DEPOSITORS' DISCIPLINE IN URUGUAYAN BANKS

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ABSTRACT

This paper uses panel data of Uruguayan private owned banks to investigate the depositors' reaction to changes in banks' fundamentals in three sub-periods: pre-crisis (from January 2000 to December 2001); crisis (January 2002 to July 2002); and post-crisis (August 2002 to December 2004). We test for depositors' discipline through the growth of deposits and through changes in the interest rates. We extend the analysis by testing if depositors discipline banks by shortening the maturity of time deposits. Taking into account that depositors' discipline does not only involve depositors' reaction but also the subsequent bank's response, we also look into the significance and velocity of mean reversion in the deposits' interest rates. We find strong evidence that supports the hypothesis that depositors discipline riskier banks by withdrawing their deposits and weaker evidence on the hypothesis that depositors require higher interest rates and reduce the maturity of their deposits as disciplining actions. Additionally, we find that banks react to depositors' actions -depositors' discipline is effective- specifically in the post-crisis period.

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Market discipline (hereafter MD) in banking is commonly interpreted as a situation in which bank related agents (depositors, bondholders, stockholders and rating agencies for example) face costs that are positively related to bank risk (understood as the bank's expected capacity to honor its claims) and react on the basis of these costs (Berger, 1991). Thus MD hypothesis, and more precisely depositors' discipline one, assumes that depositors distinguish riskier banks and react in consequence. Furthermore, MD does not only involve depositors' reaction but also the subsequent response of banks. It cannot be ignored that the main purpose of MD is achieved if banks act conservatively to limit their risk, and this target can only be attainable if banks react to depositors' request for high interest rates or to consecutive withdrawals by reducing their risk.

Theoretical literature on bank runs is divided between those who stress that depositors may run a perfectly good bank when a bad one in the same system is attacked (and then the bank run is considered a self-fulfilling prophesy) and those who think that depositors can discriminate between good and bad banks (and then the bank run is explained by bank fundamentals).

Within the first group, Diamond and Dybvig (1983) present a model in which bank runs are conceived as random events originated in shifts in agents' beliefs. Thus, panics are not necessarily related to events in the real economy. In fact, bank runs may be a self-fulfilling equilibrium -in a model with multiple equilibria- caused by any event capable of substantially modifying expectations. In order to explain how a run situation is reached, some models explicitly introduce information asymmetries between banks and depositors. Since depositors cannot perfectly monitor bank performance, they use imperfect signals of it to adequate their perceptions. These models attempt to identify how agents revise their perceptions about the solvency of banks. In this context, some piece of news (e.g. withdrawals in a bank due to genuine liquidity needs) may be interpreted as a "bad" signal (i.e. that the bank is in trouble) and hence cause a massive withdrawal of deposits. That would generate situations where solvent banks close, while other banks survive even though they would not with complete information.

On the other hand, the solvency theory states that crisis in the financial sector are a consequence of real shocks and the procyclical behavior of credit (Kindleberger, 1978). In the upturn of the cycle, banks tend to strongly extend credit to the real sector and to become highly leveraged. Then,

when real shocks get the economy into the downturn of the cycle, debtors' capability to honor their loans get dramatically reduced. If banks do not have enough reserves to confront this situation, insolvency problems occur; theses are the causes of panics. In this context, where bank runs are explained by bank fundamentals, there is a strong argument for providing depositors with adequate bank fundamentals' information.

The initiatives for greater transparency and accessible information have been promoted not only by academic bodies (particularly those who think that banks' creditors are able to discriminate between good and bad banks), but also by policy initiatives (such as the ones of the Basle Committee on Banking Supervision). To be more precise, the New Basle Capital Accord has set aside one of their three "Pillars" for market discipline; as stated in Bank for International Settlements (2003), "The purpose of Pillar 3 - market discipline is to complement the minimum capital requirements (Pillar 1) and the supervisory review process (Pillar 2)". (Bank for International Settlements, 2003, pp. 154)

The rationale for giving such an important role to MD is based on the existence of many types of regulatory and supervisory failures. For example, supervisory bodies may not act appropriately on the information they possess because they may manage their own, private, agendas or because they may not have legal protection. Moreover, even if supervisors have appropriate power and legal protection, there is an unavoidable informational asymmetry between them and the industry. Then, MD appears as a strategic complement to bank regulation and supervision and, as a consequence, there is an additional motivation to look into the existence of such kind of behavior as well as the factors that encourage it.

Empirical literature has primarily focused on the bank depositors' response to changes in bank fundamentals as well as on its relationships with the design of the financial safety net. As stated in Inter American Development Bank (2005), researchers have found a positive relationship between interest rate and deposit withdrawals and risk for most developed countries. That permits them to infer that depositors may exert pressure on banks to avoid excessive risk-taking.

Maechler and McDill (2003) confirm the presence of depositors' discipline in the U.S. banking system since uninsured depositors monitor their banks and discipline bad banks behavior by withdrawing their uninsured

deposits and demanding a higher interest rate. In addition to its results, what is indeed interesting of their work is the consideration of the price-quantities reversal causality. They suggest that when depositors discipline a bad bank by withdrawing their uninsured deposits the bank may raise its interest rate to contain the deposits drain. Then, in order to eliminate potential parameter inconsistency arising from endogeneity between price and quantity movements they use the Arellano and Bond (1991) generalized-method-of-moments (GMM) estimator for dynamic panel data.

Many country-specific studies in developing countries, specially in Latin America, have also used the GMM estimator. For example, McCandless *et al.* (2003) use it in order to determine if the Argentinean banking crisis of 2001 is best explained by a self-fulfilling prophesy or by bank fundamentals. Their main conclusion is that bank fundamentals (risk proxies) turn out to be statistically significant and with their expected sign which supports the bank fundamental (depositors' discipline) hypothesis. However, they also argue that runs in 2001 were more systemic in nature.

Both Maechler and McDill (2003) and McCandless *et al.* (2003) have used the same estimator and concentrated in the same dependent variable, the deposits' quantity. However, the former work refers to the analysis on a developed economy in "tranquil" times while the latter one analyses a developing economy in "crisis" times.

