, as the difference between the profitability of the two types of institutions increases during election years. Other papers, as García-Herrero, 2009[14] find the same negative relation, which may be explained by public institutions' higher inefficiency and lower quality assets (as evidenced by La Porta et al., 2002[18] e Barth et al. 2004[4]).

- **Foreign Assets (*For*)** = $\frac{Foreign\,Assets}{Total\,Assets}$: it is a dummy variable that returns 0 to domestic banks and, if the bank is foreign owned, represents the ratio of foreign assets to total assets in the period. It is a proxy used to represent the effects foreign capital ownership on profitability. We expect a negative relationship between these variables due to entry barriers created by information asymmetry (national banks tend to be initially more adapted to the national environment and have more information on the market and agent behaviors of its country of origin than foreign banks), different regulations for non-national companies, among other environmental causes.

- **GDP Growth** (Δ***GDP***): it is the variation of GDP. We expect it to be positively correlated to profitability. The pro-cyclical logic of profitability is explained by the credit increase when the economy is growing.

- **Inflation *(ENCP)*** : Extended National Consumer Price Index [12] it is the official price index of Brazil. There's no consensus regarding the effects of inflation on bank profitability. In general, high inflation may benefit debtors due to the corrosion of nominal interest rates. On the nexus between the banking system and inflation, based on Demirguç and Huizinga (1999)[10], Albertazzi and Gambacorta (2009)[2] find a significant and positive relation between inflation rates and profitability, arguing that during periods of high inflation, bank costumers tend to increase their amount of transactions.

- **Base Interest Rate*(Selic)*** : it is the base interest rate, set by the monetary policy committee. The main government bonds are indexed by this rate. Its effects on profitability are controversial as it affects both interest expenses and revenue from loans.

- **Herfindahl-Hirschmann index (deposits) *(HHIDepos)*:** it is the market concentration index for deposits. We expect that higher market concentration reflects the presence of market power abuse, which may lead to higher profits for the banks that practice it[13].

[Table 4]

[11] Due to their generally invariable character for the studied period, dummies for public or foreign controlled banks were eliminated from estimations with fixed effects. The proxy used does not suffer from the same issue, as it varies through time.

[12] Calculated by the Brazilian Institute of Geography and Statistics (IBGE), this index reflects the cost of living for families with income ranging from 1 to 40 minimum wages and is the price index considered in the Brazilian inflation target policy.

[13] We also tested specifications that included the Herfindahl-Hirschmann Index for loans, but the results were similar.

From the cross-correlation table (Table 7) we observe that three pairs of independent variables are strongly correlated: *EqAs* and *Buffer*; *Riska* and *Liq*; and *HHI* and *Selic*. Initially perceived as a problem, a method considered to solve it was to perform regressions between the highly correlated variables, obtaining residuals to be used to model profitability [14]. This method for treating high correlation between independent variables was thought to be used to eliminate potential measurement imprecisions, like elevated variance and covariance, resulting from high and imperfect correlation. However, knowing that the estimated coefficients are still unbiased and the most efficient, and moreover, that the existing correlation between them seems spurious, we conclude that the high correlation presents no harm to the estimation results and therefore the use of the proposed method was discarded.

5 Model and Estimation Method

5.1 The Model

Regarding our sample, we only consider banks that are part of the Brazilian financial system. Furthermore, we classify the explanatory variables in three categories: bank-specific, macroeconomic and those related to the sector's industrial structure. The general model traditionally used to estimate profitability follows a linear equation (Athanasoglou, 2008[3]) on which the base equation estimated represented below is based. We explicitly state the fixed effects variable:

$$(1)\ \pi_{it} = \alpha_0 + v_i + \sum_{j=1}^{8} \alpha_j X_{it}^j + \sum_{k=1}^{3} \beta_k M_t^k + \sum_{k=1}^{3} \delta_k I_t^k + \gamma_t T_t + u_{it},$$

where i $(i = 1, ..., 71)$ is the bank index, t is the time index $(t = 1, ..., 42)$;

;π_{it} represents the dependent variable (RoA_{it}, RoE_{it})

;v_i represents fixed effects

;X_{it}^j represents the 8 independent bank-specific variables ($Size_{it}$, $Riska_{it}$, Liq_{it}, $Qualc_{it}$, $FinEx_{it}$, $PersEx_{it}$, $AdmEx_{it}$, $Buffer_{it}$)

;M_t^k represents macroeconomic variables (ΔGDP_t, $ENCP_t$, $Selic_t$)

;I_t represents the 3 variables related to banking system structure (Pub_t, For_t, $IHHDepos_t$)

;T_t represents time dummies; and finally, u_{it} is the error term.

To test the hypothesis that capital buffers favor profitability through the reduction of funding costs, we used the following model:

[14] The residuals of *Liq* and *Selic* for example would be obtained, respectively, through the following models, regressed with fixed effects:

$$Liq_{it} = \alpha_0 + \beta Riska_{it} + \varepsilon_{it}$$

$$Selic_{it} = \alpha_0 + \beta HHI_{it} + \varepsilon_{it}$$

.

$$(2)\ \theta_{it} = \alpha_0 + v_i + \sum_{j=1}^{5} \alpha_j X_{it}^j + \sum_{k=1}^{3} \beta_k M_t^k + \sum_{k=1}^{3} \delta_k I_t^k + \gamma_t T_t + u_{it},$$

where i ($i = 1, ..., 71$) is the bank index, t is the time index ($t = 1, ..., 42$)
;θ_{it} represents the dependent variable (*IntExp*: Interest expenses)
; v_i represents fixed effects
; X_{it}^j represents independent bank-specific variables ($Size_{it}$, $Riska_{it}$, Liq_{it}, $Qualc_{it}$, $Buffer_{it}$)
; M_t^k represents macroeconomic variables (ΔGDP_t, $ENCP_t$, $Selic_t$)
; I_t represents the 3 variables related to banking system structure (Pub_t, For_t, $IHHDepos_t$)
; T_t represents time dummies, and finally u_{it} is the error term.

5.2 Method of Estimation

We use the Fisher test, based on the Augmented Dickey-Fuller test, to investigate the presence of unit roots for the dependent and bank-specific variables series. We reject the null hypothesis of unit root presence for all variables.

To model profitability we choose a fixed-effects panel estimation model, as it controls the effects of possibly omitted variables that vary individually and stay constant through time. The Hausman test to verify the advantage of using fixed effects over random effects revealed that the inclusion of fixed effects is indeed more adequate.

An ideal manner of correcting residuals when modeling a dependent microeconomic variable is the cluster adjustment technique, i.e. organizing banks in subgroups. Tecles and Tabak (2010)[27] and Tabak *et al.* (2011) [26] argue that these subgroups could be categorized by their control type and origin (domestic, foreign, private or public). Bank behavior and sensibility may vary between groups, so banks may react differently to the same changes in macroeconomic environment (changes in inflation, interest rates and economic growth). However, the number of adjustment subgroups here is lower than the minimum allowed for this type of econometric analysis [15], making it inapplicable. Therefore, data collection on subgroups that considers the niches formed by some banks may lead to more conclusive analysis regarding, for example, the effects of market concentration.

