



How banks respond to Central Bank supervision: Evidence from Brazil



João André C. Marques Pereira^a, Richard Saito^{b,*}

^a Central Bank of Brazil Setor Bancário Sul (SBS), Quadra 3 Bloco B—Ed. Sede, 70074-900 Brasília, DF, Brazil

^b Escola de Administração de Empresas de São Paulo, Fundação Getúlio Vargas, Av. Nove de Julho 2029, 01313-010 São Paulo, SP, Brazil

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ABSTRACT

Central Bank supervision is one of the pillars of capital regulation. Based on a unique database built using supervision data from the Central Bank of Brazil, we evaluate the effectiveness of the Central Bank's supervision over banks given the Central Bank's proprietary credit rating and signaling requests for higher capital buffers. We also examine the main determinants of capital buffer management in addition to supervision. We find evidence that (i) Brazilian Central Bank supervision imposes excess capital buffer needs on banks, especially small and midsize banks; (ii) market discipline may play no role in driving capital ratios; and (iii) the business cycle has a negative influence on bank capital cushions, suggesting pro-cyclical capital management. We conclude that supervision plays a major role in markets where market discipline is weak and for smaller banks which act on pro-cyclical way.

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1. Introduction

Although banks play a key role in allowing efficient resource allocation in the economy, banks also inherently carry a fragility and opacity that may cause instability to the financial system with high costs to society. As a result, the banking industry is heavily regulated. In particular, capital regulations require the holding of a minimum level of equity in the business that is proportional to asset risk to minimize opportunistic behavior and protect banks from shocks that may affect the value of their assets. Bank equity holders, in turn, generally choose their stakes such that they can maintain a safety margin over the regulatory capital limit and simultaneously meet the expectations and pressures from the market. Thus, beyond regulatory constraints, other factors may influence the so-called capital buffer implied by the capital adequacy ratio, i.e., the holding of additional equity beyond the minimum capital required by regulations.

To a certain degree, international regulatory standards, which are dictated by the Basel Accord (BCBS, 1988, 2004), address these risk factors and ultimately aim toward financial system soundness. In addition to the minimum risk-adjusted capital requirement, a financial authority also monitors banks and requires appropriate risk management from them in accordance with the complexity

of the business and appropriate disclosure to enable market monitoring. Specifically, the Basel II structure defines three pillars of regulation: Pillar 1 addresses capital requirement models and banks' capital/risk management, Pillar 2 addresses supervisory monitoring, and Pillar 3 addresses market discipline.

The Basel Committee has recently worked to redesign the regulatory model by strengthening capital requirements, increasing standardization in financial transactions, and adding a macro-prudential scope to regulation that includes additional capital buffer requirements in accordance with economic cycles (BCBS, 2010). This is informally referred to as the Fourth Pillar of prudential regulation.

In view of the discussion above, our contribution focuses on how Central Bank supervision can influence the adjustment process toward an adequate capital adequacy ratio. Using a comprehensive dynamic empirical model with bank-level panel data in which all of the Basel Pillars are controlled for, we analyze the behavior of bank capital buffers in Brazil and find that supervisory monitoring has a positive effect on solvency ratios, especially among less capitalized banks. This finding is of special interest because capital management practices are likely to be positively correlated with the economic cycle. In addition, markets seem to play no role in disciplining banks, partly because the yields to benchmark the risk profile are not available for most banks in Brazil. Our argument is based on our findings that in economies with pro-cyclical financial systems and less-developed capital markets, market discipline seems to play a minor role, whereas the role of Central Bank supervision is stronger. This result is stronger when we control for the

* Corresponding author. Tel.: +55 11555069281; fax: +55 1155064280.

E-mail addresses: joaoandre@gvmail.br (J.A.C. Marques Pereira), rsaito@stanfordalumni.org (R. Saito).

level of bank capitalization: the less capitalized banks, the stronger seem to be supervision of the Central Bank. Hence, the monitoring that is conducted by the supervisory authority contributes to curbing the risky behaviors of less solvent banks. This result contributes to the literature because, to our knowledge, this is the first study to rely on a unique database from a Central Bank and to focus on an emerging market in which market discipline seems to have no role.

The paper has the following structure. Section 2 provides some historical aspects of the implementation of the Basel Accord and trends in local prudential regulation and supervision in Brazil. Section 3 reviews banking theories regarding capital buffer management and some related empirical results in the literature. Section 4 presents the empirical model for the determinants of banks' solvency cushions based on capital buffer theories. Section 5 describes the database, highlighting the characteristics of the local market. Section 6 presents the econometric approach and robustness tests and analyzes the empirical results. Section 7 concludes the paper.