Even if it is possible to identify bank fundamentals as explanatory variables for the deposits behavior in distress times, it should be taken into account that systemic factors could overshadow bank fundamental and limit the potential for depositors' discipline in environments where systemic risk is likely to predominate. On this respect and for the Argentinean case on the Tequila crisis period, D'Amato *et al*. (1997) find that bank fundamentals are extremely important in driving the dynamics of deposits but that both macroeconomic variables and explicit "contagion" also are. Additionally, Levy-Yeyati *et al.* (2004a) argue that in emerging economies the analysis of MD should take into account the importance of institutional and systemic factors and Levy-Yeyati *et al.* (2004b) use evidence of 2001-2002 bank runs in Argentina and Uruguay and conclude that MD is indeed quite robust once systemic risk is factored in.

There are relatively few cross-country studies on MD. Martinez-Peria and Schmukler (2001), which is especially relevant to the Latin

American case, focus on the experiences of Argentina, Chile and Mexico during the 1980s and 1990s and empirically investigate the interaction between MD and deposit insurance and the impact of banking crises on MD. They find that depositors discipline banks by withdrawing deposits and by requiring higher interest rates and that deposit insurance systems does not appear to diminish the extend of MD. Moreover, they argue that aggregate shocks affect deposits and interest rates, regardless of bank fundamentals, and that the extend of MD tends to be more limited during crisis.

The majority of the empirical literature on MD has centered on how depositors react to changes in bank risk. However, the main motivation of MD is to induce banks to act conservatively and limit risk. Therefore, it should be analyzed whether and how banks respond to the actions of depositors. Barajas and Steiner (2000) and Calomiris and Powell (2001) have analyzed this issue for Colombia and Argentina respectively. Using different econometric strategies they find evidence that support the MD hypothesis: depositors discipline bad banks by withdrawing deposits and by claiming higher interest rates and such discipline is effective since banks react consequently to it. Galindo *et al.* (2005) present a true test on MD. Using a cross-country data set and vector autoregressive techniques they show that depositors tend to discipline banks when bank fundamentals (capital to assets ratio) weaken and that banks react by increasing their capital to assets ratio.

The literature referred to MD in the Uruguayan banking system is not copious. Levy-Yeyati *et al.* (2004b) analyze the recent bank run in Uruguay during 2001 and 2002 and find that MD is indeed quite robust once systemic risk is incorporated into the analysis. Vallcorba (2003) also analyze the Uruguayan crisis by studying the reaction on the interest rates (prices) instead of the deposits reaction (quantities) and by taking into account the inherent differences between banks. Results reveal that even if the risk of all banks raises, depositors differentiate between them, which evidences depositors' discipline.

In this paper we investigate the existence and effectiveness of depositors' discipline in the Uruguayan banking sector. In order to do so, we have constructed a panel data set which covers bank specific variables, as well as macro (common to all banks) variables, from January 2000 to December 2004. Such period of time is divided, given the particular path of

the Uruguayan banking sector, into three sub-periods: a crisis (distress time) period from January 2002 to July 2002 that is preceded and followed by two relatively "tranquil" sub-periods, the pre-crisis one (January 2000 to December 2001) and the post-crisis one (August 2002 to December 2004).

Given the particularities of our data set and of the dependent variables we use the Arellano and Bond (1991) GMM estimator for dynamic panel data. This methodology not only allows us to control for the potential endogeneity between the dependent variable and the independent ones, but also permit us to control for bank specific non-observable factors and to take into account the dynamic (inertial) nature of some dependent variables.

Specifically, we look into the existence of deposit discipline through three channels. On one hand, we analyze the depositors reaction to bank fundamentals through the most frequent mechanisms that appear in empirical literature: the deposits (quantities) reaction and the interest rates (prices) reaction. That is, we analyze the effect of the change in bank fundamentals proxies on the change of the quantity of time and total deposits and on the price of such deposits. On the other hand, we test the existence of another channel that depositors could use, maybe simultaneously to the previous ones, and for which we have not found previous documentation. We call that channel *maturity reaction* and is based in the fact that depositors could reduce the maturity of their time deposits as a disciplining instrument. We also investigate the effectiveness of depositors' discipline in Uruguay through the mean reversion test proposed by Calomiris and Powell (2001). This indirect test assumes that if banks are forced to increase their interest rates due to depositors' actions and they feel disciplined (if depositors discipline is effective), banks will reduce their risk-taking and consequently their interest rates will revert to their means.

The paper has the following structure. In the next section we present a brief description of the Uruguayan economy and particularly of the Uruguayan banking sector during the period of analysis. Such description helps to identify and support the sub-periods in which the analysis is divided. In section II the data and variables are presented and some characteristics of the data as the coverage and delay to become public information are discussed. Section III presents the econometric methodology and the results of the empirical analysis. This section is divided in four sub-sections in order to consecutively analyze the deposit reaction, the interest rate reaction,

the maturity reaction and the subsequent banks' response. Finally, section IV concludes.

I. Uruguayan Economy and Banking Sector

A. The Uruguayan Economy

During 1990-98 Uruguay enjoyed relatively high rates of growth, averaging 3.9 percent a year, mostly driven by consumption. Regional integration fuelled a significant expansion of trade with neighbor countries. An exchange rate-based stabilization plan reduced inflation from over 130 percent to close 10 percent. However, important structural weaknesses remained (such as an oversized public sector), and new vulnerabilities emerged, including increasing financial dollarization, currency overvaluation, and growing dependence on the region.

In 1999, after all these consecutive years of real GDP growth, Uruguay's economy plunged into recession; real GDP decreased by 2.8 percent. A number of international and domestic factors explained this reversal of fortune: the Brazilian devaluation and the consequent erosion of competitiveness of Uruguayan exports to Brazil; a sharp recession in Argentina, a key trade partner, with adverse consequences in external demand for Uruguayan goods and services; the decline in world prices for many of Uruguay's commodity exports; the appreciation of the U.S. dollar to which the Uruguayan peso was linked; the increase in international interest rates; a severe drought that had a sharp negative impact on the agricultural sector; and the contraction of public expense, precisely in public investment, with a negative impact on the activity level and the employment of several sectors such as construction, industry and services. The impact of these shocks on the domestic economy was compounded by the structural weaknesses that had remained unaddressed during the period of solid economic performance.