6 Empirical Results

The results of the estimation of Eq(1) are presented in Table 5, where columns (1) and (2) are regressions for RoA and columns (3) and (4) are regressions for RoE. A general analysis reveals similar qualitative results to both profitability measures, the differences being mostly related to the significance change regarding the public capital control variable (negative and significant in the RoE regression). Among the bank-specific determinants, the variables *Size*, *Net Assets Ratio*, *Loan Ratio*, *Financial Intermediation Expenses* prove to be significant determinants of profitability. Considering capital control,

[15] Wooldridge (2006) and Cameron and Miller (2010) suggest an interval between 5 and 35 subgroups)

proxies for foreign banks and public banks revealed that these institutions are less profitable than private banks and domestic banks. Considering macroeconomic variations, inflation has a positive, although not significant effect, and profitability revealed to be pro-cyclical and explained negatively by the Selic rate. The coefficients of the Herfindahl-Hirschmann concentration index reveal that the traditional hypotheses explained in Section 2 (higher concentration does not increase bank profitability) do not hold for the aggregate Brazilian banking system.

[Table 5]

To verify the existence of economies of scale in the Brazilian banking system, we use the variable *size*, measured as the institution's total assets. The results, similar to those obtained by Dietrich and Wanzenried (2011)[11], reveal that, *ceteris paribus*, larger banks have lower average returns than their smaller counterparts. This result applies to both RoA and RoE specifications, showing that banks with less assets are better in generating returns on both equity and assets. This may imply the existence of diseconomies of scale, revealing lower efficiency and higher administrative costs for larger banks. Figure 4 presents the average returns of the small, medium and large bank categories [16].

[Figure 4]

Regarding the *liq* (liquid assets to total assets ratio) variable, we verify a positive and significant effect, indicating that higher asset liquidity contributes positively to profitability. This result indicates the advantage of maintaining lower liquidity risks, which may improve the institution's reputation among costumers by suggesting higher stability and safety. The variable *Riska* (ratio between total loans and assets) is significant and positively correlated to profitability, indicating the profitable side of loan activities.

The variable *Qualc*, a proxy for credit quality and risk calculated as the ratio between non-performing assets and total loans has a negative effect on profitability. Deemed responsible for the high interest rates and fees charged by banks and presenting itself as an obstacle to the execution of monetary policies, the high rates of default are a significant trait of the Brazilian banking system.

Among bank expenses, only those related to Financial Intermediation (as a proportion of total expenses) present a significant effect on profitability. The effect, as with Personnel Expenses, is positive, although the latter is not statistically significant. Administrative expenses have a negative, but non-significant effect on profitability. The positive correlation may be due to the increase in activities and services *ex-ante* associated with higher expenses, which may contribute positively to bank profitability. Non-interest expenses (infra structure, marketing, communication and security) were negatively correlated to profitability.

Regarding the effects of capital buffers on profitability, we find that the excess of capital reserves maintained by Brazilian banks have indeed a positive effect on their profitability. This result is possibly due to the fact that capital buffers reduce risks and, consequently, attract depositors by signalizing that the institution is trustworthy. Furthermore, capital buffers are a form of guarantee against the violation of the minimum requirements and the costs associated with such transgression. These costs may be implicit or explicit and are related to the penalties imposed by the supervisor and to the distrust of depositors [15].

[16] Small banks were defined as the bottom 25% in terms of size, while large banks were the top 25% and medium banks were the remaining institutions.

In relation to the first argument, we test a model to directly analyze the channel between bank's interest expenses and capital buffers. The results of this regression are presented in Table 6. They reveal that controlling by size, proxy variables for liquidity and credit risks, sector concentration, capital control and time dummies, capital buffers have a negative influence on interest expenses. This result is only significant in estimation (2), in which we include time dummies to control for non-observed factors that vary with time, but not between individuals, like macroeconomic variables such as growth, inflation, interest rates and also others that were not included in (1) as, for example, exchange rates.

Public and foreign banks seem to have lower funding costs while larger banks tend to incur in higher costs. Market concentration and macroeconomic variables like growth, inflation and interest rates also tend to increase expenses with funding.

[Table 6]

In relation to the variables about capital control, the results are consistent with those of Figure 2. The higher presence of public and foreign assets in the system negatively affects bank profitability, an evidence that private and domestic banks are, on average, more profitable. These results are consistent with those of Demirguc *et al.* (2000) [10] regarding international banks and those of García-Herrero *et al.* (2009) [14] on their public counterparts.

Analyzing the results of the Herfindahl-Hirschman index, we verify that higher market concentration leads to lower profits for banking institutions. This result does not corroborate with the discussion on the competition hypotheses of Structure-Conduction-Performance (SCP) and Efficiency-Structure (ES). The high profitability of Brazilian banks and the even higher spread could be indications of an oligopolist market structure, but we did not find enough evidence to support this hypothesis. The empirical result may reveal two possible situations. The first one occurs when the high market concentration is resulting from more a competitive banking market, lowering profits. The other situation is when the market is very concentrated on few banks, then the negative effect found reflects the lower profits of the remaining institutions, which are in greater number. As mentioned before, taking into account the different market niches formed by banks is an important step for a more adequate analysis.

Regarding macroeconomic determinants, we verify a positive effect of GDP growth on profitability (probably due to the economy's growth leading to more intense financial activities and loan granting). The Selic interest rate, on the other hand, presents a negative relation with profitability. This reveals that Brazilian banks' portfolios have unbalanced asset and equity maturity, with assets usually having longer terms.

More relevant than the negative correlation we find between Selic and profitability is the discussion that arises regarding the relationship between those two variables. The results reveal the importance of analyzing in more detail the channels behind this relationship, which might involve the analysis of banking institutions' behaviors and the terms of their equity and assets.

To guarantee the quality of the used instruments, we analyze the first stage estimations and test them. The results confirm the endogeneity of the instrumented variables and the quality of their instruments and can be found in the appendix.

7 Conclusion

Through empirical investigation of the recent data on Brazilian banking institutions, this paper finds evidence pointing to the significance of several bank profitability determinants. We find evidence on the negative effect of default rates, the occurrence of diseconomies of scale, an apparently positive effect of financial intermediation expenses, higher profitability of private banks and the pro-cyclic behavior of profitability. Furthermore, we also find an empirical indication that market concentration and profitability are negatively and significantly related, which is not an usual result in literature. This seemingly counter-intuitive result motivates a dimensionally more specific, less generalizing, analysis of the Brazilian banking system's market concentration structure.

The analysis of the effects of capital buffers on the profitability of Brazilian banks is the main contribution of this paper, being relevant in the present context of national and international banking regulations reforms. The reform proposals are defined in the Basel III accord, that, elaborated as a response to the aftermath of the 2007 financial crisis, aims to guarantee the financial system's stability by increasing capital requirements and demanding two types of capital buffers. The impact of these new rules on the economy may be significant, making their analysis pertinent.

The already high level of capital reserves maintained by the Brazilian banks indicates that they may adapt more easily to the stricter requirements of Basel III before the 2019 deadline. In this sense, we find a positive relation between buffers and profitability, which can be explained by the stability signal these reserves may indicate, leading to an improved institutional image among depositors and the market, thus decreasing funding costs. Considering this result, the new regulations could be considerably effective and efficient by making the system safer without reducing bank profitability.

