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Macroeconomic determinants of bank spread in Latin America: a recent analysis with special focus on Brazil

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Latin America has one of the highest interest margins in the world; furthermore, credit to private sector and bank spread are negatively correlated. Brazil, in particular, has one the highest bank spreads in the world – it is even so far the highest one among the Latin American economies. Indeed, despite of the decline in interest rates since mid-1999, bank spread in Brazil continues to be extremely high in international terms, and in recent years has stood at around 40 percentage points. This paper intends to explore the discussion in the recent literature on bank spread about what determines bank spread in Latin America, with special focus on the Brazilian case, seeking in particular but not exclusively to analyze the macroeconomic determinants of bank spread in recent times.

Keywords: bank spread; Latin America; Brazilian banking sector

JEL Classifications: E43, E44, G21

Introduction

Overall, the scale of bank lending is low relative to economic activity, financial depth is limited, banking sector is highly concentrated, and intermediation margins are high in Latin America. Indeed, limited access to bank credit and uncertainty about financial stability are factors that have contributed to economic volatility in the region. Latin American financial systems are largely bank-based, with security markets mostly small and iliquid. Financial depth is low compared to developed countries and some groups of developing countries.[1]

Besides the low level of credit, the pattern of credit growth in Latin America has been marked by boom and bust cycles. Credit expanded sharply in the early 1990s, in part due to the increase of the capital inflows to the region, but collapsed in many cases after the banking crises in the mid-1990s and remained subdued for many years. Only after 2004 has credit begun to recover, due to the stronger economic growth, easier global monetary conditions and progress in bank restructuring.[2] Indeed, in most Latin American countries, the unstable macroeconomic environment has been a critical factor holding back financial system development and has generated a high volatility of credit growth. For example, high short-term interest rates used to fight inflation or defend the exchange rate has added to banks' funding costs and increased loan-default rates.

Brazil is an interesting study case, as the economy has at the same time a low credit-to-GDP and relatively high bank assets-to-GDP ratio. During the high inflation period (until 1994), financial depth did not decrease due to the development of a

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broader domestically denominated indexed money and also the increasing development of a modern clearing system in order to support the clients' demand for clearing the checks. More recently, the large banking portfolios of interest rate- and exchange rate-indexed government debt insulated banks against the monetary policy tightening and devaluation of the currency during external crises.

In Latin America, credit in general is not only scarce but also costly. Indeed, the region has one of the highest interest margins in the world and, as would be expected, credit to private sector and bank spread are negatively correlated. Brazil, in particular, has one of the highest bank spreads in the world – it is even so far the highest among the Latin American economies.

A number of international studies have highlighted the importance of macroeconomic factors (inflation rate, interest rates, economic growth, etc.) in determining bank spread. Considering the macroeconomic instability that has characterized the Brazilian economy during the last 25 years, it is to be expected that such factors would be significant in explaining spread in Brazil. This issue has gained in importance as, despite the decline in interest rates since mid-1999, bank spread in Brazil continues to be extremely high in international terms, and in recent years has stood at around 40 percentage points.[3] One of the main factors preventing credit growth in Brazil is the extremely high interest rates levied on loans, which explains at least partly the high profitability of the major retail banks.

This paper intends to explore the discussion in the recent literature of what determines bank spread in Latin America, with special focus on the Brazilian case, seeking particularly but not exclusively to analyze the macroeconomic determinants of spread in recent times. The paper is structured into four sections plus this introduction. The next section develops the analytical approach of the determinants of spread based on the conventional literature, while the third section briefly evaluates some case studies, with special reference to Latin America. There follows an analysis of the recent evolution of bank spread in Latin America and Brazil and an assessment of the evidence on its determinants in Brazil based on the empirical studies. Finally, we summarize the paper's main conclusions.

Determinants of bank spread: an analytical approach based on the conventional literature

The conventional theoretical literature on the determinants of bank spread[4] has developed around two major approaches. The first ('monopoly models') grew out of a seminal study by Klein (1971) and considers the bank as a firm whose main activity is to produce deposit and loan services intermediated by the use of bank service production technology, represented by a cost function of the $C(D,L)$ type.[5] As a rule, the banking firm's activity is pursued in a market environment characterized by the presence of monopolistic or imperfect competition in both the credit and deposit markets. This means that the bank has the monopolistic power to set interest rates in at least one of the markets where it operates, normally the credit market, thus behaving as a price setter. This monopoly power is considered to explain the scale of bank operations and the related asset and liability structures, given that, by its decisions, an individual bank can affect the rate of return on liability components and on bank asset components. On this approach, therefore, bank spread reflects fundamentally the bank's 'degree of monopoly', i.e. its ability to charge a higher price than the marginal cost of producing the services it offers.

In such a context, let r be the prevailing interest rate on the inter-bank market; r_l the interest rate charged on loans made by the bank; r_d the interest rate paid by deposits with the bank; α the compulsory reserves as a proportion of the bank's deposits; ε_L the interest elasticity of loan demand; ε_D the interest elasticity of deposit supply; C'_L the marginal cost of loan services; and C'_D the marginal cost of deposit services. Then, supposing that the bank is risk neutral and that its behavior is directed to maximizing profits, it can be shown that the optimal interest margin on loans and deposits is given by:[6]

$$\frac{1}{\varepsilon_L^*} = \frac{r_L^* - \left(r + C'_L\right)}{r_L^*} \tag{1}$$

$$\frac{1}{\varepsilon_D^*} = \frac{r(1-\alpha) - C'_D - r_D^*}{r_D^*} \tag{2}$$

The equations (1) and (2) state that the banking firm, operating in monopoly competition conditions, sets the prices of its loan and deposit services in such a way that the *Lerner indices* are equal to the inverse of the interest elasticity of the loan demand and deposit supply functions.

If the market structure is of the oligopolistic type in both loan-granting and deposit-taking, then the optimal interest margin on loans and deposits is given by:

$$\frac{s}{\varepsilon_L^*} = \frac{r_L^* - \left(r + C'_L\right)}{r_L^*} \tag{3}$$

$$\frac{s}{\varepsilon_D^*} = \frac{r(1-\alpha) - C'_D - r_D^*}{r_D^*} \tag{4}$$

where s is the market-share of the nth bank.

The second approach grew out of a seminal study by Ho and Saunders (1981),[7] and conceives the bank not as a firm but simply as an intermediary between the final loan-taker (firms) and the final lender (households). However, this intermediation activity is subject to two types of uncertainty. Firstly, there is uncertainty due to lack of synchronization between deposits and loans. This lack of synchronization entails an interest rate risk for the bank. In order to understand why, let us imagine that the bank encounters unexpectedly high loan demand, exceeding the volume of deposits and its free reserves. In this case, it will be forced to finance the surplus credit demand on the inter-bank market, thus incurring a refinancing risk in the event the interest rate rises (Maudos and Guevara 2004, 2262). On the other hand, if the bank encounters unexpectedly high deposit supply, exceeding the volume of loans granted by the bank in the same period, it will then have to apply those surplus funds on the inter-bank market. In that way, the bank will be incurring a reinvestment risk in the event the interest rate falls (Maudos and Guevara 2004, 2262).