Many of these adverse conditions (the strong dollar, the recession in Argentina, and high international interest rates) continued throughout 2000-2001. As a result, GDP declined by 1.4 percent in 2000 and by 3.4 percent in 2001. During this period, public sector finances also deteriorated considerably, given the adverse effect that the recession had on public sector revenues. The consolidated public sector deficit reached 3.9 percent

of GDP in 2001. At the same time, the continued appreciation of the dollar cast doubts on the sustainability of the prevailing exchange rate regime, and the authorities were forced to adjust the rate of devaluation implied by the crawling peg from 0.6 to 1.2 percent per month.

In 2002, real GDP contracted further by 10.8 percent as the country experienced a severe financial crisis that will be addressed in the next subsection. The impact of external shocks affecting Uruguay during 1998-2002 were magnified by growing internal disequilibria, particularly the changing structure of bank balance sheets as a result of the large inflows of non-resident deposits and the currency mismatch of banks' borrowers.

The crisis addressed above wiped out most of the per capita GDP gains achieved during the 1990s, and led to a significant increase in poverty. Public debt dynamics also deteriorated significantly, but were addressed in a comprehensive debt exchange in May 2003. In early 2003, activity bottomed out and the economy has been recovering gradually since then.

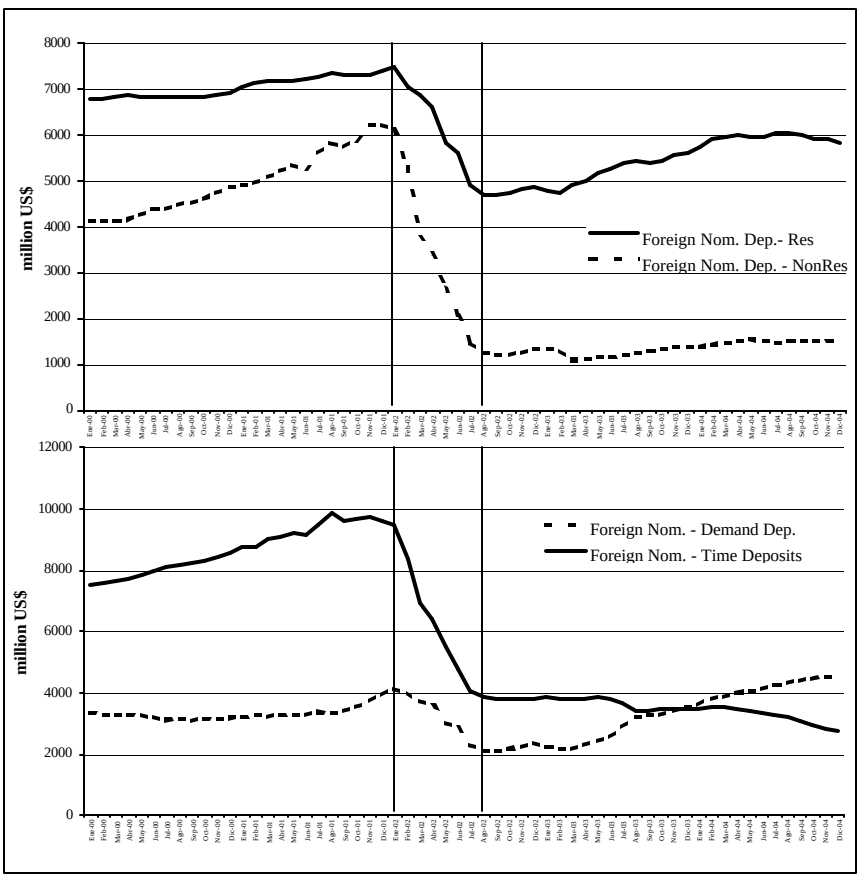
B. The Uruguayan Banking Sector

In what respects to the banking sector, it was not immune to the general economy problems beginning in 1999. Some private banks accumulated large exposures to Argentina. At the same time, while non-resident deposits rose sharply, the regulatory framework did not establish stringent liquidity requirements. The public sector banks' balance sheets weakened by high non-performing loan ratios and quasi-fiscal activities, accommodated by regulatory forbearance. Persistent fiscal deficits contributed to substantial public sector borrowing requirements and a rising debt burden, increasing dependence on capital market access. The high degree of dollarization of bank deposits seriously limited the lender-of-last-resort capacity of the Central Bank, and large currency mismatches in private and public sector balance sheets constrained the scope for exchange rate flexibility.

Despite the recession and all the adverse shocks experienced by Uruguay, confidence in the country's banking system was not undermined until 2001. In fact, throughout that year total deposits increased by 11.6 percent. In particular, non-residents' U.S. dollar deposits (which in 2001 represented almost 40 percent of all deposits) grew by 28 percent (1.342 million U$S), while residents' increased by 7 percent (484 million U$S).

The significant growth in deposits from non-residents was intimately linked to events in Argentina. As the crisis in that country unfolded, Argentine depositors fled to Uruguay, a country traditionally perceived as a regional safe haven, in part due to the presence of foreign banks and the implicit and unrestricted government deposit guarantee.

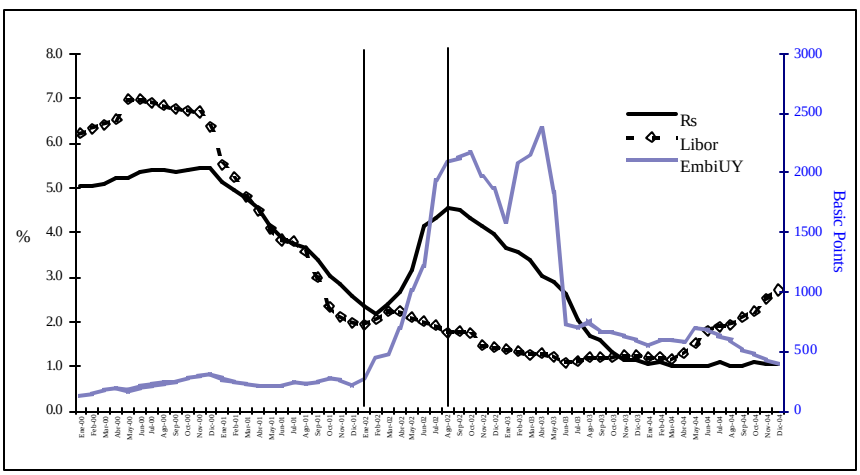
Graph 1 – Foreign Denominated Deposits



The "good" Argentine contagion towards Uruguay turned "bad" after December 2001 when authorities in that country froze and pesified local deposits (Vallcorba, 2003). Cash-strapped Argentine depositors began to withdraw their funds from Uruguay's banking system. The run on deposits rapidly extended to resident depositors after problems arose in two large