Table 1: RoA and RoE - International

	RoA (%)						RoE (%)					
	2005	2006	2007	2008	2009	**2010**	2005	2006	2007	2008	2009	2010
Brazil	**3.0**	**2.7**	**2.9**	**1.4**	**1.9**	**2.1**	**29.8**	**27.6**	**28.9**	**14.9**	**20.4**	**21.7**
Argentina	0.9	1.9	1.5	1.6	2.3	**2.8**	7.0	14.3	11.0	13.4	19.2	24.3
Paraguay	2.6	4.4	3.4	3.9	2.9	**2.7**	25.5	41.8	34.9	42.4	31.7	31.9
Russia	3.2	3.3	3.0	1.8	0.7	**1.9**	24.2	26.3	22.7	13.3	4.9	12.5
Uruguay	1.4	1.7	1.8	1.6	0.5	**1.2**	16.8	19.0	18.0	16.3	5.5	12.1
India	0.9	0.9	0.9	1.0	1.1	**1.1**	13.3	12.7	13.2	12.5	13.1	12.5
China	0.6	0.9	0.9	1.0	0.9	**1.0**	15.1	14.9	16.7	17.1	16.2	17.5
United States	1.8	1.8	1.2	-0.1	-0.1	**0.9**	17.8	17.2	11.2	-1.6	-0.6	8.2

** Countries except Brazil from higher to lower RoA for the year of 2010.*
Source: IMF

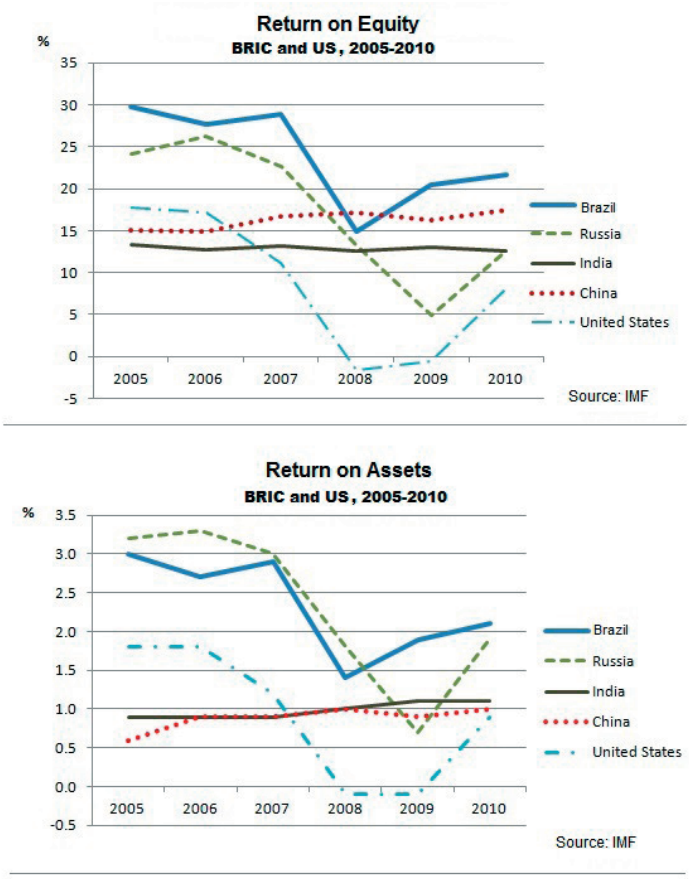
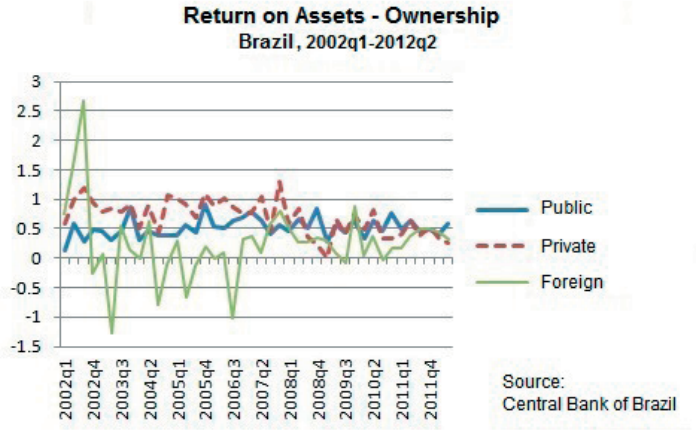


Figure 1: Annual Return on Assets and Return on Equity (%) - BRIC and U.S.



Variable	Mean	S.D.	Min.	Max.
Public	0.521	0.169	0.129	0.918
Private	0.696	0.297	0.004	1.297
Foreign	0.248	0.635	-1.282	2.674
N		42		

Figure 2: Return on Assets by Ownership (%) Quarterly - Brazil

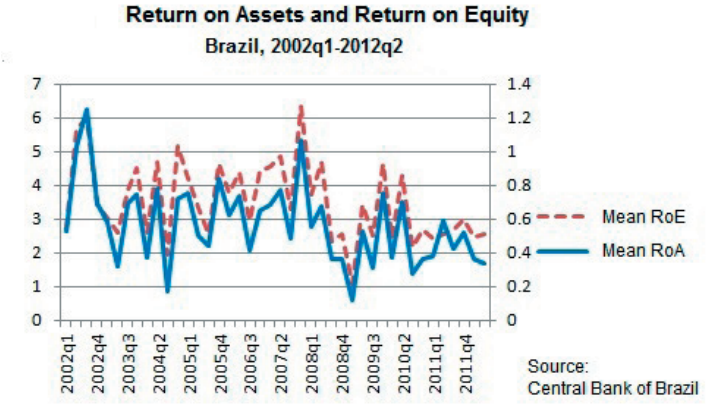


Figure 3: Return on assets and return on equity (%) Quarterly - Brazil

Table 2: Concentration Indices - Brazil, December/2012

	Total Assets	Credit Operations	Total Deposits
HHI	0.1363	0.1502	0.1629
RC4	69.72%	72.25%	75,05%

Source: Financial Stability Report - March/2013 (BC)

* The Brazilian banking market is moderately concentrated (moderate concentration HHI interval: 0.1 - 0.18, for HHI between 0 and 1.)

Table 3: Variable Description

Variable	Description
Dependent Variables	
RoA *	Return on Assets: Net Revenue/Total Assets
RoE *	Return on Equity: Net Revenue/Equity
IntExp	Interest Expenses/Total Assets
Independent Variables	
Bank-Specific	
Size (Ln)	Ln of the institution's total assets.
EqAs *	Capitalization measured by the ratio: Equity over total assets.
Liq *	Liquidity measured by: Liquid assets over total assets.
Riska *	Proxy for risk-taking: Total loans over assets.
Qualc *	Asset quality: Non-performing loans/total loans.
FinEx *	Total financial intermediation expenses/ Total Expenses
PersEx *	Personnel expenses/ Total expenses
AdmEx *	Administrative expenses/ Total Expenses
BI *	Basel capital requirement index or Basel Index.
Buffer *	Capital Buffer = Basel capital requirement index - 0.11.
Macroeconomic	
ΔGDP_t	Quarterly GDP variation. (%)
Selic (ln)	Natural logarithm of the base interest rate (Selic).
$ENCP_t$	Extended National Consumer Price Index (Variation %).
Market Concentration	
HHI_n (ln)	Normalized HHI: Sum of the squares of the loan market share of each bank, normalized by the number of banks in each period.
HHIdepos (ln)	Same index as the above, but considering the market share of each bank in terms of deposits.
Capital Control	
Pub	= total public assets over total assets if the bank is public** or =0, if not public
For	= total foreign assets over system's total assets if the bank is foreign*** or = 0 if not foreign.