Secondly, the intermediation activity exposes the bank to uncertainty regarding the rate of return on loans. That uncertainty results from the fact that a part of its loans will not be recovered because of non-payment, voluntary or otherwise, by loan-takers.

The percentage of non-performing loans, however, is not a variable known *ex-ante* by the bank, which can only estimate a likelihood of default.

One feature the Klein and Ho and Saunders' approaches have in common is the assumption that banks have market power, i.e. both approaches assume that banks are free to set the interest rates charged on credit operations and paid on deposits. Unlike the Klein approach, however, Ho and Saunders assume that the bank is a risk-averse agent. In other words, the bank's goal is not to maximize expected profit, but rather to maximize the expected utility of profit. In that context, they show (Maudos and Guevara, 2004, 2264) that optimum spread (s^*) is given by:

$$s^* = \frac{1}{2}\left(\frac{\alpha_D}{\beta_D} + \frac{\alpha_L}{\beta_L}\right) + \frac{1}{2}\left(\frac{C(L)}{L} + \frac{C(D)}{D}\right) - \frac{1}{4}\frac{U''(\overline{W})}{U'(\overline{W})} \left[\left(L + 2L_0\right)\sigma_L^2 + \left(L + D\right)\sigma_M^2 + 2\left(M_0 - L\right)\sigma_{LM}\right] \quad (5)$$

where α_D is the linear intercept of the probability function of a deposit being made at the bank, β_D is the sensitivity of the probability of a deposit being made at the bank to variations in the deposit interest rate, α_L is the linear intercept of the probability function of a loan application to the bank, β_L is loan application sensitivity to variations in the credit operation interest rate; *C(L)/L* is the average cost of credit operations; *C(D)/D* is the mean cost of deposit-taking operations; $\overline{W}$ is the bank's final stock of wealth; $-\left[\frac{U''(\overline{W})}{U'(\overline{W})}\right]$ is the bank's absolute degree of risk aversion[8]; $\sigma^2{}_L$ is the standard deviation of the yield on loans (a measure of the bank's credit risk); $\sigma^2{}_M$ is the standard deviation of the yield on applications/loans on the inter-bank market (a measure of the bank's interest rate risk); σ_{LM} is the co-variance between credit risk and interest rate risk; L_0 is the bank's starting stock of loans; and M_0 is the bank's initial net position on the inter-bank market.

From equation (5), it can be concluded that the determinants of bank spread are:

- The market structure and the level of competition in the banking sector: the greater the interest elasticity of loan demand and deposit supply (i.e. the lower the values of β_L *e* β_D), the smaller will be the optimum spread.
- The bank's average operating cost: $\left[\frac{C(L)}{L} + \frac{C(D)}{D}\right]$.
- The bank's degree of risk aversion: $-\left[\frac{U''(\overline{W})}{U'(\overline{W})}\right]$.
- The volatility of market loan interest rates: $\sigma^2{}_M$.
- The credit risk: $\sigma^2{}_L$.
- The co-variance between loan risk and interest rate risk: σ_{LM}.
- The average size of the credit and deposit operations undertaken by the bank: (*L*+*D*).

One important aspect of the Ho and Saunders approach is that it leaves room for the influence of macroeconomic variables in determining bank spread (Saunders and

Schumacher 2000, 815). The volatility of interest rates levied on loans on the inter-bank market is a direct reflection of the country's macroeconomic stability. The less stable a country's economy – e.g. the greater the variation in the inflation rate and exchange rate – the greater will be the resulting volatility of the basic interest rate[9] and, consequently, the greater the bank spread. In such a context, spread can be reduced by macroeconomic policies to reduce interest rate volatility.

Macroeconomic instability can affect bank spread through two other channels. The first is related to the degree of banks' risk, that must to some extent reflect the instability of the market environment where they operate. The less stable the environment, the greater banks' risk must be – as can be the case of interest rate risk. Thus, in a country with a history of major macroeconomic instability (high inflation, for instance) banks should face greater risks in their intermediation activity. The second channel is the co-variance between interest rate risk and credit risk. A highly volatile basic interest rate will be expressed to some extent in a highly variable level of real output. In such a context, firms' profits will also be highly variable, increasing the likelihood of default at times when profits fall below expected values. Thus, macroeconomic instability is reflected not just in a highly volatile interest rate but also in high credit risk, i.e. such instability generates high co-variance between yield on loans and yield on inter-bank market applications. From (5), it can be seen that the greater such co-variance, the greater will be bank spread.

Some international case studies with special reference to Latin America

A vast empirical literature on the determinants of bank spread has developed in recent years. One major component of the literature has been concerned with testing empirically the theoretical model of bank spread developed by Ho and Saunders (1981). Among the most important studies taking this approach are Saunders and Schumacher (2000) and Maudos and Guevara (2004), and some of these studies will be described below.

Most of this work uses the 'pure spread' estimation methodology pioneered by Ho and Saunders. The methodology assumes that actual spread comprises 'pure' spread adjusted upwards or downwards by implicit interest expense (exemption from bank charges for certain classes of customer), by the opportunity cost of holding reserves and by capital requirements resulting from regulatory standards and bank supervision. Given that context, 'pure' spread is estimated in a two-step process. The first step involves running a cross-section regression for each bank's net interest margin in the chosen country in a given year (Saunders and Schumacher 2000, 819). That equation is given by:

$$NIM_{ic} = \gamma_c + \sum_i \delta_j X_{jic} + u_i \tag{6}$$

where NIM_{iC} is the bank's net interest margin i in country c in the period t; X_{jic} is a vector of control variables (implicit interest expense, opportunity cost of required reserves and capital requirements for credit risk exposure) for each bank i in country c in some period t; γ_c is the regression constant, which is an estimate of 'pure spread' for all i banks in country c at any time t, and u_i is the residual.

In this first step, equation (6) is processed for each country in the sample over the study period. The 'pure spread' estimates obtained in the first step vary over time and

among countries.[10] Accordingly, in the second step, a regression is run with panel data from the 'pure' spread estimates obtained in the first step against a series of variables that reflect the market structure and intermediation risks. The equation to be estimated is given by:

$$\gamma_{tc} = \theta_0 + \sum_{c-1} \eta_c + \theta_1 \sigma_c \tag{7}$$

where: γ_{tc} is the 'pure spread' time series (t=1,…,8) for 7 countries (c=1,…,7); η_c is a set of dummy variables that reflect the average effects across seven countries of market structure on spread; θ_1 is the sensitivity of the 'pure' spread to intermediation risk, and σ_c is the prevailing interest rate volatility on the inter-bank market. This methodology has the advantage of separating the influence of macroeconomic variables (such as interest rate volatility) from the influence of microeconomic variables (e.g. banking sector market structure) over 'pure' spread.