private banks with strong links to Argentina: Banco Galicia Uruguay and Banco Comercial. Between December 2001 and January 2002, these banks lost a combined total of 564 million dollars, but it was not until February 2002, when Banco Galicia Uruguay was suspended, that deposits of non-residents strongly modified its growth path (until then, there was a "flight to quality" of the depositors that partially compensated the outflow of deposits from those banks). As it was mentioned before, the government suspended the operations of Banco Galicia Uruguay, a bank that dealt primarily with non-residents, but kept open and helped capitalize Banco Comercial, the private bank with the largest branch network in the country that served mostly domestic depositors. The differences in how the government dealt with these two banks in trouble increased non-residents' distrust in the Uruguayan banking system and helped to fuel a generalized run.

Graph 2 – Interest Rate and Country Risk



Uruguay's sovereign debt rating suffered successive downgrades, and access to foreign capital markets was lost. Following Uruguay's loss of the investment grade, the spread on sovereign bonds as measured by the Uruguay's Emerging Market Bond Index (*EmbiUY*) jumped from less than 300 to almost 2,000 basis points by July 2002. This worsened the country's fiscal problems and the lack of resources to forestall the liquidity run on banks that by this time was generalized. The run, in turn, reduced Central Bank's international reserves as banks withdrew from their dollar liquidity to meet deposit withdrawals, fuelling doubts regarding the

sustainability of the exchange rate regime. On June 19, 2002, the Central Bank abandoned the crawling peg system and allowed the peso to float. The depreciation of the peso had the expected negative impact on the solvency of many banks, as it accelerated the deterioration in the quality of their dollar denominated loans, already underway due to the economic downturn. A vicious circle thus ensued, with the run on deposits, the loss of Central Bank's reserves, and the worsening fiscal accounts feeding on each other to create the biggest crisis Uruguay faced in recent history. Between January 2002 and July 2002, dollar time deposits in Uruguay fell by almost 53 percent and no bank was exempt from the run. Deposit withdrawals throughout July 2002 also reflected the resignation of the minister of economy on July 22.

A package of fiscal, monetary, and banking reform measures were adopted in early August 2002, after a four day bank holiday declared on July 30, 2002, which helped to stabilize the situation together with large financial support from International Financial Institutions. On August 4, 2002, a law created a special purpose fund (Fund for the Stabilization of the Banking System, or FESB in Spanish) to provide full backing for dollar demand deposits at state-owned banks and those financial institutions that had been suspended. The same law extended the maturities of all dollar time deposits held at state-owned banks. In addition to that, four weak banks were closed. An amendment to this law was approved in December 2002 with the purpose of further strengthening the banking system. This amendment also created the deposit insurance agency, which was not explicit until this moment, and unified the good assets of the closed banks in a new commercial bank that begun to operate in March, 2003[1] . Meanwhile, the supervisor (the Superintendence of Banks of the Central Bank of Uruguay) implemented gradual changes on the disclosure of relevant information; the aim has been to provide a wider set of information about banks' balance sheets with shorter delays.

After this package was applied the run ended and the Uruguayan banking system began to stabilize. The interest rate on foreign denominated deposits, which had risen during the crisis, tended to decrease and the generalized deposit withdrawl almost ended and begun to revert slowly.

1 Even if the deposit insurance agency has been approved by law and is in process of implementation, it is not yet operative.

Two particularities could be highlighted on this process: non-residents' foreign denominated deposits rose more slowly than residents' ones and demand deposits augmented while time deposits fell.

II. Data and Variables

To conduct our analysis on depositors' discipline we have constructed a panel data set which contains monthly data for all individual banks and cooperatives[2] from January 1998 to December 2004. Such database contains detailed data on peso denominated and dollar denominated deposits: quantities and prices (interest rate), by range of maturity in the case of time deposits. In addition to that, other bank specific variables and macro – the same value for all banks in any given month– variables have been included. Data has been controlled for mergers and acquisitions since these processes cause a sudden change in banks' balance sheet information. The criterion adopted was to consider the resulting bank as a new one in our sample after the merger; the former institutions are therefore eliminated.

Despite the coverage of the data base, which surely will permit worthy analysis in the future, we restrict our attention to the information on private banks and cooperatives from January 2000 to December 2004. That is because (i) the information on the state-owned banks does not cover all the sample; (ii) such institutions have particularities, as their high market share (approximately 40 percent), that could distort the analysis; and (iii) the relevant information on banks' health of public domain before the year 2000 was considered not enough to permit depositors to differentiate between "healthy" and "ill" banks[3]. Additionally, we only concentrate in foreign denominated deposits because they represent approximately the 90 percent of total deposits in Uruguayan banks.

Given the particular path of the Uruguayan banking system, as highlighted in the previous section, the period of analysis has been split in three different stages: the pre-crisis one (from January 2000 to December

2 A specific Uruguayan legal arrange which, in practice, is alike a bank.

3 Since January 2000 the Superintendence of Banks publishes banks' balance sheet information -on the Central Bank's web page- upon which the variables used in this work can be constructed (or proxied).

2001), the crisis (from January to July 2002), and the post-crisis period (from August 2002 to December 2004).

We could separate the bank specific variables that will be included in the analysis into three categories. Firstly, the dependent variables (that could also enter as endogenous ones) are: (a) the logarithm of the stock of total dollar denominated deposits (*Ldep*); (b) the logarithm of the stock of dollar denominated time deposits (*Ltdep*); (c) the spread between the bank's marginal-weighted-average interest rate paid on time deposits and the system's marginal-weighted-average interest rate paid on deposits (*Rs*)[4]; and the logarithm of the marginal-weighted-average maturity of dollar denominated time deposits (*Lmat*). All marginal-weighted-average variables have been constructed in the same way. Given the monthly set of all new or renewal individual deposits (by bank or for the entire system), their interest rates or their maturities (which by definition are marginal ones) are aggregated taking into account the amounts of such deposits. We believe these measures are better than other implicit measures[5] usually used in MD literature because they directly incorporate the market's marginal information.