** In percentage (Ratio multiplied by 100).*
*** More than 50% of public-controlled assets.*
**** More than 50% of foreign-controlled assets.*

Table 4: Descriptive Statistics

Variable	Mean	Standard Deviation	Min.	Max.
Dependent Variables				
*Return on Assets**	0.571	1.23	-20.046	10.819
*Retorno on Equity**	3.542	6.334	-80.58	42.472
Bank-Specific Variables				
*Equity over Assets Ratio**	18.371	12.431	1.726	92.684
Size	7.863	2.229	3.147	13.575
*Liquidity Ratio**	26.832	14.834	0.121	88.027
*Loans over Assets Ratio**	51.526	17.992	3.574	102.597
*Credit Quality**	3.807	4.193	0	51.571
*Financial Intermediation Expenses**	28.179	22.655	-72.781	819.479
*Administrative Expenses**	38.929	32.712	-33.745	841.061
*Personnel Expenses**	9.378	9.038	-5.528	236.892
Capital Buffer	11.75	14.649	-17.61	184.46
Market Structure				
$lnIHHemp$	0.117	0.018	0.101	0.146
$lnIHHemp_n$	0.101	0.016	0.086	0.129
$lnIHHdepos$	0.131	0.017	0.111	0.167
Macroeconomic Variables				
$ENCP_t$	0.264	0.648	-2.307	1.881
$lnSelic_t$	2.647	0.301	2.14	3.277
ΔGDP_t	0.028	0.049	-0.082	0.096
N		2594		

** In percentage.*

Table 5: Final estimations - Instrumental variables

	RoA		RoE	
Variables	(1)	(2)	(3)	(4)
$size$ [1]	-0.228***	-0.198**	-1.021***	-0.635
	(0.002)	(0.025)	(0.002)	(0.148)
$Riska$ [1] (%)	0.015***	0.015***	0.066***	0.066***
	(0.000)	(0.000)	(0.003)	(0.003)
Liq	0.017***	0.017***	0.077***	0.075***
	(0.000)	(0.000)	(0.000)	(0.000)
$Qualc(\%)$	-0.039**	-0.039**	-0.219***	-0.217***
	(0.030)	(0.026)	(0.008)	(0.007)
$FinEx(\%)$	0.006***	0.006***	0.032***	0.032***
	(0.000)	(0.000)	(0.000)	(0.000)
$AdmEx(\%)$	-0.004	-0.003	-0.016	-0.016
	(0.175)	(0.204)	(0.178)	(0.181)
$PersEx(\%)$	0.006	0.005	0.002	0.003
	(0.620)	(0.685)	(0.966)	(0.951)
$Buffer(\%)$	0.010*	0.009*	0.037*	0.034
	(0.083)	(0.097)	(0.090)	(0.116)
$For(\%)$	-0.063***	-0.068***	-0.301***	-0.319***
	(0.001)	(0.000)	(0.000)	(0.000)
$Pub(\%)$	-0.016	-0.017	-0.188**	-0.226**
	(0.276)	(0.305)	(0.035)	(0.018)
$lnHHIdepos$	-0.834***	-2.353	-6.232***	-6.018
	(0.000)	(0.423)	(0.000)	(0.741)
$Selic$	-0.285**		-1.881***	
	(0.032)		(0.003)	
$ENCP_t$	0.051		0.307	
	(0.183)		(0.113)	
$\Delta GDP_t(\%)$	1.234***		7.416***	
	(0.002)		(0.001)	
Time dummy	NO	YES	NO	YES
Observations	2,452	2,452	2,452	2,452
Number of banks	71	71	71	71
[2] P-value sub-identification test	0.000***	0.000***	0.000***	0.000***
[3] F statistic KP Wald	411.779	410.338	411.779	410.338
[4] P-value Hansen J statistic	0.132	0.078	0.197	0.131
[5] P-value Hausman	0.000***	0.000***	0.000***	0.000***

Robust p-value in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

This table presents the results of the main estimations analyzed. Estimations (1) and (2) use RoA as the dependent variable, while (3) and (4) use RoE. Estimations (1) and (3) use macroeconomic variables, while (2) and (4) use time dummies (one for each of the sample's 42 quarters).

1. Endogenous variables instrumented respectively by their first and second lags ($size_{t-1}$ *e* $size_{t-2}$; $Riska_{t-1}$ *e* $Riska_{t-2}$)

2. The subidentification test verifies the null hypothesis that the endogenous variables are not correlated to their respective instrumental variables. We reject this hypothesis (p-value < 0.05).

3. The comparison between the KP Wald F statistic and the critical values of Stock and Yogo is a method of testing instruments' weakness. The comparison indicates that the distortion of estimations when using instrumental variables is lower than 10% of the distortion generated when using MQO. The distortion of confidence intervals was also minimal, indicating that the instruments are indeed strong.

4. A significant (> 0.05) Hansen J p-value confirms the inexistence of a significant correlation between the main estimation equation's instruments and the random errors.

5. A Hausman p-value results from an endogeneity test with instrumented variables. Its non-significant value (< 0.05) confirms the endogeneity of the instrumented variables: *size* and *Riska* in both RoA and RoE estimations.

6. Through endogeneity tests with independent variables we find endogeneity in two variables: Total Assets (proxy for size) and total loans to assets (credit risk measure). The endogenous variables were instrumented by their first and second lags respectively (Size_{t-1} and Size_{t-2}; RiskA_{t-1} and RiskA_{t-2}). To verify the adequation of the chosen instruments, we analyze the first-stage estimations' results and execute instrument weakness tests after the estimations. These tests are represented by Tables 9, 10 and 11 in the appendix.

7. To chose the best estimation technique, we test if the data is better qualified as a dynamic or static panel. For such, we use the Arellano-Bond technique with a GMM estimator for dynamic panels. We find that, for Brazilian banking institutions, bank profitability is not significantly persistent, as lagged profitability was deemed statistically insignificant in explaining present profits, characterizing a static panel case.

Table 6: Interest Expenses estimations

	Interest expenses (%)	
Variables	(1)	(2)
$size$ [1]	0.775***	0.722**
	(0.003)	(0.011)
$Riska$ [1] (%) -0.009	-0.010	
	(0.654)	(0.468)
Liq(%)	-0.005	0.009
	(0.763)	(0.410)
$Qualc$(%)	0.027	0.023
	(0.366)	(0.277)
$Buffer$(%)	-0.025	-0.038***
	(0.102)	(0.005)
Pub(%)	-0.179**	-0.113*
	(0.012)	(0.061)
For(%)	-0.191**	-0.190***
	(0.018)	(0.002)
$lnHHIDepos$	5.167***	
	(0.000)	
$ENCP_t$	0.594***	
	(0.004)	
$lnSelic_t$	6.539***	
	(0.000)	
ΔGDP_t(%)	59.829***	
	(0.000)	
Time dummy	NO	YES
Observations	2,494	2,494
Number of Banks	71	71
[2] F statistic KP Wald	419.060	421.289
[3] P-value subidentification test	0.000***	0.000***
[4] P-value Hansen J statistic	0.486	0.723
[5] P-value Hausman	0.000***	0.000***

Robust p-value in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

This table presents the results for the estimations with Interest Expenses as the dependent variable. Estimation (1) uses macroeconomic variables, while estimation (2) uses time dummies (one for each of the 42 quarters included in the sample).