Saunders and Schumacher (2000) obtained the following results: (1) the microeconomic variable with greatest impact on bank spread is implicit interest payment – i.e. where banks offset revenue lost as a result of charge exemptions by a higher interest margin; opportunity cost of reserves and bank capital assets ratio also had a positive and statistically significant influence on 'pure' spread;[11] (2) banking sector market structure had little influence on spreads – in fact, on average, only 0.2% of net interest margins could be explained by banks' market power; and (3) interest rate volatility had a positive and statistically significant impact on bank spread – indeed, on average a 1% increase in the volatility of interest rates increases bank margins by about 0.2%. This means that the more volatile the basic interest rate, the greater the average spread charged by banks.

Maudos and Guevara (2004) examine determinants of bank spread, measured by net interest margin, from data of 1826 banks in five European countries (Germany, France, United Kingdom, Italy and Spain) from 1993 to 2000. They propose an extension of the theoretical model of determinants of spread developed by Ho and Saunders (1981), to include operating costs and a direct measure of the degree of competition (Lerner index) as explanatory variables. Maudos and Guevara used a one-stage panel data regression in order to estimate the theoretical model they developed of the determinants of spread, measured by net interest margin, and considering as explanatory variables a number of bank and country characteristics for each period. The explanatory variables of the theoretical model, all expected to relate positively with spread are: competitive structure (measured by the Lerner index); operating costs (in relation to total assets); degree of risk aversion (ratio of net worth to total assets); interest risk; credit risk; interaction between credit risk and interest risk (measured by multiplying the two variables); and average size of operations (log of the volume of loans).

In addition to the variables of the theoretical model, they also consider, as explanatory variables, implicit interest payments (measured by net operating expenditure of non-interest revenues as a percentage of total assets), the opportunity cost of bank reserves (ratio of liquid reserves to total assets) – both expected to relate positively to spread – and quality of management – expected to relate negatively to interest margin. However, as a proxy for quality of management, they use the ratio operating costs/revenues, an increase in which lowers quality of management, resulting in a smaller interest margin; thence, the negative sign between the ratio and net interest margin is to be expected. The results of that study show that most of the variables posited by the

theoretical model are statistically significant and have the expected sign, i.e. interest margin relates positively with the Lerner index, operating costs, bank risk aversion, credit risk and interest risk. Significant, positive coefficients were also yielded by implicit interest payments and opportunity cost of bank reserves, and significant, negative coefficients by the operating costs/revenues ratio, as expected by the authors.

Brock and Suárez (2000) conducted an empirical analysis using panel data on determinants of bank spread in Latin American countries. Using a sample of banks in six Latin American countries (Argentina, Bolivia, Colombia, Chile, Mexico and Peru) over the period 1991 to 1996, they investigated why bank spread had not diminished in these countries in a period of financial liberalization resulting from reforms to the banking sector, marked particularly by reductions in reserve requirements and in direct restrictions on credit and interest rates. For that purpose, they analyzed the evolution of six measures of ex-post spread (net interest margin), finding significant differences among these measurements in all the countries. In addition, they used the model of Ho and Saunders (1981) with a two-step panel regression using bank-specific variables in order to estimate the determinants of spread for each of the countries individually, except Mexico. In the first step, which derived 'pure spread', Brock and Suárez controlled the microeconomic factors[12] and, in the second step, they ran a regression of the 'pure spread' for each country explained by the following variables: interest rate volatility; inflation rate; and GDP growth rate.

The first step results show that some of the variables relate positively and significantly in some of the countries: capital-asset ratio (Bolivia and Colombia); cost ratio (Argentina and Bolivia); and liquidity ratio (Bolivia, Colombia and Peru). On the other hand, contrary to expectations, non-performing loans ratio did not relate positively with bank spread in any of the countries, while in two countries (Argentina and Peru) the correlation was negative and significant. The authors suggest that this result may be associated with inadequate loan loss provisioning: higher non-performing loans would reduce banks' income. In the second-stage regression, using macroeconomic variables, the best results were given by interest rate volatility, inflation rate and GDP growth rate. Thus, macroeconomic uncertainty, represented by interest rate volatility (Bolivia and Chile) and inflation (Bolivia, Colombia, Chile and Peru), related positively with spread, corroborating the results from developed countries. Finally, economic growth rate yielded non-significant coefficients (of varying sign) in all the countries. The authors conclude, overall, that spread in Bolivia is explained by microeconomic factors; in Chile and Colombia, by both macro and microeconomics factors; while spreads in Argentina and Peru are not really explained by either macro or micro variables.

One recent study (Gelos 2006) analyzed the evolution of *ex-ante* spread and *ex-post* spread in Latin America and the determinants of *ex-post* spread in emerging countries, considering bank-specific data in the period 1999 to 2002 for 85 developing countries, among them 14 Latin American countries. From the descriptive evidence, Gelos observes that in the Latin American countries the credit/GDP ratio is low, while *ex-ante* and *ex-post* spread levels are high by international standards. In his econometric estimations, the explanatory variables he uses for interest margin are bank-level characteristics (measured by bank size, bank equity, overheads costs and a dummy for foreign ownership), several country-level characteristics (competition, reserve requirements, deposit rates, indirect taxes, legal protection and availability of information about potential borrowers) and macroeconomic characteristics (GDP growth, inflation, volatility of inflation and country risk ratings).

Gelos (2006) estimated 'cross-country' regressions for 2002 and the results suggest that, of the bank-level characteristics, only bank size and overhead costs are significant (and relate positively). Of the country-level and macroeconomic features, deposit rate and reserve requirements are associated positively with bank spread, while GDP growth displays a significant negative correlation, a result associated with banks' exercising their market power. However, concentration does not correlate significantly with spread, which the author associates with the significant relationship between concentration and overhead costs. He also estimated panel regressions with data for 1999 and 2002, confirming the relationships of the significant variables in the previous regression, although reserve requirements showed reduced significance because the related data do not vary over time. The estimation also confirms the significance of the positive coefficients for legal structure and taxes and the negative coefficient for foreign ownership.