Secondly, we consider a set of bank specific risk variables. This set of fundamentals is considered a leading indicator of the probability of default on bank deposits and includes the most commonly used variables in the empirical literature on MD. It also contains some variables to consider local peculiarities. The variables included are: (a) equity capital as a percentage of total assets (*Equity*); (b) liquid assets as a percentage of liabilities that could be claimed between the next 30 days (*Liquidity*); (c) non-performing loans as a percentage of total loans (*NPL*); (d) return on assets expressed as a percentage (*Roa*); (e) non-financial losses as a percentage of total assets (*NFLosses*); (f) the exposure to the government as the percentage of loans to the public sector plus holdings of government bonds on total assets (*PublicSL*); and, (g) the total business with non-residents as the percentage of loans plus deposits of non-residents on the total loans and deposits (*NonR*).

4 There is no accurate information on banks' interest rates for demand deposits. Besides, these rates were extremely low during the period of analysis. Therefore, we considered only time deposits' interest rates.

5 The most common interest rate measure is the total interest expenses over the total interest-bearing deposits.

The coefficients of *Equity* and *Roa* are expected to be positive in the first, second and fourth regressions proposed in the next section (deposit reaction and maturity reaction respectively), and negative in the third one (interest rate reaction). *NPL*'s coefficient is supposed to be negative in the deposit reaction and in the maturity reaction regressions (and positive in the interest rate reaction). Generally, banks with high values of *Liquidity* are perceived to be safer and then we would expect a positive coefficient in the deposit and in the maturity reaction regressions but a negative one in the interest rate reaction regression. However, it could be also perceived as a signal of inefficiency in the management of the bank's finances. The amount of non-financial expenditures may be related to the services a bank offers to its customers (high quality services) or it may be indicating inefficiency in its activity. Thus, the expected sign for *NFLosses* is indeterminate. Related to banks' exposition to country and regional risks we should signal that the expected signs might be different across the periods considered. While it seems clear that we should expect a negative coefficient for *PublicSL* (in deposit and maturity reaction regressions) after the financial crisis of 2002, it is not clear before then. The percentage of business with non-residents (basically regional) might have been a sign of bank soundness at the beginning of our sample period, particularly before the aftermath of Argentina's crisis. However, in the light of the contagion risk involved in higher levels of *NonR*, it is clearly expected to have a negative impact on deposit growth and maturity (and positive on interest rates growth) in the second and third period considered (from January 2002 to December 2004).

Table 1 – Information Disclosure Delay (Months)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2005	1.1	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.1
2004	1.6	1.5	1.7	1.6	1.5	1.5	1.6	1.5	1.6	1.6	1.5	1.6
2003	3.4	2.4	1.5	1.5	1.5	1.6	1.6	1.4	1.4	1.7	1.8	1.7
2002	6.9	5.9	4.9	3.9	2.9	1.9	1.9	1.9	2.2	1.7	2.8	2.0
2001			6.2			4.9			4.7			7.9
2000			5.9			4.6			3.4			6.9

The set of fundamentals is included with lags in the regressions to account for the delay in which banks' balance sheet information is disclosed to the public. In this sense, the lag used in the first period considered (five months) is longer than the one used for the second and third periods (three

months) due to the fact that the banking supervisor has reduced considerably the delay in the disclosure of relevant information as can be seen in Table 1. Besides, using lags of the fundamentals variables reduces the eventual incidence of endogeneity problems.

The third category of bank specific variables intend to capture and control for other bank characteristics that might affect the depositors' choice among institutions but that are not necessarily related with risk-taking behavior. The aim of including this set is to allow the model to explain depositors behavior by alternative reasons beyond depositors' discipline. As suggested by Barajas and Steiner (2000), we include: (a) a proxy to the geographic coverage of the bank's network (*Branch*); specifically, *Branch* has been constructed as the logarithm of the number of branches outside the departments of Montevideo and Maldonado; (b) the market-share (*MS*) on total, foreign denominated, time deposits (excluding those in public banks); and, (c) dummies for groups of institutions. *Type1* is equal to one if the bank is a branch of a foreign bank and zero otherwise, *Type2* is equal to one if the bank is a subsidiary of a foreign bank and uses its name and zero otherwise, and *Type3* is equal to one if the institutions is a cooperative and zero otherwise. Local banks have a zero value for the three dummies.

Partial correlations between bank specific variables can be seen in Tables A-2 (in levels) and A-3 (in first differences) in the annex.

Although several macro variables were considered, only Uruguay's Emerging Market Bond Index (*EmbiUY*) was finally included in the regressions. That is because it shows high partial correlations with other macro variables (as can be seen in Table A-1 of the annex) and no other macro variable became significant once *EmbiUY* was included among the regressors. Thus, *EmbiUY* seems to synthesize all the relevant information with regards to the macro context.

III. Methodology and Results

In this section we present the tests results on the reaction of depositors to increases in bank risk. First, we present the more traditional tests used in the MD empirical literature – though broadened with a wide set of controls. In this sense we test for MD through the growth of deposits (quantity-

based approach) and through changes on interest rates (price-based approach). Moreover, we extend the analysis in order to evaluate if depositors discipline banks by reducing the maturity of their time deposits. Finally, as it was argued previously, a true test for MD should also evaluate if banks react to depositors' actions. Then, we include a first approach to this question through an indirect test of mean reversion of deposit interest rates as the one suggested by Calomiris and Powell (2000). The assumption behind this test is that if banks are forced to increase their interest rates due to depositors' actions and they feel disciplined (if depositors discipline is effective), banks will reduce their risk-taking and consequently their interest rates will revert to their means.

A. Deposit Reaction

In order to test if depositors penalize banks for increasing the default risk on their liabilities by withdrawing their deposits – and whether this conduct has changed over time –, we used the generalized-method-of moments (GMM) estimator developed by Arellano and Bond (1991) for dynamic panel data (hereafter A-B). There are three aspects that make the A-B model suitable for this case. First, the model should allow for the presence of individual, non-observable (i.e. bank-specific) effects. Second, the methodology should let the dependent variable to show inertial behavior. Finally, it should allow to control for the possibility of endogeneity of some of the explanatory variables (that could be jointly determined with the dependent variable).