1. Endogenous variables instrumented, respectively, by their first and second lags ($size_{t-1}$ *and* $size_{t-2}$*;* $Riska_{t-1}$ *and* $Riska_{t-2}$)
2. The sub-identification test verifies the null hypothesis that the endogenous variables are not correlated with their respective instrumental variables (P-value < 0.05).
3. The comparison between the KP Wald F statistic and the critical values of Stock and Yogo is a method of testing instruments' weakness. The comparison indicates that the distortion of estimations when using instrumental variables is lower than 10% of the distortion generated when using MQO. The distortion of confidence intervals was also minimal, indicating that the instruments are indeed strong.
4. A significant (> 0.05) Hansen J p-value confirms the inexistence of a significant correlation between the main estimation equation's instruments and the random errors.
5. A Hausman p-value results from an endogeneity test with instrumented variables. Its non-significant value (< 0.05) confirms the endogeneity of the instrumented variables: *size* and *Riska*

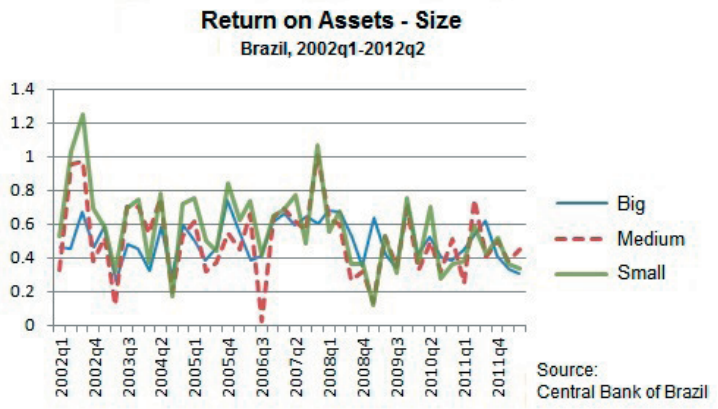


Figure 4: Return on assets by size(%) quarterly - Brazil

8 Appendix

To verify the estimation results' robustness, we test other models. The tested specifications take into account different methods of estimation, the inclusion or exclusion of time dummies and other variables and, finally, endogeneity and instrumental variables tests. The results can be found in tables 9, 10 and 11.

Table 12 presents the results of the tested regressions for RoA and RoE. The estimations (1) and (5) are modeled with all independent variables, including macroeconomic ones. Estimations (2) and (6) take into account all time dummies (42 quarters), being substitutes of the macroeconomic variables. For the remaining estimations, time dummies were used only for the third quarter of 2008 and the first quarter of 2009. These two periods were marked by the bankruptcy of the fourth largest investment bank of the U.S., the Lehman Brothers, and its impact on the global economic scenario. We verify that these dummies are significant, negative and that their inclusion, in addition to macroeconomic variables, does not alter the quality and significance of the remaining variables' coefficients (the estimations (1) and (4); (5) and (8), present similar results).

Finally, we run estimations aiming to correct the variables' volatility through yearly averages and standard deviations. For each bank, we calculated the yearly mean (average of the 4 quarters), thus formatting the panel in yearly periods. The results are presented in table 13.

Table 7: Cross Correlations

Variables	*RoA*	*RoE*	***EqAs***	*Size*	***Liq***	***Riska***	*Qualc*	*FinEx*	*AdmEx*	*PersEx*	***Buffer***	***HHI_n***	***Selic***	*ENCP_t*	ΔGDP_t
RoA	1.0000														
RoE	0.8097*	1.0000													
	(0.0000)														
EqAs	0.1254*	-0.0900*	1.0000												
	(0.0000)	(0.0000)													
Size	-0.0672*	0.1409*	-0.5997*	1.0000											
	(0.0006)	(0.0000)	(0.0000)												
Liq	0.0326**	0.0648*	0.1612*	0.0431**	1.0000										
	(0.0966)	(0.0010)	(0.0000)	(0.0283)											
Riska	0.0231	-0.1047*	0.0791*	-0.2118*	**-0.6746***	1.0000									
	(0.2393)	(0.0000)	(0.0001)	(0.0000)	(0.0000)										
Qualc	-0.0695*	-0.1027*	-0.0412**	-0.0071	0.1113*	-0.0207	1.0000								
	(0.0004)	(0.0000)	(0.0358)	(0.7167)	(0.0000)	(0.2927)									
FinEx	-0.0124	-0.0147	-0.0467**	-0.0427**	-0.0392**	-0.0108	-0.0464**	1.0000							
	(0.5286)	(0.4557)	(0.0174)	(0.0298)	(0.0459)	(0.5840)	(0.0180)								
AdmEx	0.1486*	0.0189	0.2295*	-0.3543*	-0.0662*	0.0922*	0.2998*	-0.0361*	1.0000						
	(0.0000)	(0.3371)	(0.0000)	(0.0000)	(0.0007)	(0.0000)	(0.0000)	(0.0658)							
PersEx	-0.0020	-0.0296	0.2965*	-0.2580*	0.2227*	-0.1767*	0.1501*	-0.0601*	0.3980*	1.0000					
	(0.9197)	(0.1315)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0022)	(0.0000)						
Buffer	0.0435**	-0.0617*	**0.6544***	-0.3532*	0.3798*	-0.1399*	-0.0588*	-0.0266	-0.0906*	0.1264*	1.0000				
	(0.0266)	(0.0017)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0028)	(0.1759)	(0.0000)	(0.0000)					
HHI_n	-0.0862*	-0.0870*	-0.0656*	0.1861*	0.0081	0.0528*	-0.0454**	-0.0451**	-0.0996*	-0.1125*	-0.1258*	1.0000			
	(0.0000)	(0.0000)	(0.0008)	(0.0000)	(0.6802)	(0.0071)	(0.0208)	(0.0216)	(0.0000)	(0.0000)	(0.0000)				
Selic	0.0455**	0.0252	0.0665*	-0.1997*	-0.0238	-0.0530*	0.0676*	0.1400*	0.0655*	0.1189*	0.0813*	**-0.7179***	1.0000		
	(0.0206)	(0.2000)	(0.0007)	(0.0000)	(0.2248)	(0.0070)	(0.0006)	(0.0000)	(0.0008)	(0.0000)	(0.0000)	(0.0000)			
ENCP_t	0.0210	0.0051	0.0100	-0.0495	-0.0035**	-0.0078	-0.0045	0.0485**	-0.0252	0.0454**	-0.0279	-0.0877*	0.3119*	1.0000	
	(0.2859)	(0.7957)	(0.6093)	(0.0117)	(0.8580)	(0.6923)	(0.8175)	(0.0134)	(0.2002)	(0.0207)	(0.1553)	(0.0000)	(0.0000)		
ΔGDP_t	0.0583*	0.0699*	-0.0005	-0.0092	0.0068	-0.0041	-0.0191	-0.0025	0.0189	0.0280	-0.0048	-0.0727*	0.0054	-0.1737*	1.0000
	(0.0030)	(0.0004)	(0.9789)	(0.6380)	(0.7284)	(0.8360)	(0.3316)	(0.8992)	(0.3368)	(0.1539)	(0.8065)	(0.0002)	(0.7837)	(0.0000)	

Robust p-value in parenthesis

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

Among the dependent variables used, those with stronger correlation are EqAs and Buffer; Riska and Liq; HHI and Selic.

Table 8: Fisher's Unit Root Test

	RoE	RoA	lnata *	Eta	Liq	Qualc
Inverse Normal	-18.8829	-6.3217	-18.5730	-2.8498	-3.6762	-9.9365
	0.0000	0.0000	0.0000	0.0022	0.0001	0.0000
	Riska	FinEx*	AdmEx	Pers	Buffer	
Normal Inversa	-1.9859	-22.3915	-4.0203	-6.7999	-6.3663	
	0.0235	0.0000	0.0000	0.0000	0.0000	
Number of panels = 71						
Average number of periods = 36.54						

This table presents the Augmented Dickey-Fuller test results. The hypothesis of unit root presence is rejected for every tested series.