2. Prudential regulation and supervision in Brazil

Following international regulatory standards, Basel I risk-adjusted capital rules were introduced in Brazil under Resolution 2099 on August 17, 1994. Accordingly, the document stipulated that banks must maintain a solvency ratio of at least 8% that is calculated as the ratio of capital to risk-weighted assets. In the same year, a new economic plan – the Plano Real – was introduced and decreased hyperinflation from four digits to one by the end of the following year. Prior to the introduction of the Plano Real, most bank profits came from arbitrage opportunities between low-interest bank deposits and high-interest government bonds rather than from credit transactions. A few banks had to be acquired and others were liquidated because they were not able to perform typical credit activities at a profit (Alves and Alves, 2010).

To strengthen the supervision power of the Central Bank, a new law was introduced allowing the Central Bank to intervene in banks with solvency problems and/or to proffer market solutions, such as mergers or acquisitions or even liquidation. As a result of the Asian crisis in 1997, the minimum capital adequacy ratio was increased from 8% to 11%.

The first test of the new 11% capital adequacy ratio took place in 1999, when Brazil suffered a major exchange rate crisis. Gruben and Welch (2001) argue that an important reason that Brazil exited this crisis more rapidly than other countries in similar situations was the stability of the post-restructuring banking system. Strong prudential regulation and supervision, historical macroeconomic volatility, and a tight monetary policy that encouraged banks to expand holdings of high-yield government securities made Brazil's commercial banks financially sound, with high capitalization ratios and liquidity. By contrast, the stability of the banking system may have also contributed to curbing banks' loan supply and, consequently, economic growth.

Brazil serves as an interesting setting to examine the role of supervision in determining the capital buffer. First, the Brazilian requirement is higher (11%) than the minimum standard set by BIS (8%). In the period from 2003 to 2010, the aggregated capital adequacy ratio (CAR) of commercial banks varied between 16% and 19%, well above the limit of the 11% requirement. Second, the role of supervision should be more important in an economy with fewer funding options due to the minor role played by debt and equity capital markets and – as we will provide evidence for – where market discipline seems to play a minor role. We would expect the first factor to contribute to weakening the role of supervision,

whereas the second factor may contribute to strengthening the role of supervision.

3. Review of capital buffer decisions

Given anecdotal evidence that banks present capital ratios well above regulatory requirements, a recent line of work has explored this notion by investigating the major drivers of bank capital buffers. As argued by Dewatripont and Tirole (1994), the theory states that banks balance costs and benefits across the entire balance sheet when subject to capital regulation because responsibility is shifted to the regulator when the bank's solvency falls below a threshold. Basically, the capital level should be set as an endogenous response to (i) penalties and other types of distress related to a breach of the regulatory minimum, including supervision pressure, (ii) the cost of capital surpluses, and (iii) the costs and time constraints for adjusting capital levels.

Milne and Whalley (2001) and Milne (2004) model the dynamics in banks' capital decisions as a continuous-time inventory problem. The manager must determine the level at which he must issue new capital or wait until the supervisory authority forces him to do so, giving the supervisor the important role of examining the bank's equity, as in Marcus (1984). In addition to balancing the costs and benefits of the capital surplus, the key point is that banks with high charter values have more to lose if they breach the regulation and thus have greater incentive to maintain extra capital. The models have important implications for the effects of capital regulation and supervision on bank risk taking. According to the authors, in the short term, the bank's risk aversion is a positive function of supervisory monitoring and the incentives of banks to take risks decrease as their capital levels approach the regulatory minimum.

Estrella (2004) aggregates cyclical shocks in a dynamic model in which forward-looking banks choose their capital levels subject to adjustment costs and to capital requirements on the basis of value-at-risk (VaR) models. He shows that over the cycle, the optimum capital level is negatively related to the period-dependent VaR capital constraint, such that, the difference between them – the optimal capital buffer – assumes a cyclical pattern. The results suggest that the regulatory capital requirement would be loose in phases of gains and binding on banks' capital structures during periods of loss, increasing the likelihood of reductions in the credit supply. The model also provides some useful insights regarding possible bank conduct and its implications for financial stability. In business cycle upturns, the gap between optimal and regulatory capital may be so large that banks may follow the temptation of opportunistically burning their buffer to increase short-term profits, hence ignoring possible future needs for capital. Ayuso et al. (2004) define such shortsighted behavior as pro-cyclical capital management, as they showed for the Spanish financial system through a dynamic econometric model.

In fact, the majority of empirical research has focused on dynamic models, the basis for the construction of capital buffer theories. In this regard, there are two approaches in the literature, which differ only in how they treat endogeneity in the capital-risk decision. The first approach separates capital and risk, so variables are simultaneously estimated, providing additional insights about the coordination between these two variables, as in Rime (2001) for the Swiss financial system and Jokipii and Milne (2011) for US banks¹. The second approach directly models the dynamic

¹ For the first approach, a fairly common strategy is to use least squares estimators in two or three stages (2SLS/3SLS); however, this methodology does not address eventual unobserved bank heterogeneity (fixed effects), which can lead to biased estimations. Further, even approaches that specifically address the fixed effect issue should be sources of bias in the case of dynamic panels because the within-group

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