We have conducted two regressions on deposits' reaction. The first one assumes as dependent variable the logarithm of total dollar denominated deposits (*Ldep*) while the second one considers the logarithm of dollar denominated time deposits (*Ltdep*) only. We run this two regressions not only to provide a test of robustness, but also to take into account the different behavior of time deposits in relation to total deposits (as can be seen on Graph 1).

The model specification forms are:

$$\left(Ldep_{i,t} - Ldep_{i,t-1}\right) = a + \sum_{h=1}^{H} b_h (Ldep_{i,t-h} - Ldep_{i,t-h-1}) +$$

$$+ \sum_{j=0}^{J} g_j (Rs_{i,t-j} - Rs_{i,t-j-1}) + \sum_{n=1}^{N} l_n (F^n_{i,t-k} - F^n_{i,t-k-1}) +$$

$$+ d(EmbiUY_t - EmbiUY_{t-1}) + \sum_{m=1}^{M} q_m C^m_{i,t} + y' D_i + (e_{i,t} - e_{i,t-1})$$

and:

$$\left(Ltdep_{i,t} - Ltdep_{i,t-1}\right) = a + \sum_{h=1}^{H} b_h (Ltdep_{i,t-h} - Ltdep_{i,t-h-1}) +$$

$$+ \sum_{j=0}^{J} g_j (Rs_{i,t-j} - Rs_{i,t-j-1}) + \sum_{n=1}^{N} l_n (F^n_{i,t-k} - F^n_{i,t-k-1}) +$$

$$+ d(EmbiUY_t - EmbiUY_{t-1}) + \sum_{m=1}^{M} q_m C^m_{i,t} + y' D_i + (e_{i,t} - e_{i,t-1})$$

where $Ldep_{i,t}$ stands for the logarithm of total dollar denominated deposits of bank i on month t; $Ltdep_{i,t}$ are the analogue for dollar denominated time deposits; $Rs_{i,t}$ is the interest rate (as defined on section II); $F^n_{i,t-k}$ is the nth bank-specific fundamental (lagged k periods as discussed in section II); $EmbiUY_t$ is the country risk variable; $C^m_{i,t}$ is the mth control variables (as defined in section II); D_i are bank dummies to capture non-observable bank specific effects; and $e_{i,t}$ is the error term.

On Tables A-4 and A-5 in the annex, results on total and time deposits reaction respectively, are showed by period. On each period the first column is an estimation using all bank-specific fundamentals while the second includes only those that became significant after an adjustment process was run[6]. The Sargan test of over-identifying restrictions (i.e. the test of the overall validity of the instruments) is included on the table's bottom lines, as well as the A-B tests for no first and second order autocorrelation[7].

6 Such process consists in parsimoniously dropping all non significant fundamentals from the first column and then including them one by one and finally keeping only those that became significant.

7 Since A-B method takes first difference of variables, first-order autocorrelation should appear but the consistency of the GMM estimators depend on the assumption that there is no second-order autocorrelation.

We also included a Wald test on the null hypothesis that all the bank-specific fundamentals are jointly non-significant.

Since the p-value of the Sargan Test is equal to one for the three periods, we cannot reject the existence of first-order autocorrelation and we reject the existence of second-order autocorrelation, we can reject the null hypothesis that the model is badly specified.

The coefficients of the autoregressive components of the models suggest a very strong persistence in the behavior of deposits (both total and time ones) in the first period and a somewhat weaker in the third one, while it is not significant in the financial crisis period. The first, third and fifth lag of deposits – though the latter is negative – are significant to explain next month's growth of deposits in the first period. In the third period, the first and second lags of deposits are significant in explaining next month's growth in the model with total deposits, but only the second lag is significant in the model with time deposits.

The bank-specific fundamental variables are jointly significant at one percent on the two models and for the three periods, even after controlling for the endogenous price mechanism and other non fundamental bank-specific variables; this represents a sign of depositors' discipline. Nevertheless, a closer look across the sample and throughout the fundamental variables is relevant, particularly since not all fundamentals appear to be important for depositors and the ones that are significant change over time.

To begin with a general comparison of the sample periods, note that fewer fundamentals are significant in the first period – as well as in the second one – than in the most recent one. Besides, the type of fundamentals that are significant has evolved. In the first period it was only banks' profitability that apparently caught depositors' attention – and the public sector exposure in the time deposits regression –, regardless of other risk variables evolution. In the financial distress period, even if market reaction to banks' risk may be somewhat overshadowed by the increase in systemic risk – *EmbiUY* is highly significant and negative –, depositors' attention seems to have turned to the banks' "health" variables since *Equity* became significant. Finally, in the third and last period a wider – and to some extent more sophisticated – set of bank fundamentals is significant. This evolution is consistent with (i) the reduction in the perceived coverage of deposits by

government after 2002 financial collapse (the ending of the extensive implicit deposit insurance system), and (ii) the disclosure policies conducted by the supervisor (whereby more information is now available with shorter delays).

There are several issues to point out in relation to the different bank-specific fundamental variables. For instance, despite the obvious implications of an increase in non-performing loans on the ability of banks to honor their liabilities, it does not seem to be worrisome for depositors. *NPL* is not statistically different from zero in any period[8], not even after the crisis when MD seems to be stronger.

Equity, an indicator of the banks' health, does not help to explain deposit growth on the first period, but becomes highly significant on the second one (it is the only significant fundamental variable on this period); banks with a higher ratio of equity to assets attract – or retain – more deposits. Surprisingly it is not significant on the third period in the time deposits regression (though it is significant in the total deposits regression). Also *Liquidity* is considered by depositors in the post-crisis period.

In relation to banks' profitability, their return on assets (*Roa*) plays a significant role on the first period, but is not considered during the recent financial distress period. On the third period, even though *Roa* is not significant in the time deposits regression, the banks' non-financial losses (*NFLosses*) is and has a negative sign. Then, it seems that higher non-financial losses are perceived as a proxy of inefficiency rather than of better services.