Overview of bank spread in Brazil

Evolution of bank spread in recent times: some empirical evidence

Loan interest rates charged in Brazil figure among the highest in the world, according to IMF figures. Figure 1 shows that, in 1994, the average spread for both corporate and the personal sectors was around 120% in the Brazilian banking system: approximately eight times higher than the second-highest rate charged in any country in the sample.[13] The early years, when the Real Plan's price stabilization policy was being introduced, are now past, but the spread charged by financial institutions in Brazil continues to be high – around 40% in 2000–2005 – although the gap in relation to other Latin American countries has narrowed. Indeed, across Latin America, credit is not only scarce but costly, too. Comparatively speaking, the region has one of the highest interest margins in the world (8.5%), above East Asia and the Pacific (5.1%)

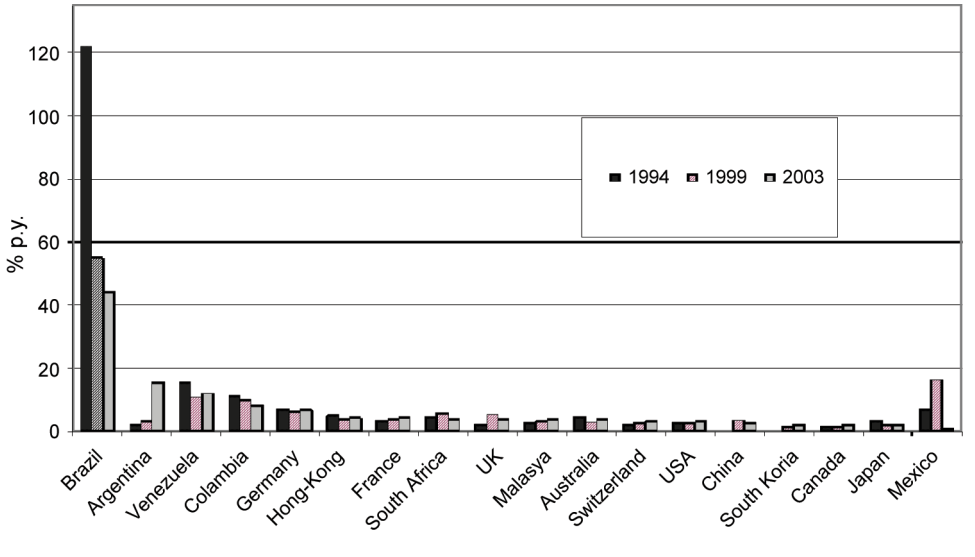

Figure 1. Bank spread in Brazil and other countries.
Source: IEDI (2004), with data extracted from IMF and Central Bank of Brazil. Figures are in nominal terms.

Table 1. Interest spread and efficiency by region, 1995–2002.

Region	Number of countries	Interest margins (percentage)	Overhead costs (percentage of assets)	Credit to private sector (% of GDP)
Developed countries	30	2.9	1.8	89
East Asia and the Pacific	16	5.1	2.3	57
Middle East and North Africa	13	4	1.8	38
Latin America and the Caribbean	26	8.5	4.8	37
Eastern Europe and Central Asia	23	8.8	5	26
Sub-Saharan África	32	10.6	5.1	15
South Ásia	5	4.6	2.7	23

Source: IADB (2005, 7) with data from IMF and World Bank.
Note: Values are simple averages for the regions for the 1990s.

and the developed countries (2.9%), yet slightly lower than Eastern Europe and Central Asia (8.8%). Table 1 shows that there is a negative correlation between private sector credit and interest spread in Latin America. Although spreads have narrowed recently, the continued presence of high spreads has limited the possible benefits of liberalization in the region.

Figure 2 shows the evolution of interest rate spreads in the main Latin American countries from 1993 to 2006.[14] Salient features include the narrowing of spreads over time – although remaining high by international standards – and considerable cross-country variation. Spreads are largest in Brazil, Uruguay and Peru. Chile has the narrowest spread, comparable with industrialized countries, followed by Argentina and more recently by Mexico. After 2004, it appears that spreads began to converge (except Brazil, Uruguay and, to a lesser extent, Peru). Spreads are correlated more

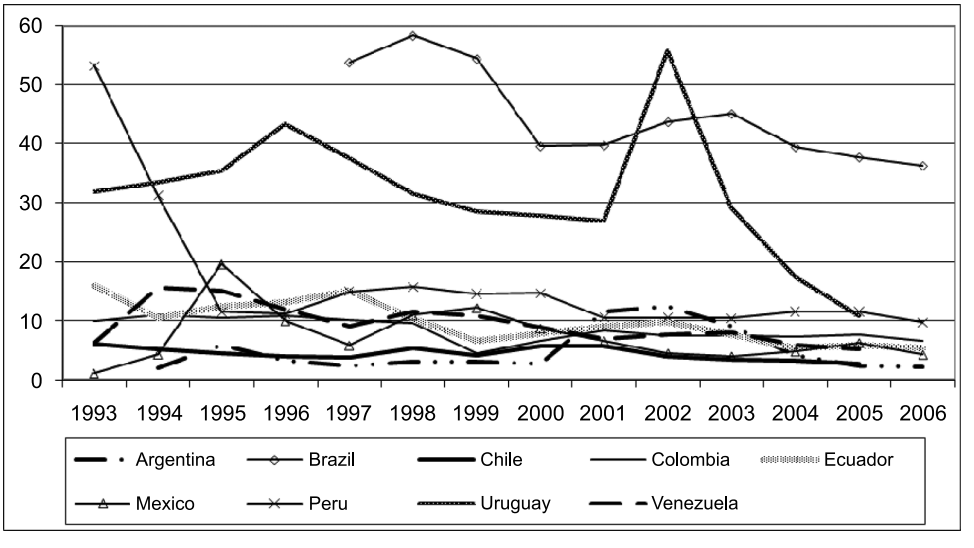

Figure 2. Bank spread in Latin America.
Source: Authors' calculations with data from International Financial Statistics – IMF.
Note: Banking spread (*ex-ante* spread) is calculated as the difference between the average lending rate and the average deposit rate, i.e. the measurement of the *ex-ante* spread.

with loan rates than deposit rates (especially in Argentina and Peru), meaning that a shock that causes spreads to widen will raise lending rates rather than decrease deposit rates.

A second important observation on the behavior of bank spread in Brazil is that it has tended clearly downward after 2000. As can be seen in Figure 3, average spread charged by Brazilian banks reached a maximum of 150% per annum early in 1995, in response to the strong tightened monetary policy measures implemented by the Central Bank in the period immediately following introduction of the Real Plan.[15] It then declined significantly in the course of 1996 as restrictive monetary measures were relaxed and agents became less wary of the risk of contagion by the Mexican crisis, until reaching a plateau of approximately 40% at the start of 2000. In particular, the change in the exchange rate regime in 1999 – from a semi-fixed exchange rate to a floating exchange rate – was a structural factor that contributed for the reduction of bank spread, as during the Real Plan (1994–1999), short-term interest rate was used to face speculative attacks on domestic currency in order to preserve a stable exchange rate. However, spread has continued at those – still extremely high – levels ever since.

One hypothesis to explain why spreads are so high in Brazil might be banks' market power, evidence of which is the increasing concentration of banking in recent times. Indeed, some recent studies of the Brazilian banking sector – e.g. Belaisch (2003) – show that the market structure prevailing in this sector is essentially non-competitive. In that context, with few incentives to increase their operating efficiency, banks operate with high spreads, either as a way of generating revenue sufficient to cover their high costs or as a result of their ability to price their services at levels substantially above the marginal cost of producing bank services.

