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Central Bank of Argentina

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# Intermediation Spreads in an Emerging Economy Under Different Macroeconomic Regimes: Argentina, 1994-2013[*]

Horacio Aguirre, Tamara Burdisso, Federico Grillo, Emiliano Giupponi[**]

*Abstract*

We study the interest rate spread of the Argentine financial system during the last eighteen years. We analyze Granger causality of selected variables, and estimate econometric models that relate *spread* to macroeconomic and microeconomic factors. Results indicate that output growth and monetization reduce spread during the whole period, while country risk and prices are significant only by subperiods, suggesting changes in macroeconomic context. Banking system variables also have significant impacts, including: taxes, administrative expenses, non-performing loans, the use of own resources and liquidity.

*Resumen*

Estudiamos el *spread* de tasas de interés de las entidades financieras argentinas durante los últimos dieciocho años. Analizamos la causalidad de Granger de variables seleccionadas y estimamos modelos econométricos que relacionan el *spread* con factores macroeconómicos y microeconómicos. Los resultados indican que el crecimiento del producto y la monetización de la economía reducen el *spread* durante todo el período; el riesgo país y los precios, en cambio, son significativos sólo por subperíodos, sugiriendo diferencias de contexto macroeconómico. Las variables del mercado bancario también tienen impactos significativos, incluyendo: impuestos, gastos administrativos, cartera irregular, uso de recursos propios y liquidez.

JEL classification codes: C22, E44, G21.

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## I. Introduction

Financial stability analysis has become increasingly relevant for monetary policy since the outbreak of the international financial crisis in 2007: analysts and policymakers alike look for variables that can be monitored to follow both the development of the financial market and the risks to which it is exposed. Intermediation spreads are a natural candidate for such analysis: we study the interest rate spread of the Argentine financial system during the last eighteen years under two definitions –explicit and implicit- analyzing its dynamics and determinants. We look at the differential influence of microeconomic and macroeconomic factors: are observed spreads the result of the macroeconomic environment, with a limited role for financial market variables, or do both type of determinants weigh on spreads in a more or less balanced fashion? We highlight the special interest of the Argentine case, as the importance of alternative factors may be assessed under two different macroeconomic regimes: a fixed exchange rate with full convertibility of the local currency with the U.S. dollar (1991-2001) and the period after the 2001-2002 crisis, with managed floating exchange rates and active monetary policy.

Previous studies of spread in Argentina have focused either on the convertibility period and the peculiar features of a financially dollarized economy (Catão, 1998; Ahumada et al., 2000); or a somewhat more extended period, including the years immediately following the Argentine 2001-2002 crisis (Kiguel and Okseniuk, 2006; Grasso and Banzas, 2006). The former tend to focus on the paradox of an economy financially integrated to international markets but with spreads that substantially exceed those of developed countries. These works were part of a larger body of literature which inquired why interest rate spreads remained stubbornly high in Latin America, even after successful macroeconomic stabilization efforts (Brock and Rojas-Suárez, 2000), a question that, with all the differences among macroeconomic performance, remains pressing in many countries of the region. The latter faced the limitation of a very short sample to evaluate changes in the post-convertibility period. We analyze intermediation spreads from the vantage point of a larger sample, including the possible effects of the international financial crisis on the domestic banking system.

Within the first group of papers (devoted to the 1990s), Catão (1998) points out that the deposit interest rate trended toward international levels, while the lending rate remained well above those of developed countries: high administration costs, payment system inefficiency, significantly high levels of non performing loans, together with market segmentation of loans in local and foreign currency, are all causes of high margins for this author. In turn, Ahumada et al. (2000) estimate econometric models of spread by credit line and conclude that high margins are not an aggregate phenomenon, but are concentrated in two types of loans: current account overdrafts and personal loans. The rest of credit lines –mortgages, pledges and discounted documents- show spreads close to international standards.

Within the second group (including the post-convertibility experience) Kiguel and Okseniuk (2006) look for spread determinants through both decomposition of banks' balance sheets and a panel

data model. They look at structural factors, pointing out that it is not the cost of credit that explains low intermediation levels, but that the latter explain high credit costs; although they recognize the role of financial market determinants in spread, they suggest that these result of low intermediation levels associated to repeated experiences of macroeconomic crises. In turn, Grasso and Banzas (2006) also employ those two complementary approaches, an accounting decomposition and a model of aggregate implicit spread of the financial system[1]. They find that both macroeconomic (growth and inflation) and microeconomic variables (administration and operational expenses, non performing loans) weigh on the determination of spread.

The papers just mentioned reach until 2005, at best: we extend the sampling period until 2013, allowing a better description of recent spread dynamics –including the impact of the international financial crisis- and its comparison with that during the currency board. We use alternative definitions, including both ex ante or explicit spread (based on new operations) and ex post or implicit spread (based on balance sheet data). The analysis is based on individual data of all banks in the Argentine financial system: we look at differential evolution among different groups, as well as changes between different macroeconomic regimes, with emphasis on the evolution of recent years. The rest of the paper is organized as follows: section II presents a descriptive analysis of explicit spread, including correlation and Granger causality; section III decomposes implicit spread in its accounting components, identifying potentially relevant factors to account for spread's dynamics. Based on such factors, as well as others identified by the literature, section IV presents the econometric model. Section V concludes.

## II. Spread: descriptive analysis

### II. a. Data and definitions

Spread or margin is defined as the absolute difference between interest rate charged for loans (active rate) and paid for deposits (passive or funding cost). We will use two alternative definitions of such margin, using: 1) interest rates as operated between financial institutions and their customers (in what follows, explicit rates); 2) the relationships between income from loans (implicit active rate) and expenses due to deposits (implicit funding cost). The former describe prices paid and received ex ante, corresponding to deals effectively made by financial institutions, but whose conditions were determined before the deposit or loan developed over time; by definition, institutions and their customers ignore the subsequent development of the deal in terms of (real) yield, repayment and other relevant features. Implicit rates reflect revenues and costs incurred by institutions during a certain

[1] Implicit in the sense that rates are computed from financial institutions' balance sheet data.. See section II.

period of time[2], incorporating events such as issuance and call of bank loans, degree of repayment, etc. Both measures contain useful information for the analysis: explicit rates correspond to the daily data survey by the Central Bank of Argentina through the *Sistema Centralizado de Requerimientos Informativos* (SISCEN), indicate in a direct way market conditions at each moment –being thus more volatile- and allow for a better appreciation of marginal costs and benefits, something particularly relevant from the point of view of banks' and customers' decisions. Implicit rates bear a more direct relation with institutions' profitability, are by construction more stable –as income and costs are averaged over a period- and are obtained from balance sheets, thus allowing to decompose spread into costs actually incurred by banks.

Financial institutions were grouped according to capital ownership as follows: private Argentine (national) banks, private foreign-owned banks, government-owned (public) banks, non-banking financial institutions[3], and the total financial system defined as the aggregate of the above. As for financing over which spread was measured, we took: current account overdrafts, discounted documents, pledges, mortgages, personal and credit card loans. We examined alternative funding measures: we found the most representative to be the average of interest rates for current account[4], savings and time deposits, weighted by the stock of each deposit type each month. This is a relevant measure as around 80% of financial institutions' liabilities correspond to deposits, while in the 1990s it was, on average, 60%; in addition, interest rates on liabilities other than deposits are not readily available. All measures were computed both in local currency (Argentine pesos, AR$) and US dollars –our focus, however, is on credit in pesos, given its current importance in the credit market.

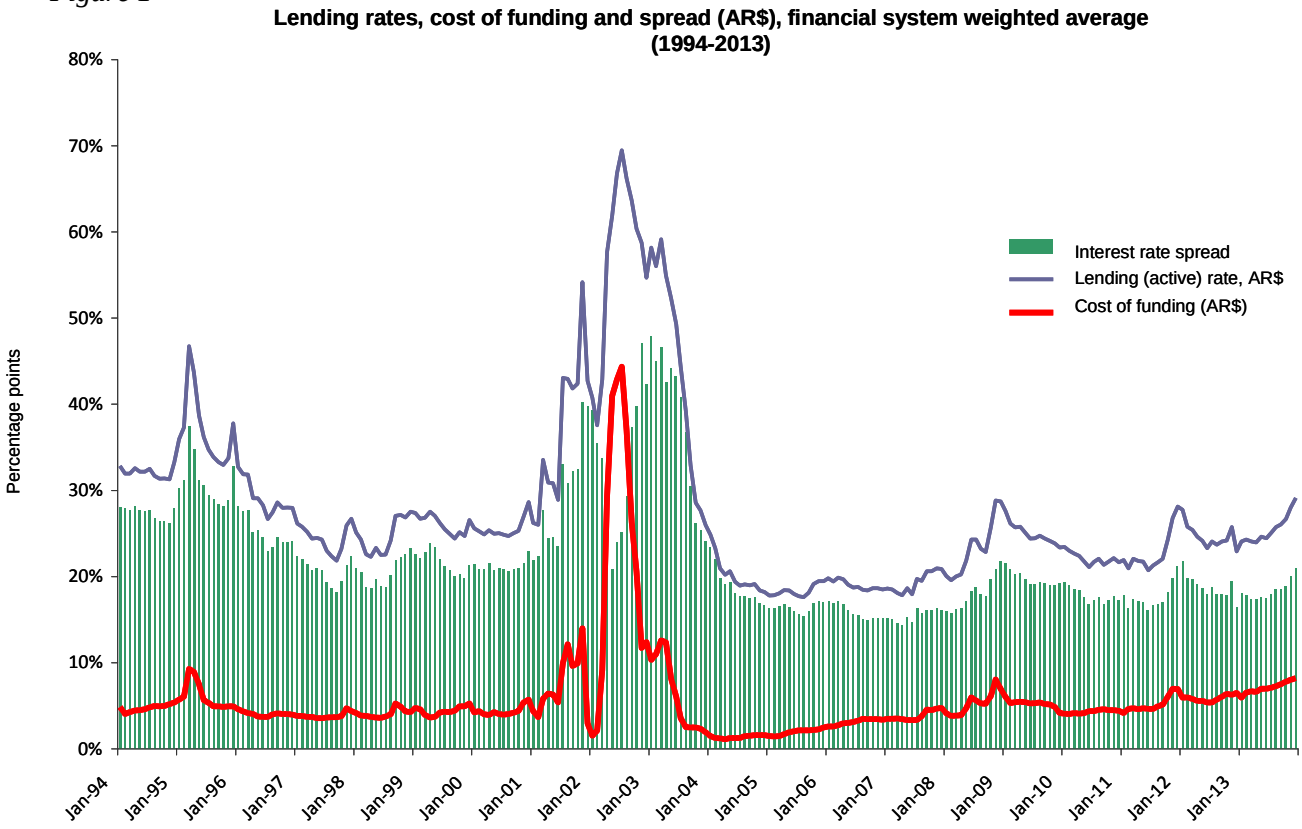
**II. b. Explicit spreads in historical and international perspective**

Through time, there are distinct phases of the evolution of average spread in the Argentine financial system[5], marked by changes in the macroeconomic regime and the impact of external events (Figure 1): the initial phase of the currency board, the "Tequila" crisis, the second half of the 1990s, the 2001-2002 crisis, its immediate aftermath (2003-2004), the normalization of local financial conditions (2004-2007) and the international financial crisis (from mid-2007 onwards). Following the notorious impact of the "Tequila" crisis and –to a lesser degree- that of the Asian crisis and similar episodes, spreads became relatively stable during the last years of the 1990s. In turn, the period following the currency board shows a strong initial decrease after the historical peaks of the 2001-

[2] In the case of explicit rates, active rates are those charged by financial institutions to the non financial private sector, while passive rates correspond to total deposits –that both the public and private sectors hold in banks. For implicit rates, we consider lending and deposit operations of financial institutions with the private and the public sector. This difference is due to data availability.
[3] Although considered for the calculation of total spread, this group is not analyzed separately here.
[4] In the Argentina financial system, these deposits are unremunerated.
[5] Unless otherwise stated, average spread refers to the average of interest rates for credit operations, weighted by the amount of such operations in all the financial system (banks and non banking financial institutions).

2002 crisis; then, two years of stability follow, while a slight trend upwards is noticed since mid-2007 –with spreads, however, at levels around those of the second half of the 1990s. During the 2004-2013 period, together with such upward trend, there are two spikes in late 2008 and late 2011 –associated to international and domestic events. Thus, mere visual inspection reveals the importance of spread as an indicator of changes in financial stability conditions.