Interestingly, exposure to government is seen in a different way before and after the 2002 financial crisis. On the first period *PublicSL* is significant and has positive sign. That is, bank exposure to the public sector was not considered risky; on the contrary, it helped to attain a higher growth rate of deposits. However, on the third period *PublicSL* is significant – now at one percent level – but has a negative effect on deposits growth. This shift is not surprising given, first, the effect of 2002 financial crisis on the perceived government capacity to honor its liabilities and, second, the actual reduction of its capacity to act as an implicit deposit insurer.

8 Except in the third one for total deposits but at ten percent of significance.

The variable related to bank exposure to regional risk became significant after the crisis and has negative sign, as expected. Given the magnitude of non-residents' withdrawals during the crisis, it is not surprising that a high level of activity with non-residents (which are primary Argentineans) turned to be associated with higher potential risk.

We have included the interest rate (*Rs*) among the regressors to control for the price mechanism of deposit growth. That is, a bank may be retaining more deposits because it is lowering its default risk or because it is offering a higher interest rate, other things equal (i.e. controlling for other non-fundamental variables that may influence depositors' perceived risk). In this sense, we extended the analysis to account for the eventual dynamic relationship between the interest rate and the quantity of deposits, as suggested in Maechler and McDill (2003). Since depositors' disciplining actions may be obscured by the bank's possibility to raise offered interest rates, they suggest to distinguish the exogenous impact of a rise in interest rates on deposits' growth from the endogenous impact of deteriorating bank fundamentals on both price and deposits. We ran different A-B regressions assuming *Rs* as endogenous as well as exogenous. We found no significant differences on using one or the other assumption. This would suggest that banks were indeed able during the first and second periods to attract more deposits by raising interest rates[9] .

Turning to the control variables, the relative size of the institutions – market share – was perceived as a positive quality during the first two periods, suggesting a "too big to fail" effect. However, it is not significant in the post-crisis period.

A remarkable change along the sample is the significance of country risk on explaining the capability of banks to attract deposits. While *EmbiUY* was not significant on the first –tranquil – period, it became strongly significant and negative on the second. On the third period it continued to be significant and negative, though it showed a lower absolute value of the coefficient. According to this – and considering that only one bank-specific fundamental is significant on the second period – we could argue that during the financial distress period depositors rather focused their reaction on

9 Interest rates were not significant during the third period but for the total deposits regression.

systemic risk variables. As signaled by Levy-Yeyati *et al.* (2004) this does not imply the absence of MD; when systemic risk prevails, depositors would rather react to expected changes in future fundamentals than to the observed evolution of past fundamentals.

We have checked whether our results are robust to a different specification of the interest rate – specifically the spread between the marginal-weighted-average rate on deposits of an institution and the *Libor* rate – and different sets of control variables. Results do not differ significantly from those that are presented in Tables A-4 and A-5.

B. Interest Rate Reaction

In the previous sub-section we have investigated the quantities channel for depositors' discipline. Here, we will look into an alternative channel that is commonly cited in MD empirical literature: the price approach. That is, depositors could penalize bad banks by requiring higher interest rates instead of withdrawing their deposits.

Taking into account the same aspects considered in the previous sub-section we have applied the A-B estimator to the following model specification form:

$$\left(Rs_{i,t} - Rs_{i,t-1}\right) = a + \sum_{h=1}^{H} b_h (Rs_{i,t-h} - Rs_{i,t-h-1}) +$$

$$+ \sum_{j=0}^{J} g_j (Lmat_{i,t-j} - Lmat_{i,t-j-1}) + \sum_{n=1}^{N} l_n (F^n_{i,t-k} - F^n_{i,t-k-1}) +$$

$$+ d(EmbiUY_t - EmbiUY_{t-1}) + \sum_{m=1}^{M} q_m C^m_{i,t} + y' D_i + (e_{i,t} - e_{i,t-1})$$

where variables are defined in section II and III.A.

Results are presented on Table A-6. We can reject the null hypothesis that the model is badly specified. We can also reject that banks' fundamentals are jointly non-significant for the best specification of the pre-crisis period and for both specifications on the post crisis period. However, no fundamental variables are significant in the crisis period but *EmbiUY* is and has the expected sign. In addition to that, more fundamentals are significant in period three than in period one. Then, we can conclude that depositors

not only discipline banks through the quantity channel but also they penalize bad banks by demanding higher interest rates on their deposits. Additionally, the use of this mechanism seems to be higher after the 2002 financial distress while in the crisis period systemic issues overshadow it.

The coefficients of the autoregressive component suggest a very strong inertia in the behavior of deposits' interest rates, though somewhat weaker in the crisis period.

Additionally, we have included deposits' maturity among the regressors to control for the yield curve's effect. In this sense, despite maturity's coefficients show a smoothening process in period one, its positive effect does not vanish as it is showed by the *Lmat* Test in Table A-6. However, this does not happen in the post-crisis period.

There are some aspects that should be highlighted with respect the banks fundamental variables that became significant. In the pre-crisis period only *Liquidity* and *PublicSL* are significant and both have a positive sign. This implies that those banks that showed a higher proportion of liquid assets and a higher exposure to the government were required higher interest rates. That is not at all rare since a higher liquidity could be perceived as a signal of inefficiency and then its expected sign is ambiguous. However, what is rare is the sign of *NPL* in period three. Banks that hold higher ratios of non-performing loans are requested for smaller interest rates on deposits. We do not have an explanation for this strange result. With respect to other banks fundamentals that are significant in the post-crisis period (*Liquidity, Roa* and *NonR*) all of them have non controversial sign. Particularly, the higher the liquidity and the profitability a bank hold, the smaller the interest rate on deposits it would pay.

C. Maturity Reaction

In this section we present an extension to the usual analyses found on the MD empirical literature. As it is commonly argued, given a deterioration on bank-specific fundamentals depositors may be willing to withdraw their deposits or to keep them while requiring an accordingly higher return. However, under such circumstances depositors could also agree to keep their deposits – or make new ones – if they are offered shorter term deposits durations. We call this channel maturity reaction and

is based in the fact that depositors could reduce the maturity of their time deposits as a disciplining instrument.