One factor supporting the hypothesis that the problem of spread in Brazil results from banks' market power is the recent tendency for concentration to increase in the banking sector. In the period 1988–2003, the 15 largest banks' market share in banking system total assets increased from around 29% in June 1988 to approximately 47% in January 2003 (Central Bank of Brazil data). If the hypothesis of banks' market

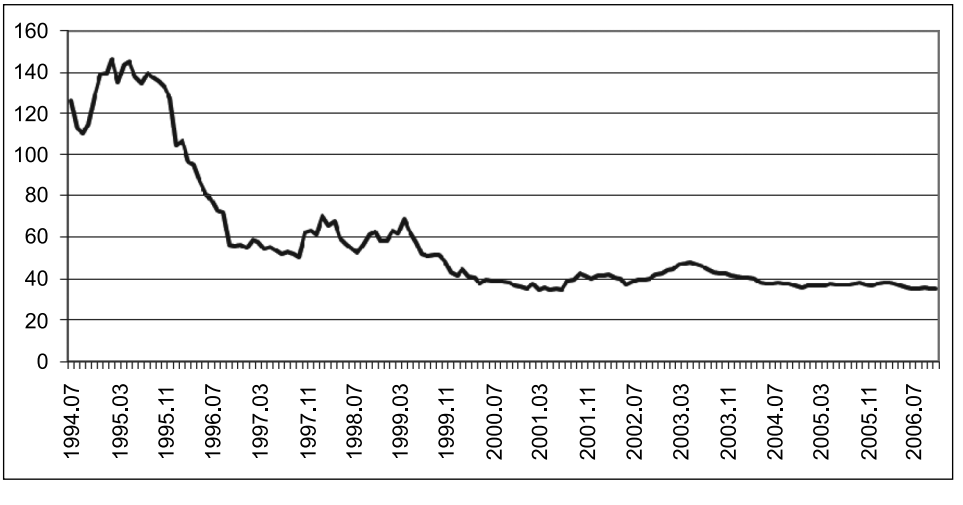

Figure 3. Bank spread in Brazil (1994–2006).
Source: Central Bank of Brazil.
Note: Average bank spread related to operations with preset interest rate.

power is correct, then the concentration indices should also have an impact on loan rates charged by banks, resulting in high rates of return on assets. Indeed, the evidence may suggest that this is the case in the retail private banking sector at least, considering that mean profitability of Brazil's three largest private banks – Bradesco, Itaú and Unibanco – was 17.3% in the period 1994–2001, far higher than the average of 11.8% of three major non-financial Brazilian firms – Petrobrás, Votorantim and CVRD (Malaga, Maziero, and Werlang 2003, 12).

The Brazilian literature on determinants of bank spread has not been conclusive on the subject. The studies done so far show that, although the market structure of the Brazilian banking sector is imperfect, it does not have the characteristics of a cartel. In fact, a review by Nakane (2003) of the empirical literature on the Brazilian case points to the following conclusions: (1) measured by the Herfindahl index, concentration in the Brazilian banking sector is not high compared with indices for other countries; (2) the market concentration indices have no statistically significant impact on interest rates charged by the banks; and (3) the market structure of the banking sector does not correspond to either of the extreme market structures (perfect competition and cartel) and can therefore be characterized as an imperfect structure.

Some evidence from the empirical studies related to bank spread in Brazil

One of the pioneering studies of determinants of bank spread in Brazil is Aronovich (1994). Using a two-stage, least-square regression, this study examined the effects of inflation and level of activity on spread in Brazil's economy from the first quarter 1986 to the fourth quarter 1992, a period when Brazil was experiencing high rates of inflation. The theoretical model developed by Aronovich admits that banks follow a rule of loan pricing guided by cost structure, regardless of whether the sector is oligopolistic or not. His results indicate that inflation tends to widen the gap between loan and deposit rates, i.e. spread. He suggests that this phenomenon is caused by the possibility of a re-allocation among the components of the bank assets, or even incorporating into mark-up the risk premium involved in credit. In that regard, inflation has a negative effect on level of activity by inducing an increase in bank loan rates. On the other hand, the statistical tests suggest that an increase in productive capacity utilization would reduce spread, thus pointing to a pro-cyclic effect.

Another study by Afanasieff, Lhacer, and Nakane (2002) identified two stylized facts about spread behavior after the Real Plan: (1) a marked fall in interest rates after 1995;[16] and (2) persistently high dispersion among bank loan rates. These facts provided the rationale for applying the methodology first used to determine bank spreads by Ho and Saunders (1981). The first step involved panel data for 142 commercial banks between February 1997 and November 2000, in order to reflect how spread was influenced by individual (bank-level) microeconomic variables,[17] i.e. those relating to bank-specific characteristics. From that panel, it was possible to obtain an estimate of 'pure' spread (see the second and third sections of this paper). The second step involved a structural model to estimate the long-term influence of macroeconomic variables – market interest rates, a measure of risk premium (C-bond spread over a US Treasury bond of equivalent maturity), inflation rate, output growth rate, compulsory reserves on sight deposits, and financial tax rates – on the 'pure' spread calculated previously.

The results of the first-step regressions show the following variables to be statistically significant: non-interest-bearing deposits to total assets; operating costs; service

revenue to total operating revenues – all of which have a positive effect on bank spread – as well as a dummy for foreign banks, whose negative sign indicates that such banks charge smaller average spreads. The coefficients estimated in the second step were significant, suggesting that macroeconomic aspects are prominent as major determinants of spreads in Brazil. The results of the regression suggest that spread tends to grow with rises in basic interest rate, risk premium, output growth and taxes. Contrary to expectations, the rate of inflation affects spread negatively, possibly because inflation may be capturing the effect of banks' appropriation of seigniorage on spread.

Another important study of determinants of bank spread in Brazil was conducted by the Central Bank of Brazil in connection with the project 'Interest rates and bank spread'.[18] Published in the form of annual reports starting in 1999, this study offers an accounting breakdown of spread,[19] in addition to other econometric studies of the determinants of spread in Brazil. Bank spread in Brazil is broken down on the basis of the margins charged by a sample of banks – a sample extended from 2004 onwards, to take in a larger universe (commercial banks and multi-banks, including state-owned ones) encompassing all the banks operating in Brazil for which information (on their fixed-rate, freely-allocated credit operations only) is available at each base date. The following components are considered: (1) a residual corresponding, by and large, to bank net margin; (2) tax wedge, including direct and indirect taxes (tax on financial operations – IOF, among others); (3) Credit Guarantee Fund ('*Fundo Garantidor de Crédito*' – FGC);[20] (4) overhead costs; (5) compulsory reserves on banks' deposits (demand deposits, time deposits and saving deposits); and (6) default (provision expenses for non-performing loans).