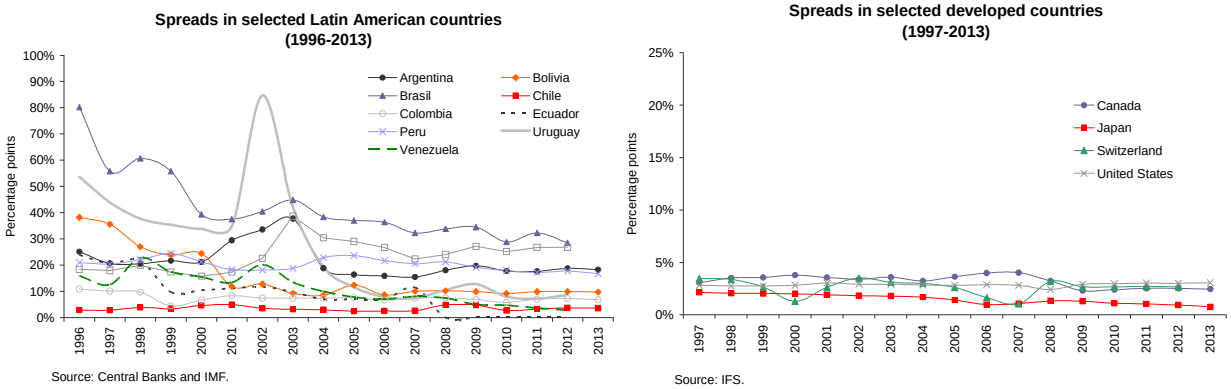
*Figure 1*




Compared to other Latin American countries, spread in Argentina lies around the mean over time; outside the 2001-2002 crisis, it does not show any marked behaviour with respect to the rest of the region (Figure 2 a). In turn, the region does show interest rate margin well above those of developed countries (Figure 2 b).

*Figure 2*

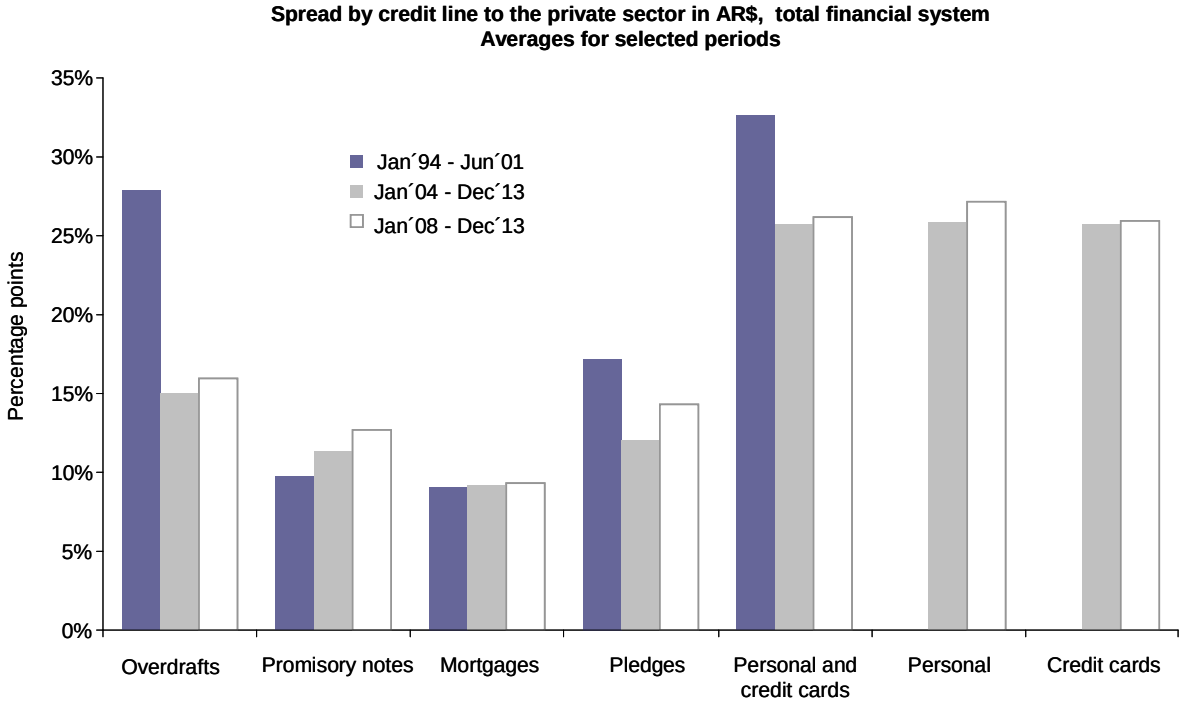
(a) (b)




## II. c. Analysis by type of credit

A first assessment of explicit spreads' evolution by financing line (for the financial system as a whole) shows higher levels during 1994-2001 than in the nine years after the convertibility crisis (2004-2013), with gaps as high as 13 percentage points (p.p.) depending on which line is considered; average spread of the financial system was 8 p.p. higher in 1994-2001 than during 2004-2013. (Figure 3) [6].

*Figure 3*

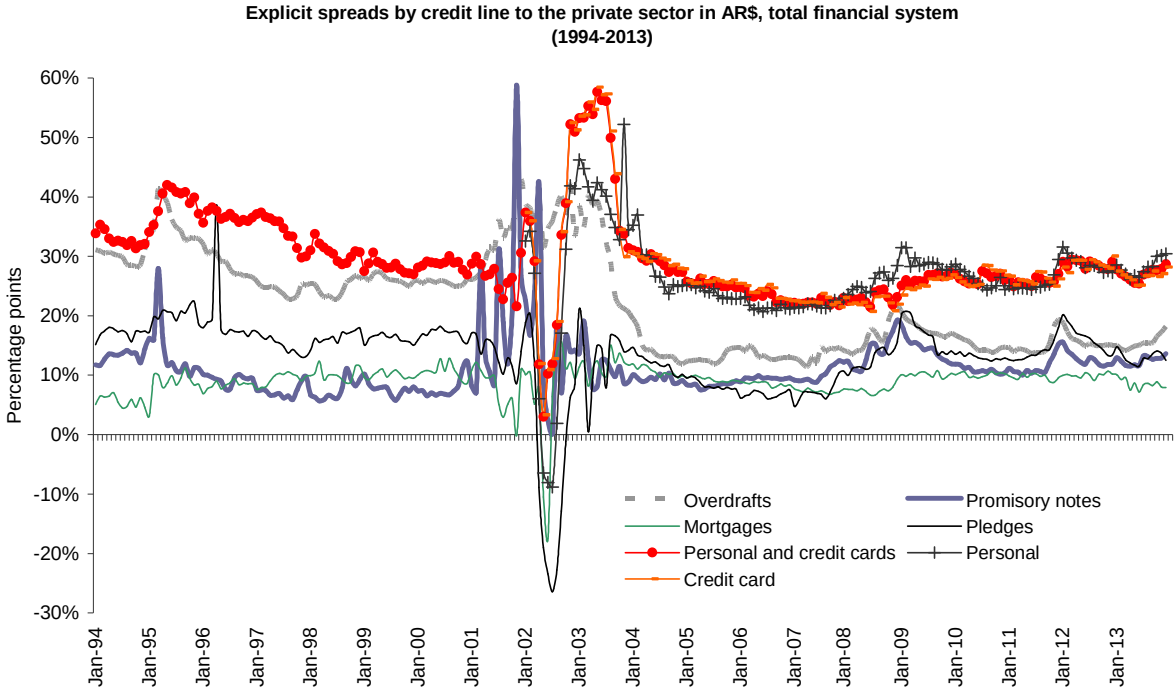



[6] Personal and credit card loans data are disaggregated as from 2002.

The biggest drops in spread after the convertibility crisis is found in current account overdrafts and personal loans (considering personal and credit card loans as a whole); the exception are discounted documents, for which an increased spread is found during 2004-2013. During the latter period, all lines show a rebound in spread, starting with international financial crisis outbreak in 2008.

Spread by credit type appears related to the collateral presented by the borrower: personal and credit card loans have the highest spread through time, while discounted documents and mortgages the lowest (Figure 4). The most prominent case is that of current account overdrafts, that go from showing a spread similar to that personal loans during the currency board period to another substantially lower during the last eight years –more akin to the nature of its implicit collateral (the borrower's balance).

*Figure 4*




Spread not only decreases on average and by credit type, it also becomes less volatile through time (table 1): standard deviation of average spread in Argentine pesos decreases almost by half from 1994-2001 to 2004-2013[7], and almost all financing lines show lower absolute (standard deviation) and relative (coefficient of variation) variability. In particular, during 2004-2013 overdrafts, documents and personal loans reduce absolute volatility almost by half as compared to the convertibility period. The case of personal loans is remarkable, as they show the highest average spread during the whole period (1994-2013): the relatively most dynamic line in terms of credit growth is also the most "expensive" and one of the most volatile when it comes to spread. Different credit types also show

[7] Data after June 2001 are excluded.

lower spread variability among them during "post-convertibility": deviation among lines falls over 40% between 1994-2001 and 2004-2013 – that is, spread becomes significantly less variable among different loans.

*Table 1*

**Spread in AR$ by loan type, financial system average - January 1994 - June 2001**

| | Overdrafts | Promisory notes | Mortgages | Pledges | Personal and credit cards | All loans |
|---|---|---|---|---|---|---|
| Average | 27.90 | 9.73 | 9.08 | 17.20 | **32.61** | 23.92 |
| Median | 26.46 | 8.76 | 9.51 | 16.97 | **31.88** | 22.73 |
| Maximum | 41.27 | 28.45 | 12.84 | 38.61 | **41.98** | 37.48 |
| Minimum | 22.85 | 5.70 | 3.15 | 13.05 | **26.70** | 18.17 |
| Standard deviation | 3.90 | 3.88 | 1.92 | 2.91 | **4.17** | 3.97 |
| Coefficient of variation | 0.14 | **0.40** | 0.21 | 0.17 | 0.13 | 0.17 |

**Spread in AR$ by loan type, financial system average, January 2004 - December 2013**

| | Overdrafts | Promisory notes | Mortgages | Pledges | Personal and credit cards | Personal | Credit cards | All loans |
|---|---|---|---|---|---|---|---|---|
| Average | 14.97 | 11.34 | 9.18 | 12.03 | 25.72 | **25.86** | 25.72 | 17.67 |
| Median | 14.56 | 10.79 | 9.54 | 12.63 | 25.76 | 25.23 | **25.76** | 17.46 |
| Maximum | 21.86 | 19.27 | 11.85 | 20.75 | 31.04 | **36.96** | 30.46 | 23.34 |
| Minimum | 11.47 | 7.53 | 6.63 | 4.79 | **21.51** | 20.71 | 20.73 | 14.41 |
| Standard deviation | 2.12 | 2.35 | 1.20 | **3.68** | 2.33 | 3.13 | 2.42 | 1.79 |
| Coefficient of variation | 0.14 | 0.21 | 0.13 | **0.31** | 0.09 | 0.12 | 0.09 | 0.10 |

## II. d. Differences among group of banks

Bank type –as defined by ownership of majority of capital- is related to spread observed during the "long" sample. Both public (government-owned) and private national-owned banks show lower spreads for all lines during 2004-2013 than in the currency board period (Figure 5), whereas private foreign-owned banks slightly increase spread for discounted documents and mortgages in the last ten years as compared with the convertibility regime –in fact, this group explains the higher average spread of documents in 2004-2013 with respect to 1994-2001. Starting in 2008, spread goes up more markedly in private banks than in public ones in overdrafts, documents, mortgage and pledge loans (Figures 5 and 6); public banks show either small decreases or stable spreads depending on which line is considered.