Table 9: Fixed or Random Effects Tests

	RoA (%)		RoE (%)	
Variables	EF	EA	EF	EA
size	-0.183***	-0.026	-0.811***	0.277**
	(0.001)	(0.352)	(0.004)	(0.046)
Riska	0.000	0.002	-0.011	-0.010
	(0.995)	(0.418)	(0.436)	(0.443)
Liq	0.012***	0.012***	0.038**	0.036**
	(0.000)	(0.000)	(0.014)	(0.014)
Qualc	-0.040***	-0.035***	-0.209***	-0.200***
	(0.000)	(0.000)	(0.000)	(0.000)
FinEx	0.005***	0.004***	0.030***	0.023***
	(0.000)	(0.001)	(0.000)	(0.000)
AdmEx	-0.003	0.001	-0.005	0.003
	(0.141)	(0.520)	(0.547)	(0.679)
PersEx	0.002	-0.008	-0.030	-0.042
	(0.739)	(0.167)	(0.367)	(0.141)
Buffer	0.005*	0.004*	0.026*	0.012
	(0.068)	(0.098)	(0.051)	(0.324)
Pub	-0.027	-0.006	-0.255**	0.019
	(0.187)	(0.253)	(0.014)	(0.433)
For	-0.046***	-0.026***	-0.244***	-0.128***
	(0.002)	(0.000)	(0.001)	(0.000)
$lnHHI_Depos$	-0.831***	-0.837***	-6.506***	-6.949***
	(0.001)	(0.000)	(0.000)	(0.000)
$ENCP_t$	0.058	0.061	0.324*	0.323*
	(0.118)	(0.101)	(0.091)	(0.095)
$lnSelic_t$	-0.258**	-0.059	-1.978***	-0.764
	(0.041)	(0.576)	(0.002)	(0.160)
GDP_t	1.260***	1.298***	7.695***	7.751***
	(0.005)	(0.004)	(0.001)	(0.001)
Constante	1.059	-1.074*	4.056	-10.817***
	(0.220)	(0.065)	(0.362)	(0.000)
Teste Hausman	$\chi^2(14) = 51.40$*** (0.000)		$\chi^2(14) = 47.62$*** (0.0000)	
Observations	2,594	2,594	2,594	2,594
R-squared	0.048		0.053	
Number of banks	71	71	71	71
F statistic [1]	8.996***		10.114***	
Wald test		113.266 ***		135.966***
R^2 Among	0.048	0.042	0.053	0.043
R^2 Between	0.068	0.122	0.022	0.242
R^2 Total	0.026	0.051	0.001	0.080

This table presents the Hausman test results for fixed or random effects. Columns EF RoA/RoE present the results of regressing with fixed effects. The columns EA RoA/RoE present the results of regressing with random effects. The Hausman test tests if the difference between both methods is significative and if the fixed effect model is preferred. The significant χ^2 reveals that the fixed effect model is more adequate.

[1] The estimation's F statistic (H0 = All independent variables have null coeficients)

Table 10: Estimation of GMM estimators for dynamic panel

	RoA		RoE	
Variables	(1)	(2)	(3)	(4)
l.RoA	0.090	0.223		
	(0.761)	(0.504)		
l.RoE			-0.057	0.049
			(0.768)	(0.841)
size [1]	0.536*	0.461	2.539	2.505
	(0.089)	(0.172)	(0.104)	(0.218)
Riska [1]	-0.008	-0.002	-0.069	-0.046
	(0.686)	(0.929)	(0.373)	(0.605)
Liq	-0.006	-0.001	-0.038	-0.022
	(0.751)	(0.946)	(0.625)	(0.798)
Qualc	-0.063**	-0.062**	-0.350**	-0.351**
	(0.032)	(0.040)	(0.029)	(0.033)
FinEx	0.001	0.000	0.009	0.007
	(0.892)	(0.981)	(0.556)	(0.661)
AdmEx	0.024*	0.020	0.094*	0.091
	(0.076)	(0.162)	(0.090)	(0.191)
PersEx	-0.018	-0.015	-0.054	-0.033
	(0.399)	(0.497)	(0.551)	(0.735)
Buffer	0.032*	0.027	0.093	0.093
	(0.099)	(0.195)	(0.271)	(0.382)
Pub	-0.027	-0.022	-0.070	-0.076
	(0.244)	(0.363)	(0.474)	(0.544)
For	-0.035*	-0.031	-0.164**	-0.158*
	(0.058)	(0.116)	(0.027)	(0.085)
$IHHDepos$	-0.282	-0.400	-4.655**	-4.341
	(0.423)	(0.891)	(0.040)	(0.786)
$ENCP\_t$	0.085*		0.370	
	(0.067)		(0.130)	
Selic	0.745		2.295	
	(0.103)		(0.343)	
$\Delta GDP_t(\%)$	1.480**		5.968*	
	(0.019)		(0.086)	
Constant	-6.351*	-4.749	-29.501	-26.054
	(0.084)	(0.437)	(0.147)	(0.449)
Time Dummy	NO	YES	NO	YES
Observations	2,523	2,523	2,523	2,523
Number of banks	71	71	71	71
Number of Instruments	19	55	19	55
P-Sargan	0.011	0.022	0.017	0.024
P-Hansen	0.284	0.325	0.243	0.314
Hansen-df	3.000	3.000	3.000	3.000
P-AR(1)	0.068	0.063	0.038	0.038
P-AR(2)	0.408	0.261	0.805	0.518

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

This table presents the estimations'results (2 and 4 are different due to the use of time dummies) for dynamic panel, i.e., considering that the dependent variable in the present is affected by its past self. The estimation method used follows that of Arellano and Bond (1995) with GMM estimators. The results show, however, that this effect is not significant (RoA_{t-1} does not affect RoA_t in any significant degree, the same being valid for RoE), leading us to reject the persistence of profitability.

1. Endogenous variables instrumented by their first and second lags ($Size_{t-1}$ and $Size_{t-2}$; $Riska_{t-1}$ and $Riska_{t-2}$).

Table 11: First-stage estimations

	Roa		Roe		Dcap	
	size	*Riska*	*size*	*Riska*	*size*	*Riska*
[1] R^2 Partial	0.9672	0.7534	0.9672	0.7534	0.9669	0.7506
[2] F	3766.90***	416.43***	3766.90***	416.43***	3823.34***	419.67***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
[3] AP-F	5022.38***	555.23***	5022.38***	555.23***	5090.08***	558.38***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
[4] AP- χ^2	15169.08 ***	1676.96 ***	15169.08***	1676.96 ***	15354.07***	1684.32***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

1. The partial R^2 obeys the general rule suggesting a value above 0.15.
2. The F values of the estimations are significantly superior to those recommended by the general rule (F>10 in the case of an endogenous variable).
3. The Angrist-Pischke (AP) F statistics can be compared to the critical values of Stock-Yogo, testing the instruments' weakness.
4. The results show that F is large, leading us to conclude that the bias in the estimations carried with instrumental variables is lower than 5% of the bias produced in MQO estimations.
5. The Chi-squares of Angrist-Pischke (AP) and the respective p-values are used in the subidentification test. The results reject the null hypothesis stating the subidentification of the tested dependent variables.