Figure 4 shows how each of these components participate in bank spread in Brazil, from 2000 to 2003, now using the methodology revised in 2004.[21] Decomposition of

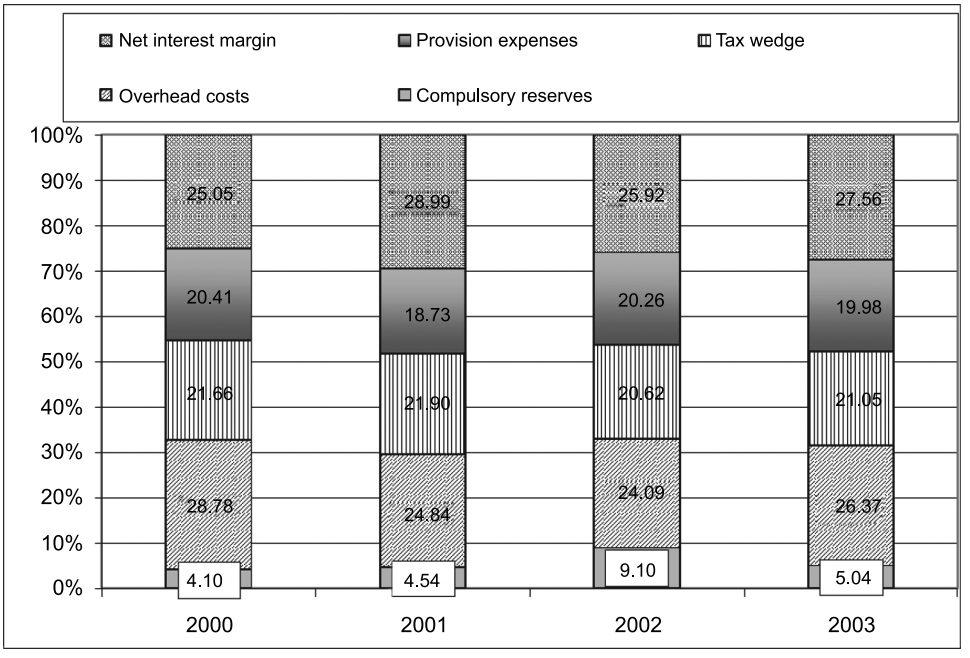

Figure 4. Accounting decomposition of bank spread in Brazil.
Source: Central Bank of Brazil.

spread was calculated by Central Banks of Brazil using a sample of 93 banks in 2000, 100 banks in 2001, 68 banks in 2002 and 77 banks in 2003. Sample of banks include commercial banks and universal banks (public and private ones[22]). The analysis considers only preset lending interest rates for both individuals and corporate.

From the accounting decomposition of spread, the most important constituent factors are, respectively, net interest margin (a 2000–2003 average of 26.9%) and overhead (26.0%), followed by tax wedge (21.6%) and provision expenses (19.9%). Compulsory reserve requirements, the least important item in the accounting decomposition, came to represent a relatively more significant effect in 2002 (9.1% of spread), as a result of the imposition of additional compulsory reserve requirements that year.

For econometric tests it is supposed that the following structural equation is valid:

$$\ln \text{spread} = \beta_0\, trend + \beta_1 \ln Selic + \beta_2 \ln adm + \beta_3 \ln risk + \beta_4 \ln imp + \beta_5 \ln comp \tag{6}$$

where β_{ii} (i= 0,…, 5) are the estimated parameters, *trend* is a deterministic trend that controls other variables which may affect spread, but are not included in the equation above.[23] The regressors are *Selic*, which is the Central Bank of Brazil's basic interest rate;[24] *adm*, a measure of banks' overhead; *risk*, a proxy for credit risk, measured as C-Bond spread over a US Treasury bond of equivalent maturity; *imp*, indirect taxes; and *comp*, compulsory reserves as a percentage of banks' demand deposits.

Eight lags were used for all the estimation variables, including dummy variables for January 1996, November 1997 and December 1997, in order to generate normal residuals. The equation thus estimated by the Central Bank of Brazil was:[25]

$$\ln \text{spread} = -0.0003\, trend + 0.503\ \ln Selic + 1.554\ \ln adm + 0.219 \ln risk + 0.723\ \ln imp. \tag{7}$$

From that equation it can be concluded, according to the methodology adopted by the Central Bank, the average spread among Brazilian banks depends positively on the basic interest rate, bank overhead, risk and taxes. As the variables were expressed as natural logarithms, it follows that the coefficients of the equation estimated are simply the elasticity of spread to each of these variables. In that context, what is most striking about the Central Bank study is the high sensitivity of bank spread to variations in bank overhead. Indeed, from the equation estimated by the Central Bank, a 1.0% reduction in bank overheads would yield a 1.55% reduction in the spread charged by banks. In addition, banks' net interest margin contributes substantially to spread composition.

Koyama and Nakane (2001) draw on the spread decomposition methodology adopted by the Central Bank in order to examine the expected impact on spread of alterations in any of its components, i.e. overhead, loan-loss expense, indirect taxes, direct taxes and bank net interest margin. In order to estimate a vector autoregression, they disaggregate bank spread into the following factors: (1) Selic interest rate, which is used as an approximation to banks' gross mark-up, given that time deposits and overnight rates behave similarly; (2) a measure of country risk premium (C-Bond yield over a US Treasury bond yield of equivalent maturity); (3) the ratio of overhead to credit volume; and (4) indirect taxes.

They test for co-integration among the variables and find the following relative values for September 2001: risk component (45%); overhead (20%); indirect taxes (19%); and Selic overnight rate (16%). In this analysis of bank spreads, risk-related variables played a greater part than loan-loss costs, as in the study carried out regularly by the Central Bank. This may be explained by the forward-looking nature of the risk-related variables with regard to future scenarios, while non-performance costs, relating to past losses, are retrospective. In this way, as 2001 was a year of uncertainty in Brazil's economy, the influence of the risk component in spread increased, as was to be expected. The importance of the Selic interest rate in determining spread may be understood differently. Brazilian government debt has an important specificity: a larger share of government bonds are indexed by Selic interest rate.[26] These bonds are called *Letras Financeiras do Tesouro* (*LFT*). The indexation by Selic made LFTs completely free of the *interest rate risk*, so that they can be considered a *perfect substitute* for banking reserves (Barbosa 2006, 235). The existence of such a kind of bonds that are highly liquid and with a high nominal and real rate of return imposes a very high opportunity cost for loans to the private sector, increasing the bank spread (Paula and Alves 2003, 361).

Oreiro et al. (2006) analyze the bank spread in Brazil using a multiple-regression analysis with the objective of finding what macroeconomic variables determine, directly or indirectly, the banking spread in the period 1995–2003. For this purpose they use the following variables in the model: interest bank spread; Selic short-term interest rate; volatility of interest rate (as a proxy of the bank's interest rate risk); industrial output (as a proxy of the GDP); extensive consumer price index (IPCA); and reserve requirements on demand deposits (a regulatory variable under Central Bank's control). The results found in the variance decomposition and impulse-response function showed that the high volatility of the short-term interest rate (Selic) and its level, and the industrial output were the main macroeconomic determinants of the banking spread in Brazil.