*Figure 5*

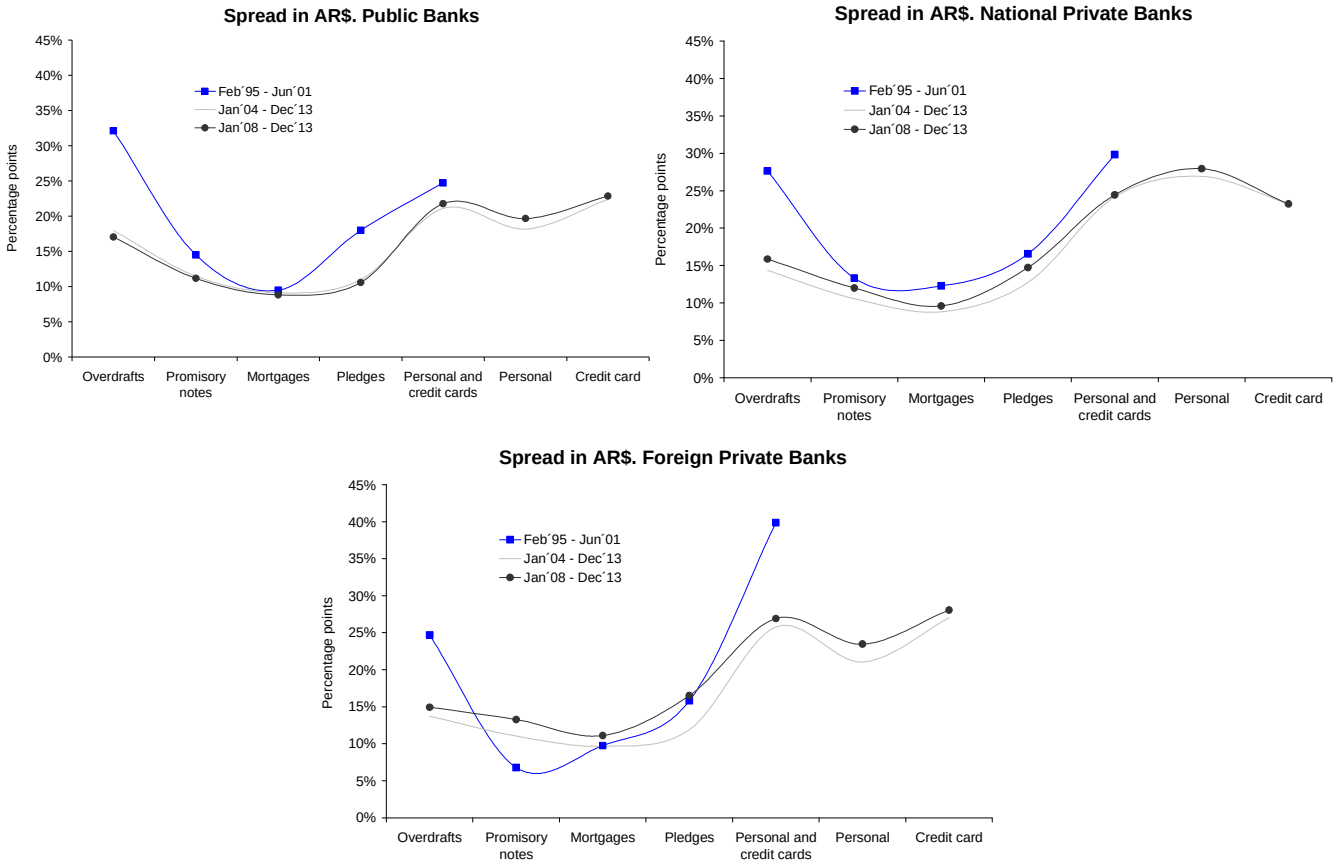
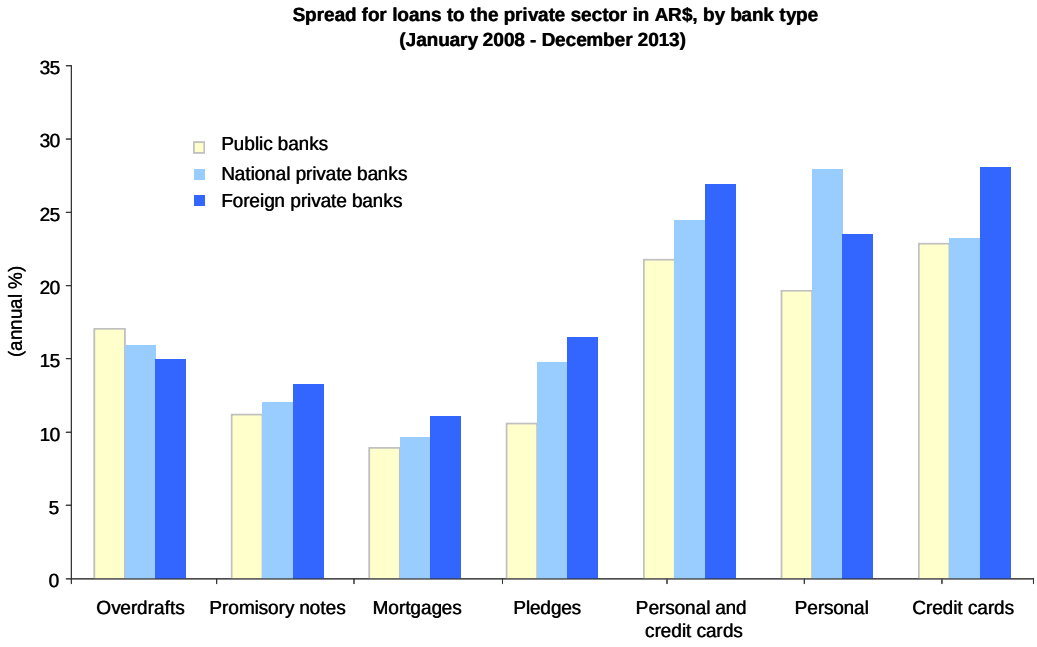



*Figure 6*



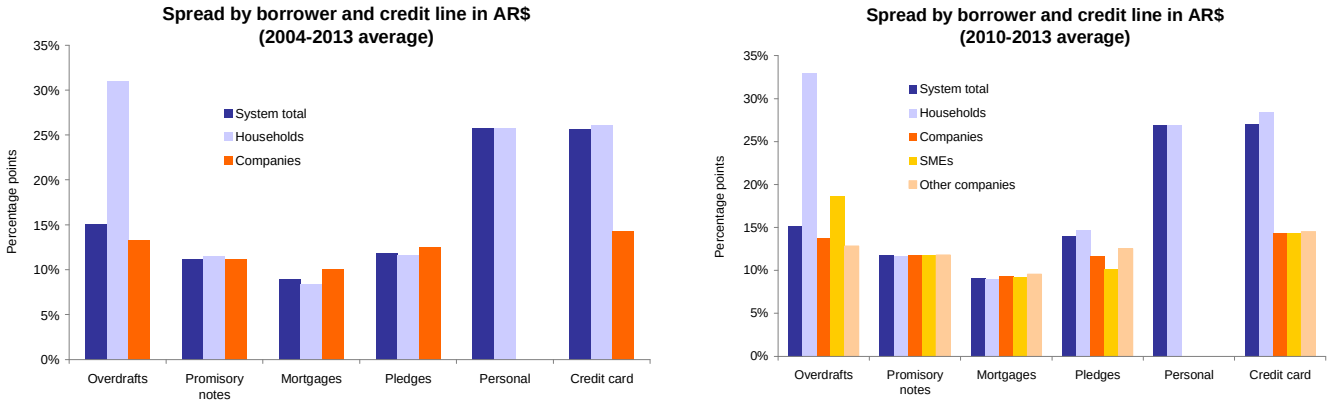

In turn, spread volatility decreases both within each group's lines and among the three groups. The former is more noticeable in foreign owned private banks: during convertibility they showed the

highest volatility of spread among lines (over 50% of that of national-owned and public banks), which decreases by half in 2004-2013; the two other groups diminish volatility among different lines by around a third. These changes imply that variability among groups also goes down markedly between the two time lapses considered.

### II. e. Spread by credit recipient

Just as there are differences among credit originators, spread differs by credit recipients (Figure 7).

*Figure 7*




The longest database available allows us to discriminate cost of financing by physical persons and legal entities, (roughly, individuals and companies) since 2002. Considering 2004-2013, average spread of credit granted to individuals is substantially higher than that to companies in overdrafts and credit cards; for the former credit type, the difference exceeds 100%. The rest of financing lines shows no major differences –indeed, for pledges and mortgages, spread is just slightly higher for individuals. With data available as from 2010, we can distinguish small and medium sized enterprises (SMEs) within the group of legal entities: the spread on credit to SMEs is significantly higher than for the rest companies only in the case of current account overdrafts.

### II. f. Correlation analysis

A first step toward analyzing spread dynamics over time is to examine its association with other variables: we look at its linear correlation with its two defining components, cost of funding and active rates of interest. For the whole period, (1994-2013), the result is clear: average intermediation spread shows a positive linear association with both components; correlation of spread with the active rate is higher than with the cost of funding; it is 0.85 with the former and goes down to 0.32 with the latter. This regularity is verified for the financial system on average, with different types of credit and also

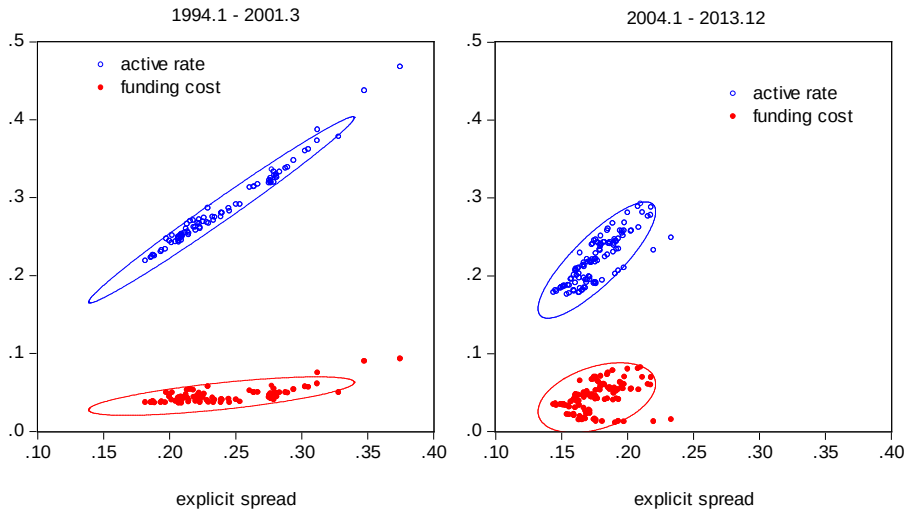
looking at different groups of banks. It implies that changes in *ex ante* intermediation spreads are above all related to changes in rates paid by borrowers than to rates received by lenders (depositors).

The occurrence of the 2001-2002 and the difference between the macroeconomic regime in place before and after it point to the convenience of analyzing correlation by sub-periods (Figure 8). This clearly shows that spread-active rates and spread-cost of funding correlations decrease from 1994-2001 to 2004-2013: the former go down from 0.98 to 0.83, the latter from 0.69 to 0.39 (see Figure 8). This evolution seems determined to a significant extent by the lower correlation (during the second period) between spread and active rates of overdrafts, the line of credit with the highest weight in new operations.

Correlation analysis may be further opened by: (a) credit line; (b) bank group; (c) both bank group and credit line. Regarding (a) and as expected, correlation is stronger between spread and active rates within each credit line, something particularly marked in the case of current account overdrafts. Moreover, during 2004-2013 the co-movement among active rates of different lines increases notably.

*Figure 8*

***Average explicit spread* (AR$): scatter plot and confidence ellipse correlation**




Differences among groups of banks also explain part of the previously illustrated dynamics (table 2). Government-owned banks show the lowest correlations between spread and active rates, and between spread and funding cost, of the three groups. They do not only register the highest decrease in correlation between spread and active rates from 1995-2001 to 2004-2013, but also an inverse correlation (from positive to negative) between spread and funding cost between those periods. This suggests a differential behavior of public banks in 2004-2013, in that they do not increase spread through higher active rates, but by lower funding costs; or that public banks do not increase spread when passive rates are rising. Such difference is reinforced when considering that public banks show,

a negative correlation between their spread and funding costs during 2004-2013, as well as a very small correlation between their own margin and that of private banks (and certainly much lower than that correlation registered during 1995-2001). These findings are preliminary evidence for the countercyclical role played by public banks during 2004-2013 vis-à-vis their performance during the currency board regime.

The relations described above are reinforced by cross correlations by line and bank group (c). For public banks, correlation between spread and funding cost for overdrafts, documents, pledge and mortgage loans goes from positive (not significant in the case of mortgages) to negative between the two periods we examine. For national private banks, positive correlation between spread and funding cost is higher in overdrafts, while for foreign-owned banks it is higher in discounted documents; these regularities are maintained throughout the whole period. In turn, active lending rates of the different credit types are correlated more strongly among them during the second period (2004-2013), something more accentuated in private banks; for them, rates on overdrafts and documents show the highest association –which much lower in public banks.