This table presents the first-stage estimation's results for RoA, RoE and interest expenses modeling (results on tables 9 and 10). We aim to show that the instrumental variables (one and two period lags) used to instrument the variables *size* and *Riska* are, in fact, adequate.

Table 12: Robustness tests' estimations

	RoA (%)				RoE (%)			
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
size	-0.228***	-0.198**	-0.149***	-0.216***	-1.021***	-0.635	-0.473**	-0.917***
	(0.002)	(0.025)	(0.008)	(0.004)	(0.002)	(0.148)	(0.049)	(0.006)
Riska (%)	0.015***	0.015***	0.014***	0.015***	0.066***	0.066***	0.063***	0.066***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.003)	(0.005)	(0.003)
Liq(%)	0.017***	0.017***	0.017***	0.017***	0.077***	0.075***	0.077***	0.075***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Qualc(%)	-0.039**	-0.039**	-0.039**	-0.039**	-0.219***	-0.217***	-0.216***	-0.217***
	(0.030)	(0.026)	(0.029)	(0.031)	(0.008)	(0.007)	(0.008)	(0.009)
FinEx(%)	0.006***	0.006***	0.005***	0.006***	0.032***	0.032***	0.028***	0.032***
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
AdmEx(%)	-0.004	-0.003	-0.004	-0.004	-0.016	-0.016	-0.016	-0.016
	(0.175)	(0.204)	(0.169)	(0.163)	(0.178)	(0.181)	(0.171)	(0.160)
PersEx(%)	0.006	0.005	0.008	0.006	0.002	0.003	0.015	0.001
	(0.620)	(0.685)	(0.494)	(0.611)	(0.966)	(0.951)	(0.726)	(0.971)
Buffer(%)	0.010*	0.009*	0.009	0.009*	0.037*	0.034	0.032	0.036*
	(0.083)	(0.097)	(0.102)	(0.086)	(0.090)	(0.116)	(0.134)	(0.100)
For(%)	-0.063***	-0.068***	-0.064***	-0.062***	-0.301***	-0.319***	-0.305***	-0.290***
	(0.001)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Pub(%)	-0.016	-0.017	-0.028*	-0.019	-0.188**	-0.226**	-0.268***	-0.213**
	(0.276)	(0.305)	(0.051)	(0.203)	(0.035)	(0.018)	(0.002)	(0.019)
$lnHHI_D epos$	-0.834***	-2.353	-0.682***	-0.831***	-6.232***	-6.018	-5.448***	-6.382***
	(0.000)	(0.423)	(0.006)	(0.001)	(0.000)	(0.741)	(0.000)	(0.000)
$lnSelic_t$	-0.285**			-0.269**	-1.881***			-1.764***
	(0.032)			(0.044)	(0.003)			(0.006)
$ENCP_t$	0.051			0.047	0.307			0.291
	(0.183)			(0.224)	(0.113)			(0.137)
ΔGDP_t(%)	1.234***			1.093**	7.416***			6.933***
	(0.002)			(0.010)	(0.001)			(0.002)
2008trim3			-0.199*	-0.188*			-1.649**	-1.582**
			(0.075)	(0.094)			(0.013)	(0.018)
2009trim1			-0.275*	-0.149			-1.412	-0.615
			(0.061)	(0.333)			(0.103)	(0.493)
Time dummy	NO	YES	NO	NO	NO	YES	NO	NO
Macro variables	YES	NO	YES	NO	YES	NO	YES	NO
Observations	2,452	2,452	2,452	2,452	2,452	2,452	2,452	2,452
Number of banks	71	71	71	71	71	71	71	71
F statistic KP Wald	411.779	410.338	418.060	411.202	411.779	410.338	418.060	411.202
P-value sub-identification test	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
P-value Hausman	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
P-value Hansen J statistic	0.132	0.078	0.152	0.133	0.197	0.131	0.234	0.200

Robust p-value in parenthesis
*** p<0.01, ** p<0.05, * p<0.1

This table presents the results of regressions tested for RoA and RoE. The estimations (1) and (5) are modeled with all independent variables, including macroeconomic ones. Estimations (2) and (6) take into account all time dummies (42 quarters), being substitutes to macroeconomic variables. For the remaining estimations we used time dummies for the third quarter of 2008 and the first quarter of 2009 only.

Table 13: RoA estimation - yearly data

VARIABLES	(1) Average ROA	(2) Standard Deviation RoA	(3) Ratio
size	-0.620***	0.030	1.249
	(0.005)	(0.807)	(0.150)
Riska	0.037***	-0.007	0.003
	(0.000)	(0.134)	(0.926)
EqAs	-0.083***	0.029**	0.023
	(0.000)	(0.012)	(0.658)
Liq	0.033***	0.001	-0.006
	(0.000)	(0.772)	(0.856)
Qualc	-0.035	0.033*	-0.016
	(0.107)	(0.054)	(0.900)
FinEx	0.004	-0.034***	0.009
	(0.617)	(0.000)	(0.829)
AdmEx	-0.002	0.038	0.547**
	(0.979)	(0.345)	(0.011)
PersEx	0.044	0.136	0.735
	(0.874)	(0.296)	(0.579)
Buffer	0.032***	-0.014	0.029
	(0.000)	(0.128)	(0.165)
Pub	-0.032	-0.033	-0.083
	(0.226)	(0.117)	(0.531)
For	-0.078***	0.068***	-0.327
	(0.004)	(0.004)	(0.359)
HHI_n	-9.730**	-2.912	27.878
	(0.023)	(0.398)	(0.238)
ENCP_t	-0.120	0.089	0.713
	(0.288)	(0.474)	(0.276)
Selic	-0.303	-0.061	3.083*
	(0.300)	(0.789)	(0.096)
GDP	0.606	-0.117	2.692
	(0.159)	(0.692)	(0.315)
Constant		1.563	-70.725**
		(0.551)	(0.016)
Observations	537	680	680
Number of banks	69	71	71
KP Wald F statistic	10.883		
P-value superidentification test	0.000***		
P-value Hausman	0.000***		
P-value Hansen J statistic	0.162		
F		6.257	1.898
Robust p-value in parenthesis			
*** p<0.01, ** p<0.05, * p<0.1			

This table presents the results of the estimations run to correct the variables' volatility by using the yearly average (1), yearly standard deviation (2) and the ratio between them (3) as dependent variables. Instrumental variables were needed in estimation (1). The instrumented variables were *size* and *Riska*

Banco Central do Brasil

Trabalhos para Discussão

Os Trabalhos para Discussão do Banco Central do Brasil estão disponíveis para download no website http://www.bcb.gov.br/?TRABDISCLISTA

Working Paper Series

The Working Paper Series of the Central Bank of Brazil are available for download at http://www.bcb.gov.br/?WORKINGPAPERS