Conclusions

This paper did a survey of the literature about the determinants of bank spread in Latin America, with both focus on Brazil and the macroeconomic determinants of spread. According to the literature, macroeconomic instability affects bank spread through three main channels: first, the volatility of interest rates levied on loans on the inter-bank market is a direct reflection of the country's macroeconomic stability, so that the less stable a country's economy – e.g. the greater the variation in the inflation rate and exchange rate – the greater will be the resulting volatility of the basic interest rate and, consequently, the greater the bank spread; second, the degree of banks' risk, as banks' risk must to some extent reflect the instability of the macroeconomic environment where they operate: the less stable the environment, the greater banks' risk must be; finally, the covariance between interest rate risk and credit risk, as a highly volatile basic interest rate will be expressed to some extent in a highly variable level of real output.

Empirical works show evidence that high banking spread in Latin America is determined for both microeconomic (high operating costs, poor loan quality, high capitalization and reserve requirements) and macroeconomic factors (interest rate volatility, GDP growth and inflation). However, the picture is somehow heterogeneous among the Latin American economies. Empirical evidence suggests that microeconomic factors have been the main determinant of spreads in Bolivia; micro and

macroeconomic factors impacted on spreads in Chile and Colombia; macroeconomic factors were more important in determining Brazilian spreads; neither micro nor macroeconomic factors adequately explained the evolution of spreads in Argentina and Peru.

In the Brazilian case, macroeconomic aspects are prominent as major determinants of bank spread, and this can explain at least partially why spread is so high compared to other countries, including Latin American countries. Particularly noteworthy are the risk variables (risk premium, interest rate volatility), output growth and the level of short-term interest rate. These findings are not surprisingl if one considers that the Brazilian economy has had a 'stop–go' tendency as a general feature in the last 25 years, and more recently (that is, since the mid-1990s) has suffered a lot of speculative attacks on its domestic currency.

In particular, the importance of the level and volatility of interest rates in Brazil as macroeconomic determinants of the spread confirms the hypothesis of banks preference for liquidity (Paula and Alves 2003), according to which – in view of the existence of an interest risk-free application combining liquidity and profitability (indexed public bonds, the *LFT*s) – banks in Brazil came to build a high liquidity premium into their loan-making operations. Added to this, Selic interest rate rises may lead to greater variation in real output levels and business profitability, thus raising credit risk, which can result in higher loan rates and increased spreads. Lastly, for the purposes of proposing policies to reduce bank spread in Brazil, the results of this study seem to indicate that a reduction in the Selic interest rate and in its volatility, combined with the substitution of indexed bonds by non-indexed ones, are necessary conditions for obtaining any pronounced and lasting reduction in spread in Brazil.

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Notes

1. According to IADB (2005, 5) the average ratio banking credit-to-GDP and credit plus market capitalization-to-GDP were, respectively, 28% and 48% in 2003 in Latin America, much lower than in other groups of emerging countries, such as East Asia and the Pacific (72% and 150%), and the Middle East and North Africa (43% and 80%).
2. Carvalho, Paula, and Williams (2009) show that global financial crisis had, in the second semester of 2008, some but small impact on the recent credit boom in the major Latin American economies – Brazil, Mexico and Argentina.
3. Bank spread in Brazil is calculated by the Central Bank of Brazil, that uses the following definition: 'bank spread is defined as the difference between lending and deposit rates for CDBs [certificates of bank deposit]. The average CDB rate for the set of financial institutions was calculated from the average of the individual rates weighted by each institution's net deposits' (Banco Central do Brasil 2002, 50).
4. Bank spread can be defined overall as the difference between what the bank charges loan-takers and the return it grants to depositors, and can be measured in two ways. *Ex-ante spread* (known as 'bank interest spread') is measured by reference to banks' prefixing decisions on rates paid on deposits and rates charged on loans, made prior to performing any financial intermediation activity, and is normally calculated as the difference between the interest rates on the bank's loans and deposits, drawn from information on bank operations generally collected and published by central banks. *Ex-post spread* (also known as 'net interest margin') is a measurement of the net yield of bank financial intermediation, according to the revenues actually generated by credit operations and the actual cost of deposit taking,

normally calculated from accounting data made available by the bank itself. There are a number of measures of net interest margin, the most common being the ratio of net interest income to total assets. The studies generally argue that *ex-ante* spread tends to be more sensitive to perceived risk (Demirguç-Kunt and Huizinga 1999) and to macroeconomic oscillations (Afanasieff, Lhacer, and Nakane 2002) than *ex-post* spread.

5. Where D is the volume of deposits 'produced' by the bank and L is the volume of loans.
6. See Freixas and Rochet (1997, ch. 3).
7. In what follows, we will work with the most recent extension of the Ho and Saunders approach developed by Maudos and Guevara (2004). See, also, Allen (1988), McShane and Sharpe (1985), and Angbazo (1997).
8. Note that, as a result of the risk aversion hypothesis, $U'(.) > 0$ and $U''(.) < 0$.
9. Mainly in the case where monetary policy is conducted on the basis of the system of inflation targeting.
10. Saunders and Schumacher (2000), for example, use a sample of 746 banks in seven countries (United States, Germany, France, United Kingdom, Italy, Spain and Switzerland) in the period 1988–1995.
11. That is to say, high regulatory and/or endogenously determined capital ratios – as protections against risks – tend to erode bank profitability.
12. The variables considered are non-performing loan ratio (non-performing loans/total assets), capital ratio (equity/total assets), cost ratio (overhead and other operating costs/performing loans) and liquidity ratio (short-term assets/total deposits).
13. One should be careful in analyzing Figure 1, as IMF uses different measures of banks' funding cost for each country: money market rate; discount rate; treasury bill rate; and interbank rate.
14. For a further analysis on this concern and others comparisons related to banking in Latin America, see Carvalho, Paula, and Williams (2009).
15. In addition to the policy of positive real interest rates, these measures initially included a compulsory reserve of 100% on sight deposits and, from December 1994 onwards, 30% on time deposits and 15% on any credit operation.
16. A more stable international environment, a fall in the overnight rate and measures adopted by the Central Bank of Brazil all contributed to a reduction in spreads (Paula and Alves 2003, 358). The Central Bank measures included particularly a reduction in compulsory reserve requirements, from 75% to 45% on demand deposits and from 20% to 0% on time deposits, new rules for loan-loss provisioning, reduction in the financial operations (IOF) tax rate from 6% to 1.5% and development of a credit risk centre.
17. The variables selected by Afanasieff, Lhacer, and Nakane (2002) were: (1) number of bank branches; (2) ratio of non-interest-bearing deposits to total operating assets; (3) ratio of interest-bearing assets to total assets; (4) operating costs; (5) bank liquidity; (6) ratio of service revenue to total operating revenues; (7) bank net worth; and (8) bank leverage.
18. See, among others, Banco Central do Brasil (1999, 2002, 2004).
19. The accounting decomposition of spread can be carried out by way of simple accounting definitions like those presented here (Demirgüç-Kunt and Huizinga 1999, 381). Bank net interest margin (NIM) is defined as the ratio of the book value of interest revenue to the value of the bank's assets. According to the Central Bank of Brazil's accounting breakdown of spread, net interest margin can be calculated residually, given that the values of pre-tax profitability, taxes paid, non-interest income, overhead and loan-loss provision are all known as proportions of the bank's assets.
20. The following credits are entitled to the guarantee rendered by the FGC: demand deposits; saving deposits; time deposits; bills of exchange; real estate bills; and mortgage bills, up to the amount of R$ 60,000.00 (sixty thousand reais) for each person.
21. In Figure 4 the 'FGC Cost' is added to 'Tax Wedge', as the values are smaller than 0.30%. The methodology revised in 2004 sets out a new manner of calculating overhead using Aumann–Shapley price calculation, rather than the revenue generation-based cost allocation approach used previously (See Banco Central do Brasil 2004, ch. III).
22. Unfortunately Central Bank of Brazil does not divulge data on bank spread for individual banks. In any case, one should consider that after the privatization of a lot of state-owned banks during the mid-1990s the remaining public banks – including the two federal giant banks – Banco do Brasil and CEF – are performing more or less like private banks.
23. These include inflation rate, level of economic activity, structural changes in the banking industry resulting from interest rate policy, banks entering the market, etc.