*Table 2. Pearson´s correlation among funding cost, active rate and explicit spread, by group of banks*

Sample: 1995.2 - 2001.6
Included observations: 77 after adjustments

| | | Funding cost | | | Active rate | | | Explicit Spread | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Foreign-owned banks | Private national banks | Public banks | Foreign-owned banks | Private national banks | Public banks | Foreign-owned banks | Private national banks | Public banks |
| Funding cost | Foreign-owned banks | 1<br>-----<br>----- | | | | | | | | |
| | Private national banks | **0.925**<br>21.130<br>0.000 | 1<br>-----<br>----- | | | | | | | |
| | Public banks | **0.827**<br>12.727<br>0.0000 | **0.855**<br>14.281<br>0.0000 | 1<br>-----<br>----- | | | | | | |
| Active rate | Foreign-owned banks | **0.760**<br>10.134<br>0.000 | **0.846**<br>13.736<br>0.000 | **0.750**<br>9.819<br>0.000 | 1<br>-----<br>----- | | | | | |
| | Private national banks | **0.699**<br>8.454<br>0.000 | **0.784**<br>10.947<br>0.000 | **0.927**<br>21.361<br>0.000 | **0.780**<br>10.796<br>0.000 | 1<br>-----<br>----- | | | | |
| | Public banks | **0.542**<br>5.588<br>0.000 | **0.690**<br>8.260<br>0.000 | **0.808**<br>11.868<br>0.000 | **0.727**<br>9.162<br>0.000 | **0.872**<br>15.442<br>0.000 | 1<br>-----<br>----- | | | |
| Explicit Spread | Foreign-owned banks | **0.605**<br>6.587<br>0.000 | **0.735**<br>9.380<br>0.000 | **0.649**<br>7.394<br>0.000 | **0.977**<br>39.969<br>0.000 | **0.728**<br>9.195<br>0.000 | **0.714**<br>8.822<br>0.000 | 1<br>-----<br>----- | | |
| | Private national banks | **0.582**<br>6.191<br>0.000 | **0.664**<br>7.688<br>0.000 | **0.876**<br>15.761<br>0.000 | **0.702**<br>8.541<br>0.000 | **0.985**<br>48.844<br>0.000 | **0.857**<br>14.407<br>0.000 | **0.671**<br>7.830<br>0.000 | 1<br>-----<br>----- | |
| | Public banks | **0.322**<br>2.944<br>0.004 | **0.509**<br>5.123<br>0.000 | **0.596**<br>6.433<br>0.000 | **0.612**<br>6.699<br>0.000 | **0.721**<br>9.009<br>0.000 | **0.955**<br>27.849<br>0.000 | **0.645**<br>7.304<br>0.000 | **0.726**<br>9.134<br>0.000 | 1<br>-----<br>----- |

Sample: 2004.1 - 2013.12
Included observations: 120 after adjustments

| | | Funding cost | | | Active rate | | | Explicit Spread | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Foreign-owned banks | Private national banks | Public banks | Foreign-owned banks | Private national banks | Public banks | Foreign-owned banks | Private national banks | Public banks |
| Funding cost | Foreign-owned banks | 1<br>----- | | | | | | | | |
| | Private national banks | **0.974**<br>46.259<br>0.000 | 1<br>----- | | | | | | | |
| | Public banks | **0.894**<br>21.617<br>0.0000 | **0.929**<br>27.308<br>0.0000 | 1<br>----- | | | | | | |
| Active rate | Foreign-owned banks | **0.816**<br>15.339<br>0.000 | **0.847**<br>17.272<br>0.000 | **0.797**<br>14.351<br>0.000 | 1<br>----- | | | | | |
| | Private national banks | **0.836**<br>16.564<br>0.000 | **0.894**<br>21.710<br>0.000 | **0.865**<br>18.759<br>0.000 | **0.941**<br>30.322<br>0.000 | 1<br>----- | | | | |
| | Public banks | **0.160**<br>1.766<br>0.080 | **0.205**<br>2.279<br>0.024 | **0.313**<br>3.577<br>0.001 | **0.572**<br>7.565<br>0.000 | **0.519**<br>6.600<br>0.000 | 1<br>----- | | | |
| Explicit Spread | Foreign-owned banks | **0.457**<br>5.580<br>0.000 | **0.525**<br>6.699<br>0.000 | **0.513**<br>6.495<br>0.000 | **0.887**<br>20.861<br>0.000 | **0.781**<br>13.571<br>0.000 | **0.751**<br>12.370<br>0.000 | 1<br>----- | | |
| | Private national banks | **0.517**<br>6.560<br>0.000 | **0.594**<br>8.031<br>0.000 | **0.614**<br>8.455<br>0.000 | **0.835**<br>16.457<br>0.000 | **0.891**<br>21.373<br>0.000 | **0.725**<br>11.441<br>0.000 | **0.871**<br>19.298<br>0.000 | 1<br>----- | |
| | Public banks | **-0.524**<br>-6.682<br>0.000 | **-0.509**<br>-6.422<br>0.000 | **-0.462**<br>-5.658<br>0.000 | **-0.068**<br>-0.736<br>0.463 | **-0.168**<br>-1.848<br>0.067 | **0.698**<br>10.585<br>0.000 | **0.315**<br>3.601<br>0.001 | **0.214**<br>2.380<br>0.019 | 1<br>----- |

## II. g. Granger causality

Temporal anticipation or Granger causality allows us to further characterize spread and its direct determinants. In order to test Granger causality, we run regressions of each variable on the other, with lags of dependent variable determined through the Akaike criterion (so as to obtain uncorrelated and homoskedastic residuals), and controlling for anomalous observations (such as crisis episodes) through dummy variables; we performed Wald tests with the null hypothesis that coefficients of the dependent variable are equal to zero. We analyzed spread, deposit and lending rates for the whole system on average as well as for each credit line. Examining the two main subperiods show differentiated dynamics.

During the currency board period, active rates Granger-cause funding cost at 5% level of significance (with both variables measured on average over the whole financial system), but the opposite does not hold; meanwhile, spread also anticipates funding cost, and there is no anticipation from lending rates to spread (table 3 a). The margin, in turn, does not Granger cause neither active nor passive rates, in a bivariate analysis[8].

During 2004-2013, in contrast deposit and lending rates (financial system averages) are mutually determined: each one of them Granger causes the other; at the same time, banking spread anticipates both passive and active rates (once again, in a bivariate analysis). Simultaneous determination of these

[8] Nevertheless, at 1% level of significance neither active nor passive rates Granger cause spread, and the same holds in the opposite direction.

variables is to be expected from the economic point of view, although it is not particularly useful to learn about their dynamics.

Taking into account the foregoing results, we ran multivariate models with active rates distinguished by credit type during 2004-2013[9] (table 3 b): in general, cost of funding in pesos anticipates the different lending rates, but the reverse does not apply (testing at a 5% level of significance). The deposit rate Granger causes several lending rates (overdrafts, documents, mortgages and credit cards) but none of the active rates anticipates the deposit rate (testing at a 5% significance level). Moreover, the rates for certain credit lines Granger-cause other active rates: overdraft rates anticipate document, mortgage, and personal loan rates; documents Granger cause overdraft, mortgage and credit card rates at a 5% significance level (not shown in table 3b); pledges cause documents and mortgage rates.

Thus, a basic scheme of temporal precedence during 2004-2013 links the cost of funds to the overdraft rate, and the latter to the rest of the active rates. This is consistent with other econometric analyses and with anecdotal evidence of rate hike episodes during the 2000s, when the BADLAR (Buenos Aires Deposit of Large Amount Rate, the wholesale time deposit rate, included in the average time deposit rate, which in turn is the most important component of the cost of funding we calculate) reacted quickly to changes in economic and market conditions, while cost of credit only adjusted gradually –in other words, the analysis confirms the role of "thermometer" of money market passive rates, upon which other operation adjust their financial conditions.

*Table 3 (a)*

| $H_0$: does not Granger cause | | | 1994.3 - 2001.3 | | 2004.1-2013.12 | |
|---|---|---|---|---|---|---|
| | | | F test | p-value | F test | p-value |
| funding cost | does not cause | active rate | 1.767 | 0.188 | 37.486 | 0.000 |
| | | spread | 0.190 | 0.664 | 14.377 | 0.000 |
| active rate | does not cause | funding cost | 3.600 | 0.032 | 9.013 | 0.000 |
| | | spread | 0.190 | 0.664 | 18.889 | 0.000 |
| spread | does not cause | funding cost | 3.600 | 0.032 | 9.147 | 0.000 |
| | | active rate | 1.468 | 0.237 | 21.513 | 0.000 |

[9] We estimated a vector autorregression model, with up to three lags –as alternative criteria indicated one and three lags- and using dummy variables for crisis episodes; we report here results based on one lag..

*Table 3 (b)*

| $H_0$: does not Granger cause | | | 2004.1-2013.12 Chi² statistic | p-value |
|---|---|---|---|---|
| Funding cost | does not cause | overdraft rate | 32.226 | 0.000 |
| | | promisory note rate | 38.580 | 0.000 |
| | | mortgage rate | 10.627 | 0.001 |
| | | personal rate | 2.973 | 0.085 |
| | | pledge rate | 0.028 | 0.867 |
| | | credit card rate | 5.356 | 0.021 |
| overdraft rate | does not cause | funding cost | 3.287 | 0.070 |
| promisory note rate | | | 3.169 | 0.075 |
| mortgage rate | | | 2.881 | 0.349 |
| personal rate | | | 0.210 | 0.647 |
| pledge rate | | | 2.139 | 0.144 |
| credit card rate | | | 0.817 | 0.366 |
| overdraft rate | does not cause | promisory note rate | 14.429 | 0.000 |
| | | mortgage rate | 4.527 | 0.033 |
| | | personal rate | 9.104 | 0.003 |
| | | pledge rate | 0.852 | 0.356 |
| | | credit card rate | 0.000 | 0.984 |

VAR with one lag and dummy variables for outliers

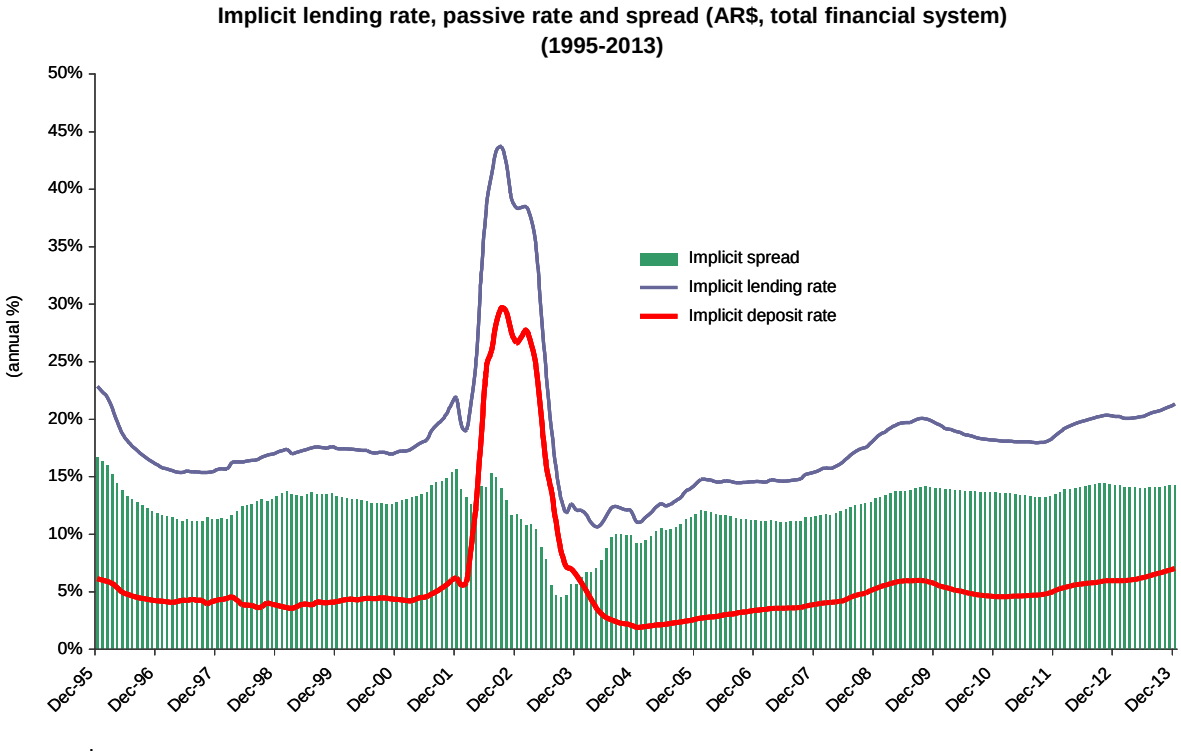
Dynamic features of spread analyzed so far are an illustration of how its components (active and passive rates) move over time; but it remains to determine which factors underlie such movement. The next two sections focus on that issue.

## III. Implicit spreads: evolution and analysis by components

### III a. Aggregate evolution

Implicit spread analysis allows us to approach its possible direct determinants, as well as to link the concept to financial institutions' (accounting) profitability. We look at implicit (nominal) intermediation spreads on credit to the private sector in pesos granted by all financial institutions: the system currently shows levels only slightly below those of the second half of the 1990s, with a positive trend in recent years (Figure 9). It should be pointed out, however, that total spread in pesos and US dollars shows a higher average spread in 2004-2013 (+3,5 p.p.) than during the currency board period: even though the spread in foreign currency has remained on average stable, it is systematically lower than in pesos; and in the last ten years, the foreign currency segment of the credit market was strongly reduced.