297	**Avaliando a Volatilidade Diária dos Ativos: a hora da negociação importa?** *José Valentim Machado Vicente, Gustavo Silva Araújo, Paula Baião Fisher de Castro e Felipe Noronha Tavares*	Nov/2012
298	**Atuação de Bancos Estrangeiros no Brasil: mercado de crédito e de derivativos de 2005 a 2011** *Raquel de Freitas Oliveira, Rafael Felipe Schiozer e Sérgio Leão*	Nov/2012
299	**Local Market Structure and Bank Competition: evidence from the Brazilian auto loan market** *Bruno Martins*	Nov/2012
299	**Estrutura de Mercado Local e Competição Bancária: evidências no mercado de financiamento de veículos** *Bruno Martins*	Nov/2012
300	**Conectividade e Risco Sistêmico no Sistema de Pagamentos Brasileiro** *Benjamin Miranda Tabak, Rodrigo César de Castro Miranda e Sergio Rubens Stancato de Souza*	Nov/2012
300	**Connectivity and Systemic Risk in the Brazilian National Payments System** *Benjamin Miranda Tabak, Rodrigo César de Castro Miranda and Sergio Rubens Stancato de Souza*	Nov/2012
301	**Determinantes da Captação Líquida dos Depósitos de Poupança** *Clodoaldo Aparecido Annibal*	Dez/2012
302	**Stress Testing Liquidity Risk: the case of the Brazilian Banking System** *Benjamin M. Tabak, Solange M. Guerra, Rodrigo C. Miranda and Sergio Rubens S. de Souza*	Dec/2012
303	**Using a DSGE Model to Assess the Macroeconomic Effects of Reserve Requirements in Brazil** *Waldyr Dutra Areosa and Christiano Arrigoni Coelho*	Jan/2013
303	**Utilizando um Modelo DSGE para Avaliar os Efeitos Macroeconômicos dos Recolhimentos Compulsórios no Brasil** *Waldyr Dutra Areosa e Christiano Arrigoni Coelho*	Jan/2013
304	**Credit Default and Business Cycles: an investigation of this relationship in the Brazilian corporate credit market** *Jaqueline Terra Moura Marins and Myrian Beatriz Eiras das Neves*	Mar/2013

304	**Inadimplência de Crédito e Ciclo Econômico: um exame da relação no mercado brasileiro de crédito corporativo** *Jaqueline Terra Moura Marins e Myrian Beatriz Eiras das Neves*	Mar/2013
305	**Preços Administrados: projeção e repasse cambial** *Paulo Roberto de Sampaio Alves, Francisco Marcos Rodrigues Figueiredo, Antonio Negromonte Nascimento Junior e Leonardo Pio Perez*	Mar/2013
306	**Complex Networks and Banking Systems Supervision** *Theophilos Papadimitriou, Periklis Gogas and Benjamin M. Tabak*	May/2013
306	**Redes Complexas e Supervisão de Sistemas Bancários** *Theophilos Papadimitriou, Periklis Gogas e Benjamin M. Tabak*	Maio/2013
307	**Risco Sistêmico no Mercado Bancário Brasileiro – Uma abordagem pelo método *CoVaR*** *Gustavo Silva Araújo e Sérgio Leão*	Jul/2013
308	**Transmissão da Política Monetária pelos Canais de Tomada de Risco e de Crédito: uma análise considerando os seguros contratados pelos bancos e o *spread* de crédito no Brasil** *Debora Pereira Tavares, Gabriel Caldas Montes e Osmani Teixeira de Carvalho Guillén*	Jul/2013
309	**Converting the NPL Ratio into a Comparable Long Term Metric** *Rodrigo Lara Pinto Coelho and Gilneu Francisco Astolfi Vivan*	Jul/2013
310	**Banks, Asset Management or Consultancies' Inflation Forecasts: is there a better forecaster out there?** *Tito Nícias Teixeira da Silva Filho*	Jul/2013
311	**Estimação não-paramétrica do risco de cauda** *Caio Ibsen Rodrigues Almeida, José Valentim Machado Vicente e Osmani Teixeira de Carvalho Guillen*	Jul/2013
312	**A Influência da Assimetria de Informação no Retorno e na Volatilidade das Carteiras de Ações de Valor e de Crescimento** *Max Leandro Ferreira Tavares, Claudio Henrique da Silveira Barbedo e Gustavo Silva Araújo*	Jul/2013
313	**Quantitative Easing and Related Capital Flows into Brazil: measuring its effects and transmission channels through a rigorous counterfactual evaluation** *João Barata R. B. Barroso, Luiz A. Pereira da Silva and Adriana Soares Sales*	Jul/2013
314	**Long-Run Determinants of the Brazilian Real: a closer look at commodities** *Emanuel Kohlscheen*	Jul/2013
315	**Price Differentiation and Menu Costs in Credit Card Payments** *Marcos Valli Jorge and Wilfredo Leiva Maldonado*	Jul/2013
315	**Diferenciação de Preços e Custos de Menu nos Pagamentos com Cartão de Crédito** *Marcos Valli Jorge e Wilfredo Leiva Maldonado*	Jul/2013

316	**Política Monetária e Assimetria de Informação: um estudo a partir do mercado futuro de taxas de juros no Brasil** *Gustavo Araújo, Bruno Vieira Carvalho, Claudio Henrique Barbedo e Margarida Maria Gutierrez*	Jul/2013
317	**Official Interventions through Derivatives: affecting the demand for foreign exchange** *Emanuel Kohlscheen and Sandro C. Andrade*	Jul/2013
318	**Assessing Systemic Risk in the Brazilian Interbank Market** *Benjamin M. Tabak, Sergio R. S. Souza and Solange M. Guerra*	Jul/2013
319	**Contabilização da Cédula de Produto Rural à Luz da sua Essência** *Cássio Roberto Leite Netto*	Jul/2013
320	**Insolvency and Contagion in the Brazilian Interbank Market** *Sergio R. S. Souza, Benjamin M. Tabak and Solange M. Guerra*	Aug/2013
321	**Systemic Risk Measures** *Solange Maria Guerra, Benjamin Miranda Tabak, Rodrigo Andrés de Souza Penaloza and Rodrigo César de Castro Miranda*	Aug/2013
322	**Contagion Risk within Firm-Bank Bivariate Networks** *Rodrigo César de Castro Miranda and Benjamin Miranda Tabak*	Aug/2013
323	**Loan Pricing Following a Macro Prudential Within-Sector Capital Measure** *Bruno Martins and Ricardo Schechtman*	Aug/2013
324	**Inflation Targeting and Financial Stability: A Perspective from the Developing World** *Pierre-Richard Agénor and Luiz A. Pereira da Silva*	Sep/2013
325	**Teste da Hipótese de Mercados Adaptativos para o Brasil** *Glener de Almeida Dourado e Benjamin Miranda Tabak*	Set/2013
326	**Existência de equilíbrio num jogo com bancarrota e agentes heterogêneos** *Solange Maria Guerra, Rodrigo Andrés de Souza Peñaloza e Benjamin Miranda Tabak*	Out/2013
327	**Celeridade do Sistema Judiciário e Créditos Bancários para as Indústrias de Transformação** *Jacopo Ponticelli e Leonardo S. Alencar*	Out/2013
328	**Mercados Financeiros Globais – Uma Análise da Interconectividade** *Marcius Correia Lima Filho, Rodrigo Cesar de Castro Miranda e Benjamin Miranda Tabak*	Out/2013
329	**Is the Divine Coincidence Just a Coincidence? The Implications of Trend Inflation** *Sergio A. Lago Alves*	Oct/2013
330	**Forecasting Multivariate Time Series under Present-Value-Model Short- and Long-run Co-movement Restrictions** *Osmani Teixeira de Carvalho Guillén, Alain Hecq, João Victor Issler and Diogo Saraiva*	Oct/2013
331	**Measuring Inflation Persistence inBrazil Using a Multivariate Model** *Vicente da Gama Machado and Marcelo Savino Portugal*	Nov/2013

332 Does trade shrink the measure of domestic firms? Nov/2013
João Barata R. B. Barroso