24. Select interest rate is the interest rate for overnight inter-bank loans, collateralized by those government bonds that are registered with and traded on the Selic. This is the interest rate equivalent to the *Federal Funds* rate in the United States.
25. Central Bank of Brazil has calculated bank spread in Brazil each year, since 1999.
26. According to Central Bank of Brazil, the share of Selic indexed bonds in internal government net debt was about 35% in the first quarter of 2008.

References

Afanasieff, T.S., P.M. Lhacer, and M.I. Nakane. 2002 The determinants of bank interest spread in Brazil. *Money Affairs* XV: 183–207.

Allen, L. 1988. The determinants of bank interest margins: A note. *Journal of Financial and Quantitative Analysis* 23: 231–35.

Angbazo, L. 1997. Commercial bank net interest margins, default risk, interest-rate risk, and off-balance sheet banking. *Journal of Banking and Finance* 21: 55–87.

Aronovich, S. 1994. *Uma nota sobre os efeitos da inflação e do nível de atividade sobre o spread bancário. Revista Brasileira de Economia* 48: 25–140.

Banco Central do Brasil (BCB). 1999. *Juros e spread bancário no Brasil.* Brasília: Central Bank of Brazil.

Banco Central do Brasil (BCB). 2002. *Economia bancária e crédito: Avaliação de 3 anos do projeto juros e spread bancário.* Brasília: Central Bank of Brazil.

Banco Central do Brasil (BCB). 2004. *Economia bancária e crédito: Avaliação de 5 anos do projeto juros e spread bancário.* Brasília: Central Bank of Brazil.

Barbosa, F.H. 2006. The contagion effect of public debt on monetary policy: The Brazilian experience. *Brazilian Journal of Political Economy* 26: 213–38.

Belaisch, A. 2003. Do Brazilian banks compete? IMF working paper WP/03/113. International Monetary Fund.

Brock, P.L., and L.R. Suarez. 2000. Understanding the behavior of bank spreads in Latin America. *Journal of Development Economics* 63: 113–34.

Carvalho, F.C., L.F. Paula, and J. Williams. 2009. Banking in Latin America. In *The Oxford Handbook of Banking,* ed. A. Berger, P. Molyneux, and J. Wilson. Oxford: Oxford University Press.

Central Bank of Brazil. http://www.bcb.gov.br (accessed in 3 November 2007).

Demirguç-Kunt, A., and H. Huizinga. 1999. Determinants of commercial bank interest margins and profitability: Some international evidence. *The World Bank Economic Review* 13: 379–408.

Freixas, X., and J. Rochet. 1997. *Microeconomics of banking.* Cambridge, MA: MIT Press.

Gelos, R. 2006. Banking spreads in Latin America. IMF working paper 06/44. International Monetary Fund.

Ho, T.S.Y., and A. Saunders. 1981. The determinants of bank interest margins: Theory and empirical evidence. *Journal of Financial and Quantitative Analysis* 16: 581–600.

Instituto de Estudos para o Desenvolvimento Industrial (IEDI). 2004. *Spread no Brasil e no mundo*. *Bulletin IEDI* n. 100. São Paulo: IEDI.

Inter-American Development Bank (IADB). 2005. *Unlocking credit: The quest for deep and stable bank lending.* Washington, DC: IADB.

International Monetary Fund (IMF). 2007. *International Financial Statistics.* Washington, DC: IMF.

Klein, M.A. 1971. A theory of the banking firm. *Journal of Money, Credit and Banking* 3: 205–18.

Koyama, S.M., and M.I. Nakane. 2001. *Os determinantes do spread bancário no Brasil.* In *Juros e spread bancário no Brasil: Avaliação de 2 anos do projeto,* 27–36. Brasilia: Central Bank of Brazil.

Malaga, T., P. Maziero, and S.R.C. Werlang. 2003. *Estudo de rentabilidade bancária. Report of Banco Itaú – Special Bulletin.* Sao Paulo: Banco Itaú.

Maudos, J., and J.F. Guevara. 2004. Factors explaining the interest margin in the banking sectors of the European Union. *Journal of Banking and Finance,* 28: 2259–81.

McShane, R.W., and I.G. Sharpe. 1985. A time series/cross section analysis of the determinants of Australian trading bank loan/deposit interest margins: 1962–1981. *Journal of Banking and Finance* 9: 115–36.

Nakane, M.I. 2003. *Concorrência e spread bancário: Uma revisão da evidência para o , Brasil.* In: *Juros e spread bancário no Brasil: Avaliação de 4 Anos do projeto,* 58–67. Brasília: Central Bank of Brazil.

Oreiro, J.L., L.F. Paula, G.J. Costa da Silva, and F.H. Ono. 2006. Determinantes macroeconômicos do spread bancário no Brasil: Teoria e evidência recente. *Brazilian Journal of Applied Economics* 10: 609–34.

Paula, L.F., and A.J. Alves, Jr. 2003. Banking behaviour and the Brazilian economy after the Real Plan: A post-Keynesian approach. *Banca Nazionale del Lavoro Quaterly Review* 227: 337–65.

Saunders, A., and L. Schumacher. 2000. The determinants of bank interest rate margins: An international study. *Journal of International Money and Finance* 19: 813–32.