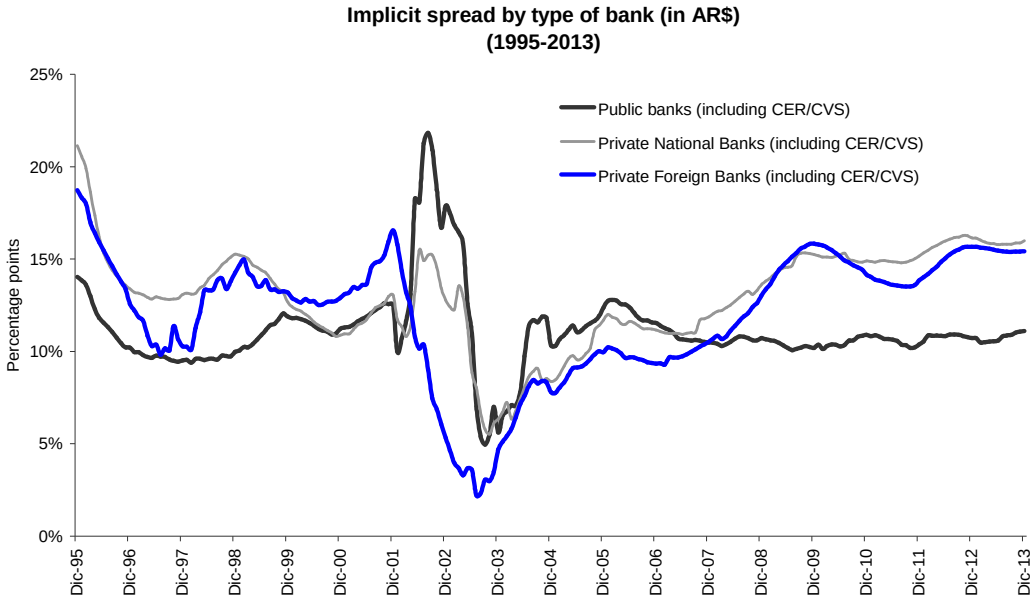
*Figure 9*




Decomposing spread in its components using balance sheet data suggests contrasts between the current situation and the convertibility regime, including –once again- differential behaviour by group of banks. Administration expenses are the item with the highest weight on spread over time, while in the last five years the impact of "other assets" decreases, and the cost associate to holding liquid assets increases; the share of equity in funding, in turn, also operates in the direction of increasing observed spread (in the face of growth in nominal profitability). The weight of taxes becomes more important (a factor more directly related to economic policy); finally, charges for delinquency go down, in line with the financial system performance in recent years, with substantially lower risk than in the past. As for group of banks, implicit spread stabilizes in government-owned banks in the period following the 2001-2002 crisis, which contrasts with an increase in private banks (Figure 10) [10]. In what follows, we present the methodology of decomposition and its main results.

[10] Interest income includes the adjustment of "pesified" loans as a consequence of the 2001-2002 crisis (CVS index); and interest paid include deposits adjusted by retail inflation (CER index) as a consequence of the same pesification process.

*Figure 10*




## II. b. Decomposing implicit spread in AR pesos

Accounts from financial institutions' balance sheet and financial statement may be used to calculate the factors that "explain" implicit spread on loans. It is an ex post analysis of banks operations and their informed profitability, and consists basically of "solving for" spread from implicit loans and deposit rates in pesos in an identity derived from the financial statements of institutions.

We look at spread for operations in pesos: the main difference with total (bi-monetary) spread is that the opportunity cost of lending in US dollars and the additional cost of funding deposits in foreign currency are distinguished as separate components of spread in pesos–but when considering total spread, those factors are included in the income and costs that make up the margin. At the same time, we include the implicit return on liquid assets in order to have a more precise figure of the opportunity cost of liquidity. Implicit spread in pesos is defined as:

$$s_{\$} = \left(ROE - i_{\$}^{D}\right)\phi_{PN} + \alpha_{E}\left(i_{\$}^{P} - i^{E}\right) + \alpha_{OA}\left(i_{\$}^{P} - i^{OA}\right) - cn + \alpha_{USD}^{P}\left(i_{\$}^{P} - i_{USD}^{P}\right) + \left(i_{USD}^{D} - i_{\$}^{D}\right)\phi_{USD}^{D} +$$
$$+ \left(i^{OP} - i_{\$}^{D}\right)\phi_{OP} + c + g + t$$

Where:

- $s_{\$}$ is the implicit spread on domestic currency loans, that is, the difference between the active implicit rate in pesos ($i_{\$}^{P}$) and the passive implicit rate or funding cost in pesos ($i_{\$}^{D}$);

- $ROE$ is the return on equity and $\left(ROE - i_{\$}^{D}\right)\phi_{PN}$ is the difference between the cost of funding with own resources and with deposits, multiplied by the ratio of equity to assets (or inverse of leverage). It may be interpreted as the additional cost of funding with capital vis-à-vis deposits in local currency;

- $\alpha_{OA}\left(i_{\$}^{P} - i^{OA}\right)$ is the share of "other assets" (i.e. assets minus loans in local and foreign currency minus liquid assets) in total assets, times the difference between implicit rates of peso loans and of other assets, and may be understood as the opportunity cost of holding other assets if the loan rate exceeds the rate earned by other assets;

- $\alpha_{USD}^{P}\left(i_{\$}^{P} - i_{USD}^{P}\right)$ is the share of foreign currency loans in total assets, times the difference between implicit loan rates in peso and in US dollars, and can be interpreted as the opportunity cost of granting dollar-denominated loans if the rate of peso loans exceeds that in USD;

- $cn$ : are net commissions (charges, fees) in terms of assets;

- $\left(i^{OP} - i_{\$}^{D}\right)\phi_{OP}$ is the difference between the implicit rates of other assets and of deposits, times the ratio of other liabilities to assets, and may be read as the marginal cost of funding different from deposits in pesos;

- $\left(i_{USD}^{D} - i_{\$}^{D}\right)\phi_{USD}^{D}$ is the product of: the difference between the implicit rates of foreign currency deposits and peso deposits; and the ratio of foreign currency deposits to assets; and may be thought of as the additional cost of funding through foreign currency instead of pesos;

- $c$ are delinquency charges in terms of assets;

- $g$ are administrative expenses to assets;

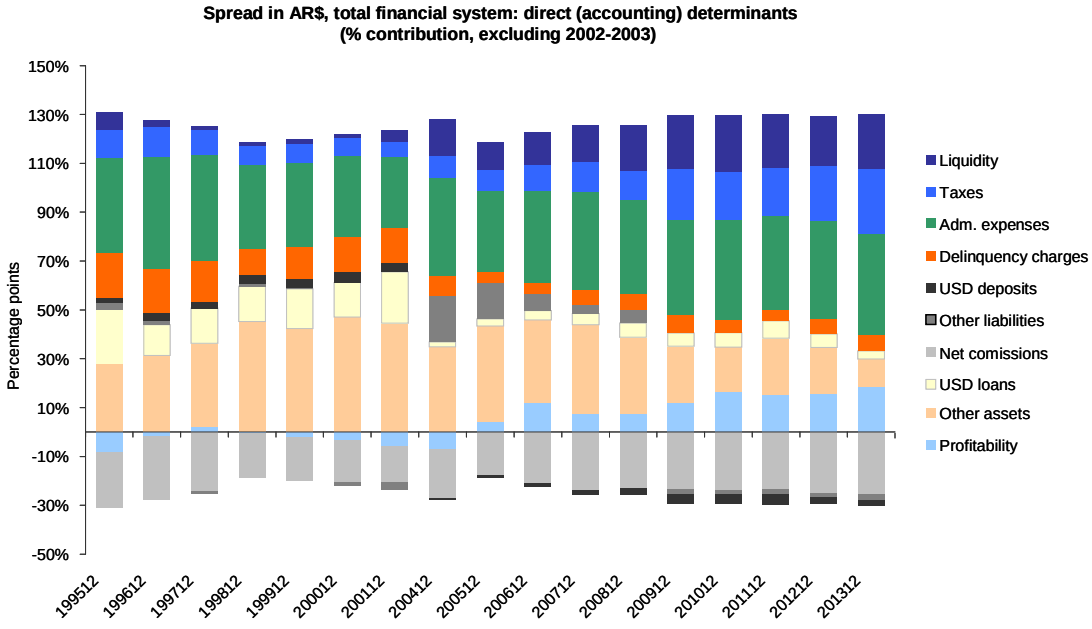
- $t$ are total taxes in terms of assets;

- $\alpha_{E}\left(i_{\$}^{P} - i^{E}\right)$ is the product of the ratio of liquidity to assets, times the difference between the implicit rate of loans in pesos and the return on liquid assets (cash held by banks plus current account deposits at the Central Bank), and may be understood as the opportunity cost of liquidity.

Data used were obtained from monthly balance sheets of financial institutions, compiled by the Superintendence of Financial and Foreign Exchange Institutions (SEFyC-BCRA). We used monthly data for the period that goes from November 1994 to November 2013. For profit and losses items we computed accumulated flows over 12 months, while for stocks we took the 12-month moving average.

Different direct determinants of spread are relevant through time, and the difference between macroeconomic regimes shows in the data (Figure 11). In recent years (2007-2013) the most important (accounting) factor behind spreads were administration expenses (39.9%), followed by the opportunity cost of other assets (24.8%). The opportunity cost of liquidity (19.8%) and taxes (17.9%) were also relevant and, to a lesser degree, the return on equity (Figure 12).

*Figure 11*




The comparison with the currency board period (1995-2000) shows noticeable changes in the weight that each component of implicit spread carries (Figure 13). The cost of use of own funds ($\left(ROE - i_{\$}^{D}\right)\phi_{PN}$), the cost of liquidity ($\alpha_E\left(i_{\$}^{P} - i^{E}\right)$) and taxes ($t$) increased their share in the explanation of spread after the 2001-2002 crisis. The weight of equity is due to the increase of financial institutions' profitability in recent years; and that of liquidity corresponds to the much higher share of liquid assets in banks' balance sheets during the last ten years.

*Figure 12*

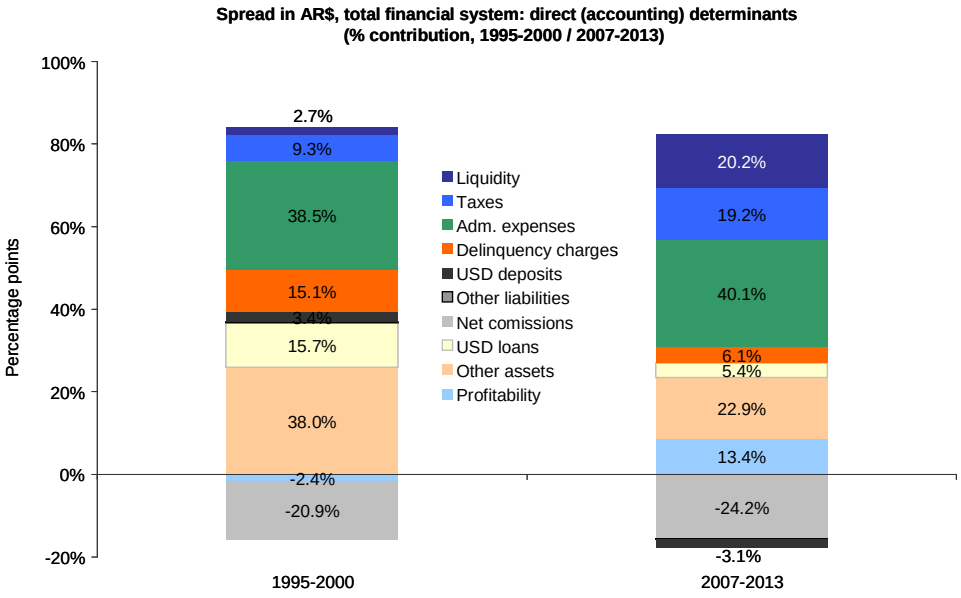
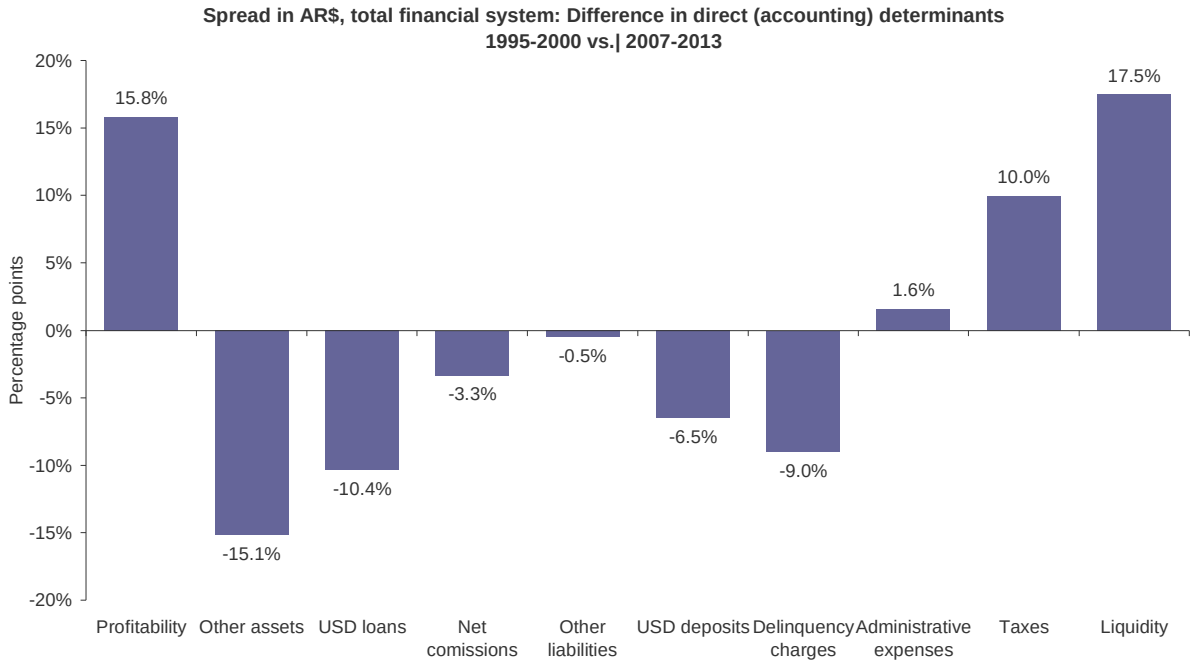


*Figure 13*




In turn, delinquency charges ($c$) and the opportunity cost of other assets ($\alpha_{OA}\left(i_{\$}^{P} - i^{OA}\right)$) have become weaker determinants of the size of spread. Finally, the share of US dollar loans in assets ($\alpha_{USD}^{P}$) and the ratio of US dollar deposits to assets ($\phi_{USD}^{D}$) decreased sharply after the 2001-2002 crisis, as a result of the prudential regulation aimed at limiting lenders' and borrowers' exposure to currency mismatch. Due to such regulation (including limitations to applying funds in foreign currency), this distinction loses some sense in recent years. Finally, net commissions increased in absolute terms in recent years, "reducing" spread in accounting terms. This analysis suggests the importance of a set of variables of the own financial system as "candidates" to explain spread in a causal model.

## IV. Econometric analysis of explicit spread and its determinants

The analysis so far does without causal relationship between variables, at least in a systematic way, combining description, temporal anticipation and accounting relations; econometric analysis allows us to discriminate the role that different variables play in explaining observed spread over time. What is the influence of the macroeconomic environment, and that of the features of the financial system, in explaining observed spread? In different ways, several studies –for Argentina and other countries have tried to answer this question.

**IV. a. Selected literature survey: macroeconomic and microeconomic determinants**

Ho and Saunders (1981) are a standard reference for empirical works on intermediation spreads in the last few decades. They analyze US spreads in two stages: a regression of spread against banking microeconomic variables; and a regression of "pure" spreads (residuals of the previous stage) against a set of macroeconomic variables. In their estimated model, they identify four factors that account for mark up of passive rates: risk aversion of banks, market structure, average size of banking operations and interest rate volatility.

In Latin America, Brock and Rojas-Suárez (2000) estimate a panel data model and find that variables of the banking sector (operational costs, delinquency, liquidity requirements) and its environment (macroeconomic uncertainty) explain observed spread dynamics. For the Brazilian economy, Atanasieff (2002) points out that lower spreads registered since 1999 may be due to macroeconomic factors: he finds positive relations with inflation and the interest rate, and negative with interest rate volatility and activity. More recently, Alencar (2013) indicates that banks adjust their interest rates for loans according to the monetary policy rate, without finding microeconomic factors in the explanation of retail active rates; however, for wholesale rates such factors are significant. In turn, market concentration has strong significant effect on spreads and active rates, as does country risk. Fuentes and Basch (1998) examine the Chilean case after the 1982-83, when a large number of banks were liquidated or intervened, giving way to a reformed financial system; they find that weights of microeconomic, macroeconomic and institutional factors change over time.

Economic activity is one of the most relevant macroeconomic factors behind spread: an inverse relationship should be expected, as growth may lead to higher net worth of credit recipients (Bernanke and Gertler, 1989). This is confirmed in Argentina by Grasso and Banzas (2006) and Kiguel and Okseniuk (2006). However, other studies in Latin America conclude that the sign is ambiguous (Banco Central de Honduras, Arreaza et al., 2001).

Monetization of the economy, as a proxy of financial system depth or development is generally expected to bear an inverse relationship to spread; this would be due to lower funding resources being associated to lower monetization, with higher cost of credit as a result. Results for Argentina by Catão (1998) and Grasso and Banzas (2006) are along these lines. However, other authors argue that the relationship is not straightforward (Arreaza et al., 2001, for Venezuela): lower money demand could imply a squeeze on liquidity, inducing banks to raise the deposit rate and thereby reducing spread – such direct relationship between spread and monetization is actually find for the Venezuelan case.

Macroeconomic volatility is also expected to weigh on spreads; it is usually approximated by interest rate and foreign exchange volatility. Still, a direct relationship is not always found in practice; Kiguel and Okseniuk (2006) point out that low significance of estimated coefficients of volatility may be due to the correlation between macroeconomic volatility indicators and other variables such as

country risk. Fuentes and Basch (1998) find a significant relationship only for foreign owned banks in Chile.

While one could expect a positive impact of inflation on spread, this is not always the case. Although inflation affects both active and passive rates, its impact on banking costs, in the presence of mark up, would lead to higher active rates and a positive relation with spread. There is, however, little evidence for this in Argentina (Kiguel and Okseniuk, 2006) and Bolivia (Requena et al., 1998); other studies actually find a negative relationship between spread and inflation (Atanasieff, 2002; Arreaza et al., 2001). Atanasieff (2002) conjectures that the negative relationship between inflation and spread could be due to banks' ability to obtain seignorage revenue.

Banking market structure, and market concentration, are as relevant as they are controversial in their effect on spread. Fernandez de Guevara (2003), in a study of Spain, presents the expected positive relation between spread as concentration, via market power and rents. In contrast, Catão (1998), Kiguel and Okseniuk (2006) find the opposite; the latter give the example of Chile, that bears the lowest spreads in the region together with high banking concentration; as long as the banking sector is competitive, higher interest rates for retail products will also reflect higher commercial costs or higher credit risk, and may not necessarily imply higher profitability, adjusted by risk. Arreaza et al. (2001) find evidence of a negative link between spread and concentration. Cao and Shi (1999) suggest that this result may be due to information problems: in the face of them, an increase in the number of banks tends to reduce the probability of banks evaluating credit and, based on it, make an offer to borrowers. This reduces the number of banks with information about a project, and so fewer banks will be willing to grant credits, increasing its cost. Other studies emphasize the ambiguity of the link between spread and concentration, associated to efficiency. Ho and Saunders (1981) point out that out of efficiency factors, smaller banks may generate higher spreads.

The discussion leads to microeconomic factors: for operating costs, there is wide agreement about its positive impact on spreads, confirmed by empirical studies, and its relevance in explaining them. For Arreaza et al. (2001), operating costs are the most significant explanatory variable of spread in Venezuela, both for the industry average and for individual banks. In general, the proxy for operational costs is the ratio of general administration expenses to assets; when other variables were used (number of branches, x-efficiency), results were not always significant.

As for liquidity requirements, all studies reviewed here point toward a direct relation between them and spread. Higher reserve requirements imply lower funds to loan, and so banks should increase margins to obtain the same income. The cost of keeping a higher share of liquid assets is assumed to be shifted to borrowers through higher spread (Arreaza et al., 2001; Fernández de Guevara, 2003).

The literature has also identified credit quality (or its lack thereof, delinquency) as one the most relevant microeconomic factors in generating spread. The impact of delinquency is positive and significant in several country studies (see for instance Fuentes and Basch, 1998). However, as Brock and Rojas-Suárez (2000) indicate, there is evidence that in financial system of transition economies,

less sound and weakly regulated than developed ones, the relationship between spread and riskier loans could be inverse: as problem loans increase, banks could reduce the lending rate so as to gain share in the credit market; this is found to be significant by Catao (1998).

Other microeconomic variables, namely profitability and taxes, are found to be empirically related to spread in a positive way by several of the studies referred to here.

Finally, beyond macro and micro determinants, the literature identifies a third group of variables, that can be labeled as institutional. Efficiency of the judiciary system and availability of information could reduce spread, by decreasing default risk. Besides ownership of equity can also be associated to spread: here the evidence seems mixed, as some authors find that foreign ownership is linked to lower spread (Martínez Peria and Mody, 2004); instead, according to Tonveronachi (2004) the presence of foreign banks did not lead to the reduction of spreads, among other performance indicators, in the case of Argentina.

**IV. b. Econometric model: average spread of the financial system**

As a first approximation to the available database, this exercise considers the relation between explicit spread of the financial system in pesos and a set of macroeconomic, monetary and financial variables (see annex I), with monthly data for the period 1996-2013; models were also estimated for two subperiods, 1996-2001 y 2004-2013. Macroeconomic variables include:

- GDP growth, according to the monthly activity estimator;
- retail inflation;
- monetization, measured as the ratio of broad money (M3) in pesos to GDP.

Financial market variables are:

- financial system concentration, measured through the Hirschman-Herfindahl coefficient for credits;
- country risk, measured by the *Emerging Market Bond Index*.

Finally, banking system variables include:

- administration expenses as a percentage of assets;
- liquidity, using two alternative definitions: regulatory requirements over deposits, or liquid assets over total assets;
- taxes in terms of assets;
- the cost of use of own funds (vis-à-vis external ones), approximated by the product of equity to assets and return on assets;
- delinquency, captured alternatively by non performing loans to assets and delinquency charges to assets.

Financial system data correspond, in all cases, to the system average, obtained from aggregation of individual data. According to general hypothesis found in other studies, both local and international,

we expect certain variables to increase spread: administration expenses, delinquency, liquidity requirements, taxes, profitability and total liquidity (including holdings of government bonds and excess reserves). Other variables show different impacts according to sample, method, etc: activity, inflation, monetization and banking concentration.

At least two factors limit the scope of our empirical analysis. On the one hand, the dependent variable is ex ante spread, and so its determinants should be expected levels of macroeconomic and financial variables; however, we take contemporaneous values of such variables, some of them even measured over a period of a year before the observation (e.g.: ratios to assets consider the 12-month average of the denominator). This choice is certainly restricted by data availability; from an economic point of view, it contains an implicit assumption of adaptive expectations. On the other hand, one could argue that there is potential endogeneity of some regressors with respect to the dependent variable –for one, profitability or equity structure may be jointly determined with spread, or explained by the same variables that cause spread. Even though the problem is partially alleviated by the data structure (observations that contain past information, which by construction cannot be determined by current spread), the costs of estimating causal relationships with endogenous variables are such that we resorted to methods that account for their presence. These same methods also allowed us to account for the possible effect of the lagged dependent variable

Therefore, we estimated models through the Generalized Method of Moments (GMM) for the different definitions of data just referred. Each model was simplified by testing regressor relevance through tests of J-statistic differences, evaluating if the variable is redundant within a set of information, over and above its individual significance. This resulted in a broad set of estimated models; we show the results of one of the models used, with all variables as outlined above, liquidity requirements and delinquency measured by non performing loans (table 4); a summary of the rest of the models can be found in annex II. We used as instruments the following: the first and second lag of variables that could potentially exhibit endogeneity; contemporaneous values of the rest of regressors; and the first lag of the dependent variable[11].

As for macroeconomic variables, both GDP growth and monetization show the expected signs, in the sense that higher growth and monetization reduce spread; this effect is found for the whole sample (1996-2013) and the two subperiods (1996-2001; 2004-2013). We find economic significance as well as statistical: one percentage point of M3 to GDP equals a reduction of 0.6 p.p. in spread for the whole sample (a value that goes up to 1.7 p.p. in 1996-2001); and one p.p. of y-o-y growth reduces spread by approximately 2.2 p.p. In turn, the impact of certain variables depends on the period considered: the coefficient associated to country risk is positive and significant only in 1996-2001[12]; likewise, the one

[11] This was motivated by the inclusion of the lagged dependent variable in an OLS estimation of the model, that turned out to be significant in the period 2004-2013.

[12] The coefficient on country risk changes when sample size is reduced: starting the estimation in 2005, it is significant again. After the normalization of part of the defaulted debt, EMBI drops sharply; we interpret it as an indicator of financial conditions' volatility, including domestic interest rates.

associated to inflation is positive and significant only in 2004-2013. These two results may be associated to changes in macroeconomic regime: the former may be linked to full financial integration under the currency board, and is consistent with studies that identified country risk as the single most important variable for monetary dynamics during such period (Grubisic and Manteiga, 2000); the latter, in turn, would point toward the differential impact of a period with low inflation –even deflation- and another one with higher levels and persistence of such variable.

*Table 4*

Dependent variable: average explicit (ex-ante) spread of the financial system, AR$
Method: Generalized Method of Moments

| | Sample estimation | | |
|---|---|---|---|
| Regresors | 1996.3-2013.12 | 1996.3-2001.2 | 2004.1-2013.12 |
| Economic activity (y.o y.) | -0.222 *** (0.039) | -0.256 *** (0.050) | -0.201 *** (0.035) |
| Inflation (y.o y.) | - | - | 0.091 ** (0.041) |
| M3 / GDP | -0.636 *** (0.064) | -1.711 *** (0.211) | -0.706 *** (0.118) |
| EMBI Argentina | 0.066 *** (0.015) | 0.462 *** (0.084) | - |
| HHI Loans | 1.308 *** (0.373) | - | - |
| Administration Expenses / Assets | - | - | - |
| Required Liquidity / Deposits | -0.492 *** (0.094) | 0.521 *** (0.169) | -0.432 *** (0.092) |
| Taxes / Asstes | 3.222 *** (0.792) | 2.237 ** (1.101) | 4.034 (0.719) |
| Equity / Assets | 0.764 *** (0.265) | - | 0.608 ** (0.177) |
| ROE | -0.226 *** (0.035) | - | - |
| Non Perfoming Loans (% of Loans) | -0.246 *** (0.054) | -0.147 ** (0.042) | 0.355 *** (0.025) |
| Constant | 0.268 *** (0.043) | 0.337 *** (0.061) | 0.303 *** (0.059) |
| Dummy 2001M3_2002M3 | 0.070 *** (0.014) | - | - |
| Dummy 2002M4_2002M9 | -0.111 *** (0.020) | - | - |
| Dummy 2002M10_2003M12 | 0.095 *** (0.024) | - | - |
| | | | |
| Included observations | 214 | 61 | 120 |
| Mean dependent variable | 0.214 | 0.217 | 0.177 |
| S.D. dependent variable | 0.069 | 0.020 | 0.018 |
| S.E. of regression | 0.020 | 0.009 | 0.009 |
| Instrument rank | 32 | 21 | 21 |
| J-statistic | 18.199 | 10.657 | 13.915 |
| Prob(J-statistic) | 0.509 | 0.713 | 0.380 |

The value in parenthesis denotes the coefficient standard error .
Symbols denote * 10%,** 5% and *** 1% level of significance
Standard errors and covariance matrix computed using HAC weighting matrix
(Barlett kernel, Newey-West bandwidth=5).

The explanation of spread, however, exceeds macroeconomic performance: the estimated model also highlights the importance of financial system variables. These show higher coefficients than macroeconomic variables (note, however, that such coefficients are not, by construction, elasticities,

so estimated effects depend on the units in which the estimation was made). The most "structural" variable of the set, financial system concentration, carries a positive and significant coefficient for the whole sample; but it does not show up in none of the two subperiods. Taxes in terms of assets have a positive and significant impact for the whole sample and both subperiods: an increase of one p.p. in such ration translates into 3.3 more points of explicit spread. Administration expenses are highly collinear with taxes[13],so they did not turn out to be individually significant when included in the regression together with taxes; an alternative specification, including expenses and excluding taxes yielded a positive coefficient, comparable in magnitude to that of taxes. In turn, equity and non performing loans exhibit coefficients with the expected positive sign only during the most recent subperiod (2004-2013): an increase of 1 p.p. in equity implies 0.6 p.p. more spread, and 1 p.p. of non performing loans entails a rise in spread of 0.35 p.p.

The coefficient associated to liquidity requirements is significant, but does not always carry the expected sign: for the whole sample and in 2004-2013, higher requirements mean less spread. We have at least two interpretations for this result: on the one hand, although higher liquidity entails more unremunerated resources (or less profitable than loans), it also reflects –in terms of requirements- relatively cheaper funds for financial institutions. In the Argentine financial system, sight deposits and those with the shortest maturities have a higher requirement than the rest: the effect of cheaper funding from short term deposits may dominate the opportunity cost of liquidity, thereby reducing spread. Alternatively, and in view of the higher correlation between spread and active rates, it may be that more or less liquidity is an indication of financial stress: higher liquidity means less stress and, with it, lower rates and lower spread

Dummy variables introduced to capture crisis episodes are significant as expected. Moreover, we employed different tests that revealed adequate specification in terms of lags, instruments and omitted variables. Model selection contemplated the redundancy or not of each variable considered individually and its contribution to explained variability of average spread in pesos.

Results outlined are generally robust to alternative definitions of liquidity and delinquency, as detailed in the annex. In particular, we tried an alternative definition of liquidity, holdings of bills and notes issued by the Central Bank (LEBAC) in terms of assets; and a variable was included to capture the share and return of other assets. The Central Bank began issuing its own bonds to sterilize the effect of its foreign exchange operations by the time it adopted a managed floating regime in 2002; thus, holdings of LEBAC by financial institutions were included in the regression for the 2004-2013 period only. The coefficient of LEBAC holdings turned out to be negative and significant: as such holdings are a way of keeping "technical" (as opposed to required) liquidity by banks, and that they may increase them when having excess liquidity, and sell them when resources are needed, there is support to the relation between more or less tight conditions in the money market and spread –in line

[13] This was corroborated not only by correlation of both variables, but also by "variance inflation" analysis.

with the sign of the estimated coefficient. As for other assets, estimates were not significant for their share in assets, but for their returns.

The signs of coefficients are also robust to alternative estimation methods: we ran ordinary least squares regressions (see annex III) with dependent variables lagged one period (trying to alleviate, at least partially, potential regressor endogeneity); we found no change of signs with respect to GMM estimation. When lagged spread was tested as omitted variable, it turned out significant during 2004-2013. Thus, GMM estimation allowed us to incorporate both the effect of the lagged dependent variable and the potential endogeneity of regressors.

Finally, we estimated the model with macroeconomic and microeconomic variables separately: the presumption was that the former may be having an impact through the latter in, for instance, expenses, taxes or delinquency. However, the exercise revealed that both types of variables are necessary for estimation, as the complete model shows a higher global goodness-of-fit. If anything, some preliminary evidence suggests that macroeconomic factors could have a higher weight during the currency board period in explaining spread, while financial system variables would share explanation with macroeconomic ones more markedly during 2004-2013: the model estimated through OLS can be reduced to a specification completely based on macroeconomic variables in the first period, but not in the second.

### IV. c. Econometric models: spread by group of banks

The model used in the previous section was also estimated by group of banks (defined by ownership, as in the rest of the paper), so as to ascertain whether any of the findings at the aggregate level may be driven by some particular group. We adapted the definitions of some variables where it made more sense given the level of aggregation: thus, to account for financial depth of each group we used the ratio of deposits in pesos to GDP (instead of pesos M3/GDP); and to detect the possible impact of market power on spread, we included the share of each group in total loans (pesos and dollars), instead of the Hirschman-Herfindahl index. The estimation methodology and macroeconomic variables were the same as in the previous section, and financial indicators were computed for each group. Results are shown in table 5.

For the 2004-2013 period, estimates by group corroborate the differential behaviour of public banks from private ones (whether national or foreign). While both groups of private banks show a countercyclical relation of economic activity to spread, this variable does not seem to be significant for public banks; liquidity, taxes, profitability and the use of own funds show opposite signs in public banks with respect to the other two groups. With the exception of taxes, those variables show signs for public banks that agree with the findings for the whole system –i.e. higher liquidity, profitability and equity entail higher spread. On the contrary, estimated coefficients of private banks imply either inverse relationship of spread with those variables, or lack of significance.

*Table 5*

Dependent variable: explicit (ex-ante) sperad by bank groups
Method: Generalized Method of Moments

| | Public banks | | Private national banks | | Foreign-owned banks | |
|---|---|---|---|---|---|---|
| | 1996.02-2001.02 | 2004.01-2013.12 | 1996.02-2001.02 | 2004.01-2013.12 | 1996.02-2001.02 | 2004.01-2013.12 |
| Economic activity (y.o y.) | -0.164 *** | -0.081 | 0.156 ** | -0.204 *** | -0.161 | -0.204 *** |
| | (0.030) | (0.063) | (0.066) | (0.054) | (0.182) | (0.070) |
| Inflation (y.o y.) | 0.634 *** | 0.025 | 0.149 | 0.106 | -0.905 * | 0.055 |
| | (0.214) | (0.040) | (0.391) | (0.117) | (0.531) | (0.086) |
| Deposits AR$ / GDP | -0.674 | -1.014 *** | -3.825 ** | -0.922 | -5.944 ** | -2.100 *** |
| | (0.528) | (0.329) | (1.785) | (0.687) | (2.435) | (0.655) |
| EMBI Argentina | -0.141 ** | 0.008 | 0.045 | 0.044 *** | 0.263 | 0.002 |
| | (0.055) | (0.011) | (0.206) | (0.015) | (0.418) | (0.019) |
| Loan Shares | -0.025 | 0.194 | 0.103 | 0.537 * | 0.707 *** | -0.615 *** |
| | (0.157) | (0.177) | (0.161) | (0.300) | (0.206) | (0.195) |
| Administration Expenses / Assets | -2.101 | 3.594 ** | 5.573 *** | -1.337 | 1.689 | 2.468 |
| | (1.613) | (1.451) | (1.511) | (1.318) | (2.644) | (1.728) |
| Total Liquidity / Assets | -0.723 | 0.425 *** | 2.418 *** | -0.457 | -1.232 | -1.057 *** |
| | (1.035) | (0.125) | (0.849) | (0.570) | (2.068) | (1.728) |
| Taxes / Assets | 10.969 *** | -2.105 ** | -13.207 *** | 4.381 *** | 11.887 ** | 2.007 *** |
| | (3.440) | (0.834) | (2.596) | (0.814) | (4.415) | (0.434) |
| Equity / Assets | -0.014 | 2.938 *** | -0.051 | -1.417 *** | -2.342 | -1.574 ** |
| | (0.138) | (0.666) | (0.232) | (0.427) | (1.896) | (0.623) |
| ROE | -0.118 | 0.164 ** | -0.156 ** | -0.406 *** | 0.221 | -0.066 |
| | (0.079) | (0.077) | (0.065) | (0.136) | (0.199) | (0.051) |
| Non Performing Loans (% of Loans) | 0.355 *** | 0.531 *** | 1.052 *** | -0.451 * | -0.642 | 0.305 *** |
| | (0.123) | (0.152) | (0.255) | (0.243) | (0.759) | (0.071) |
| Constant | 0.283 *** | -0.289 *** | 0.008 | 0.363 | 0.171 | 0.618 *** |
| | (0.045) | (0.093) | (0.080) | (0.132) | (0.191) | (0.103) |
| Included observations | 61 | 120 | 61 | 120 | 61 | 120 |
| Mean dependent variable | 0.302 | 0.178 | 0.244 | 0.172 | 0.168 | 0.160 |
| S. D. dependent variable | 0.014 | 0.022 | 0.020 | 0.020 | 0.021 | 0.022 |
| S.E. of regression | 0.007 | 0.009 | 0.010 | 0.010 | 0.015 | 0.011 |
| Instrument rank | 21 | 21 | 21 | 21 | 21 | 21 |
| J-statistic | 11.206 | 9.025 | 11.230 | 10.029 | 7.051 | 10.229 |
| Prob(J-statistic) | 0.262 | 0.435 | 0.260 | 0.348 | 0.632 | 0.332 |

The value in parenthesis denotes the coefficient standard error .
Symbols denote * 10%,** 5% and *** 1% level of significance
Standard errors and covariance matrix computed using HAC weighting matrix ( Barlett kernel, Newey-West bandwidth=4)

In turn, in 2004-2013 financial depth is negatively associated to spread in the three bank groups, just as it was at the (average) system level –still, the coefficient is not significant for domestic-owned banks. Inflation has a positive but insignificant coefficient for the three groups, something that contrasts with a positive and significant sign for the system. Likewise, country risk is estimated to be directly related to spread for all groups, but the relation is significant only in the case of national banks.

Finally, some variables show different signs and/or significance across all three groups. Market share of loans is positive and significant for private national banks, negative and significant for foreign ones, but is insignificant for public banks. Further work should be done to establish whether this actually is supportive evidence for market power of national banks. Administration expenses have a positive estimated coefficient in public banks, but insignificant coefficients in private banks, either positive (foreign) or negative (national). It is worth remembering that collinearity between taxes, administration expenses and prices may explain some of these contradictory relationships.

In 1996-2001 it is even more difficult to characterize behaviour by groups. Financial depth also presents an inverse relationship with spread, but it is not significant in the case of public banks. The

coefficient on activity is negative for public banks, positive for domestic banks but insignificant (negative) for foreign ones. Prices are directly related to spread in public banks, but inversely so in foreign owned banks –something which contrasts with the absence of this variable at the system level. Country risk and market share also bear different signs and significance among groups, in a way not straightforward to interpret. In general, banking indicators (profitability, liquidity, leverage) seem to have lower relevance during the currency board period than in 2004-2013; it could be hypothesized that macroeconomic factors and country risk, in an economy fully integrated to financial flows, could be relatively more important determinants of spread than group-specific indicators, which gain explanatory power during the last decade or so.

The most important caveat that applies to data in 1996-2001 is that during that period the system went through a series of very important reforms, that included changes in equity ownership: privatization of provincial banks and acquisition of some of the biggest institutions by foreign banks were two distinct features, at the same time that the number of banks decreased notably, especially following the impact of the "Tequila" crisis (1994-1995). So a sizable amount of the effects among groups could only be due to changes in their composition, rather than in behaviour by financial institutions.

## V. Concluding remarks

Interest rate spread is an important variable to monitor, both in terms of financial stability and of money and credit market conditions; this is even more so in an economy like Argentina, where financial development remains a challenge. We describe and characterize intermediation spread in the Argentine financial system during the last two decades, using two definitions –explicit and implicit-, looking for its determinants across two different macroeconomic regimes.

Descriptive analysis shows that, in recent years and even with a slightly upward trend following the international financial crisis, explicit spreads in Argentine pesos remain below those recorded during most of the convertibility regime. In an international comparison, local spreads tend to be in line with the regional average: below those of other Latin American economies of comparable size, but above those of more developed banking systems.

Explicit spreads change over time according to credit line (overdrafts, discounts, mortgages, pledges and personal loans), type of bank (government owned –public-, private local or foreign owned) and credit recipient (families and companies and –within this group, small and medium sized companies). In 2004-2013, spreads become less volatile among different lines and groups of banks. Higher spreads correspond to overdrafts and personal loans. And government owned banks show a differential behaviour vis-à-vis private owned ones, especially in 2004-2013; evidence also suggests that public banks act countercyclically. Among credit recipients, only families and SMEs (in two lines: overdrafts and credit cards) show a systematically higher spread.

Spreads appear more correlated to lending rates than to deposit rates; such correlation changes over time, being somewhat lower in recent years for the financial system average. Once again, public banks seem to lie behind such evolution: in 2004-2013, they show the highest fall in the correlation between spread and lending rates, and even show a negative correlation between spread and deposit rates; their spread is also negatively correlated with other groups' active rates.

Granger causality analysis suggest that, in general, funding costs anticipate active rates, with limited feedback from the latter to the former. In general, for 2004-2013, changes in economic and financial conditions impact first on money market rates, whose volatility is passed through credit rates only later.

Looking for direct determinants of spread, we decompose implicit spreads (based on balance sheet data of income and expenses related to credits and deposits) of banking operations between 1995 and 2013: this allows us to discriminate the relative importance of different balance sheet items. Even it is an accounting analysis, which does not establish behavioral relations by itself, it suggests a considerable role for taxes, administrative expenses and liquidity, as well as changes in the structure of the banking market over time.

Finally, we estimate econometric models of spread in Argentine pesos for the whole financial system between 1995 and 2013, considering the whole period and two subperiods (1996-2001; 2004-2013): results indicate the significance of both microeconomic and macroeconomic variables for spread determination; GMM estimation allows us to account for both dynamics and potential endogeneity of regressors. Output growth and monetization have significant negative effects on spread, detected throughout the whole sampling period; this underscores the importance of scale of financial intermediation in spread determination, in line with previous works' findings. One percentage point (p.p.) more of broad money to GDP ratio leads to 0.6 p.p. lower spread for the whole sample (an estimate which rises to 1.7 p.p. in 1996-2001); and one point more of y-o-y output growth decreases spread by 0.25 p.p. for the whole sample. Country risk and inflation, in turn, appear to be significant only in subperiods (the former in 1996-2001, the latter in 2004-2013), suggesting changes in the macroeconomic context. Thus, changes in international financial conditions appeared to be an important determinant only when the economy was fully integrated to international financial markets.

Econometric estimates confirm that an explanation of intermediation spreads may not be fully reduced to the macroeconomic environment: financial market variables have significant effects both statistically and economically. In particular, the share of taxes and administration expenses in total assets of the financial system show the highest estimated coefficients: one p.p. more of taxes-to-assets translates into three p.p. more explicit spread. In 2004-2013, non performing loans and the use of banks' own resources for funding also act as expected –increasing spread. Liquidity appears to have a counterintuitive impact –higher liquidity, lower spread. This suggests either the effect of relatively cheaper funding on spread, or liquidity as an indicator of more or less "stressed" financial conditions.

Models were also estimated by groups of banks (public and private-owned), confirming differential performance of government owned banks in 2004-2013.

We plan to enrich the analysis by using panel data techniques, fully exploiting the granularity of our database: this will be the project's next step, that we aim to present at the BIS/CCA conference. Estimates so far, however, already point to the relevance of both macroeconomic and microeconomic variables for the explanation of spread: even though the macroeconomic environment influences banking system activity, and in different ways according to policies implemented, banking system features also determine spread, and the latter cannot be reduced to the former. Analysts and policymakers should assess and act on both types of variables in order to understand and influence the evolution of interest rate spreads.

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**Annex I: Variable definitions and sources**

**EMAE**. Monthly estimator of economic activity, year-over-year (y-o-y) change (base year of series: 1993). Source: Instituto Nacional de Estadística y Censos (INDEC).

**Inflation:** y-o-y change of consumer price index, Greater Buenos Aires (IPC-GBA); y-o-y change of composite index (wages and wholesale prices). Source: INDEC.

**M3 / GDP**: monetary aggregate M3 in AR pesos (currency outside banks, savings accounts, current accounts, fixed time deposits), nominal value. Source: BCRA. GDP of Argentina, current prices, base year 1993. Source: INDEC.

**EMBI+Argentina**. Source: JP Morgan.

**HHI, Loans.** Herfindahl-Hirschman index. Loan concentration in existing institutions. Source: authors' calculation based on BCRA data.

**Administration expenses over assets:** 12-month cumulative flow of administration expenses over 12-month moving average stock of total assets, finacial system. Source: financial institutions' balance sheets, as compiled by the *Superintendencia de Entidades Financieras y Cambiarias* (SEFyC), BCRA.

**Taxes over assets:** 12-month cumulative flow of assets over 12-month moving average stock of total assets, financial system. Source: financial institutions' balance sheets as compiled by SEFyC – BCRA.

**Liquidity over assets:** 12-month moving average stock of currency held by financial institutions plus current account deposits at BCRA, over 12-month moving average stock of assets, financial system. Source: SISCEN - BCRA.

**Liquidity requirements:** percentage of deposits and other liabilities subject to regulation, requirement adjusted by holdings of bills and coins and net of franchises (AR$ and US$), financial system. Source: SISCEN - BCRA

**ROE**: return on equity, financial system. Cumulative 12-month profit/loss over 12-month moving average equity. Source: financial institutions' balance sheets as compiled by SEFyC – BCRA.

**Non performing loans**. Non performing loans (as defined by SEFyC) of public and private sector over total loans, financial system. Source: financial institutions' balance sheets as compiled by SEFyC – BCRA.

**Annex II: robustness checks – GMM estimation**

In what follows, we review results for alternative specifications of GMM econometric models.

For the whole estimation period (1996-2013), and under alternative specifications of liquidity and delinquency, some variables show the expected effects: growth and monetization impact negatively on spread; in turn, country risk, banking system concentration and equity to assets increase spread. Certain variables carry the expected sign but are not significant in all models: inflation and administration expenses are positively linked to spread. Finally, certain determinants are not always significant, but when they are they show a sign opposite to expectation: liquidity (measured both as holdings or as regulatory requirement) would be associated to lower spread, while taxes and delinquency would show an inverse relationship (the latter two variables, however, are significant only in the minority of models). Dummy variables aimed at capturing crisis episodes are all significant.

Regarding the subsample 1996-2001 (currency board regime), monetization, country risk and taxes show the expected signs in all specifications: the former reduces spread, the latter increase it. Surprisingly, administration expenses carry a negative coefficient on spread in all estimations –but, as noted elsewhere, this is very likely due to collinearity with taxes. Economic growth reduces spread in most estimations, and liquidity increases it in two of them. Finally, non performing loans impact differently from expected, while inflation is not significant in any estimation of this subperiod.

For the period starting in 2004 (of more interest to assess the current situation), the level of activity and monetization show an inverse relationship with spread, under all specifications. Non performing loans also impact spread, but –as expected- by increasing it. Inflation acts in the same direction, although it is only significant in a couple of models; something similar happens with country risk, banking concentration and administrative expenses. Liquidity in any of its definitions has an inverse association to spread, contrary to expectation; and both equity and taxes have different signs depending on the model employed.

With the whole set of results, the impact of monetization and economic activity is unambiguous over time, decreasing spread. In turn, certain determinants tend to be more associated to a particular period: country risk (during the currency board regime) and inflation (from 2004 onwards). Non performing loans are also present over time, but their sign changes from convertibility (negative) to post-convertibility (positive). Administration expenses and liquidity are not always significant and their sign changes according to specification. Finally, some evidence suggests that macroeconomic factors could carry more weight during the currency board period in explaining spread, while financial market variables have a more “shared” role with macroeconomic ones during 2004-2013.

**1996.3- 2012.11**

| | Regression 1 | Regression 2 | Regression 3 | Regression 4 |
|---|---|---|---|---|
| Δ_economic activity (y-o-y) | **neg** | **neg** | **neg** | **neg** |
| Δ_prices (y-o-y) | **pos** | **pos** | **-** | **pos** |
| M3 / GDP | **neg** | **neg** | **neg** | **neg** |
| EMBI (Arg) | **pos** | **pos** | **pos** | **pos** |
| HHI (credit) | **pos** | **pos** | **pos** | **pos** |
| Administration expenses / assets | **-** | **pos** | **pos** | **-** |
| Liquidity / assets | **neg** | | | **neg** |
| Liquidity requirements / deposits | | **neg** | **neg** | |
| Taxes / assets | **-** | **neg** | **-** | **-** |
| Equity / assets | **pos** | **pos** | **pos** | **pos** |
| Return on equity | **neg** | **-** | **neg** | **neg** |
| Delinquency charges / assets | **-** | **-** | | |
| Non performing loans / credit | | | **neg** | **-** |
| D2001M3_2002M3 | **pos** | **pos** | **pos** | **pos** |
| D2002M4_2002M9 | **neg** | **neg** | **neg** | **neg** |
| D2002M10_2003M12 | **pos** | **pos** | **pos** | **pos** |

**1996.3- 2001.3**

| | Regression 1 | Regression 2 | Regression 3 | Regression 4 |
|---|---|---|---|---|
| Δ_economic activity (y-o-y) | **neg** | **-** | **neg** | **neg** |
| Δ_prices (y-o-y) | **-** | **-** | **-** | **-** |
| M3 / GDP | **neg** | **neg** | **neg** | **neg** |
| EMBI (Arg) | **pos** | **pos** | **pos** | **pos** |
| HHI (credit) | **-** | **-** | **-** | **-** |
| Administration expenses / assets | **neg** | **neg** | **neg** | **neg** |
| Liquidity / assets | **-** | | | **-** |
| Liquidity requirements / deposits | | **pos** | **pos** | |
| Taxes / assets | **pos** | **pos** | **pos** | **pos** |
| Equity / assets | **neg** | **-** | **-** | **neg** |
| Return on equity | **-** | **-** | **-** | **-** |
| Delinquency charges / assets | **neg** | **neg** | | |
| Non performing loans / credit | | | **neg** | **neg** |

| | 2004.1-2012.11 | | | |
|---|---|---|---|---|
| | Regression 1 | Regression 2 | Regression 3 | Regression 4 |
| Δ_economic activity (y-o-y) | **neg** | **neg** | **neg** | **neg** |
| Δ_prices (y-o-y) | **-** | **-** | **pos** | **pos** |
| M3 / GDP | **neg** | **neg** | **neg** | **neg** |
| EMBI (Arg) | **pos** | **pos** | **-** | **-** |
| HHI (credit) | **pos** | **pos** | **-** | **-** |
| Administration expenses / assets | **pos** | **pos** | **-** | **-** |
| Liquidity / assets | **neg** | | | **neg** |
| Liquidity requirements / deposits | | **neg** | **neg** | |
| Taxes / assets | **neg** | **neg** | **pos** | **pos** |
| Equity / assets | **neg** | **-** | **pos** | **-** |
| Return on equity | **-** | **-** | **-** | **-** |
| Delinquency charges / assets | **pos** | **pos** | | |
| Non performing loans / credit | | | **pos** | **pos** |

## Annex III: Ordinary least squares estimation

Dependent variable: average explicit (ex-ante) spread of the financial system, AR$
Method: Ordinary Least Squares

| Regresors | 2004.1-2013.12 |
|---|---|
| Economic activity (y.o y.) | -0.216 *** |
| | (0.033) |
| Inflation (y.o y.) | 0.062 |
| | (0.039) |
| M3 / GDP(-1) | -0.643 *** |
| | (0.119) |
| EMBI Argentina | - |
| HHI Loans(-1) | -0.621 ** |
| | (0.301) |
| Administration Expenses / Assets(-1) | - |
| Required Liquidity / Deposits(-1) | -0.322 *** |
| | (0.078) |
| Taxes / Asstes(-1) | 4.995 *** |
| | (1.125) |
| Equity / Assets(-1) | 0.386 |
| | (0.243) |
| ROE(-1) | - |
| Non Perfoming Loans (% of Loans)(-1) | 0.345 *** |
| | (0.038) |
| Constant | 0.330 *** |
| | (0.069) |
| Included observations | 120 |
| Mean dependent variable | 0.177 |
| S.D. dependent variable | 0.018 |
| S.E. of regression | 0.009 |
| $R_2$ adjusted | 0.731 |
| Fstatistic | 41.462 |
| Prob(F statistic) | 0.000 |

The value in parenthesis denotes the coefficient standard error .
Symbols denote * 10%,** 5% and *** 1% level of significance
White heteroskedasticity-consistent standard errors and covariance