We estimated a dynamic panel data model similar to the one used for deposit and interest rate reaction, using the A-B methodology, were the dependent variable is now the logarithm of the bank's marginal-weighted-average maturity of new – or renewal – term deposits (*Lmat*)[10] . The model specification form is:

$$\left(Lmat_{i,t} - Lmat_{i,t-1}\right) = a + \sum_{h=1}^{H} b_h (Lmat_{i,t-h} - Lmat_{i,t-h-1}) +$$

$$+ \sum_{j=0}^{J} g_j (Rs_{i,t-j} - Rs_{i,t-j-1}) + \sum_{n=1}^{N} l_n (F^n_{i,t-k} - F^n_{i,t-k-1}) +$$

$$+ d(EmbiUY_t - EmbiUY_{t-1}) + \sum_{m=1}^{M} q_m C^m_{i,t} + y' D_i + (e_{i,t} - e_{i,t-1})$$

We can reject the null hypothesis that the model is badly specified since the Sargan test, as well as the autoregressive tests, assume the expected values as can be seen in Table A-7.

We can also reject the null hypothesis that the bank-specific fundamentals are jointly non-significant (though the third period's best specification only at the five percent level). This could be seen as a sign that depositors also react to deteriorating fundamentals by shortening the terms of their deposits.

Regarding the banks' fundamental variables we can see that the return on assets (*Roa*) is significant on the first period; *Liquidity* is significant on the second one; and, exposition to the government *PublicSL* is significant on the last one (all of them with the expected sign).

The autoregressive component has positive sign and is quite high in the first and third period. This implies an important inertial behavior on the term of deposits. During the financial distress period, however, the

10 As explained on section II, deposits marginal maturities are weighted by their amount to calculate the marginal-weighted-average maturity. Besides, it considers only new deposits – or renewals – though it is a marginal maturity indicator.

autoregressive coefficient was still high and significant but negative. This suggests a correction process in the next month.

As it was expected, interest rates help to explain longer deposit terms mainly in period one. Although the contemporary and lagged coefficients have different sign, we can reject the null hypothesis that their sum equals zero, which suggests that its effect is smoothened but does not vanish. However, this relation weakens along the sample. On the second period it is somewhat less significant and has a lower coefficient. Moreover, on the third period the interest rate mechanism is not relevant to explain higher maturities; the contemporary and the one period lagged interest rate coefficients are significant and alternate sign but even if their values would suggest a smoothing process, we cannot reject the null that the sum of them is zero as can be seen in the bottom line on Table A-7.

D. Do banks respond to depositors' reactions?

The results shown on the previous sections suggest that depositors react to increasing default risk on their deposits by withdrawing their funds, by requesting higher interest rates or by shortening their deposits' maturities. Those results suggest also that depositors' reactions to banks' default risk is somewhat stronger in the most recent period – after the 2002 crisis – than what it was before. However, this is not a true test on depositors' discipline because such concept implies that banks react in consequence. That is, depositors' discipline is effective if depositors react to banks' risk-taking and banks respond to depositors' actions. Thus, to complete the analysis we should describe the responses of banks to depositors' reactions and to evaluate whether these responses have evolved over time.

Maybe the best way to evaluate the effectiveness of depositors' discipline is to estimate a vector autoregressive system of equations as Galindo *et al.* (2005) do. However, we will perform an indirect test based on Calomiris and Powell (2000). This indirect test assumes that if banks are forced to increase their interest rates due to depositors' actions and they feel disciplined (if depositors' discipline is effective), banks will reduce their risk-taking and consequently it is expected that the interest rates will reduce. Accordingly, they examine whether there is a tendency for individual banks' interest rates to revert to their mean.

The specification used to model the time series properties of the banks' interest rates is:

$$\left(R_{i,t} - R_{i,t-1}\right) = j + a\,R_{i,t-1} + b_i + g_t + e_{i,t}$$

where $R_{i,t}$ is the deposit interest rate paid by bank *i* on month *t*, b_i and g_t are random individual and time effects respectively, and $e_{i,t}$ is an error term.

This is equal to testing for:

$$R_{i,t} = j + (1+a)R_{i,t-1} + b_i + g_t + e_{i,t}$$

The coefficient a, which represents the speed at which the interest rate reverts to its mean, is therefore expected to be negative. The number of periods – months – that it takes the interest rate to revert to its mean after a certain shock will be given by:

$$months = \frac{\ln(2)}{\ln(1-a)}$$

As it can be seen from the results shown on Table A-8, the coefficient a is always negative but it is only significant in the third period. Beyond it's absolute value, it is useful to compare the required time for mean reversion for different periods. In this sense, while in the first period the model adjusted suggests that it takes an extraordinary long period for the interest rate to mean revert, approximately 30 months, in the third one it would take only 7.5 months, which is even inferior than the minimum time (estimated at ninety five percent of significance) required in the first period (12 months). Also the maximum time of mean reversion in the third period is relatively small: 11.4 months.

This analysis suggests that, despite the fact that depositors reacted to banks' fundamentals even before 2002, depositors' discipline in Uruguay has became effective only after the financial distress period.

IV. Final Remark

Market discipline in banking is commonly interpreted as a situation in which bank related agents face costs that are positively correlated to

bank risk and react on the basis of these costs. Moreover, market discipline also involves the subsequent response of banks to correct their risk-taking strategies. It is generally agreed that markets, if provided of accurate and timely information, react immediately to news. It is also supported that supervisory bodies may not act appropriately on the information that they possess because of lack of legal protection, agency problems or unavoidable informational asymmetry problems. Thus, policy recommendations place market discipline as a strategic complement to supervision in banking markets and suggest a balanced combination of both to preserve the system soundness.

We have analyzed the extend of depositors' discipline in Uruguay (since the main liability of Uruguayan banks are deposits) in three relevant periods (pre-crisis, 2002 crisis and post-crisis), and through three complementary test (the quantity approach, the price approach and the maturity approach). To do so, we have constructed a panel data base that combines bank specific detailed information on deposits, deposits' interest rates, fundamental variables and macro variables. We used the Arellano and Bond (1991) GMM estimator on such data base in order to take into account the inertial behavior of the dependent variables, the potential endogeneity of the dependent variable with some of the explanatory ones and the existence of bank specific non-observable effects.

The main conclusion of this work is that depositors react to banks' fundamental changes through the entire sample. However, such disciplining behavior becomes stronger after the 2002 financial crisis and it is overshadowed by systemic factors during the distress time. Moreover, depositors' discipline is only effective, in the sense that banks also react (feel disciplined), in the post-crisis period (from August 2002 to December 2004). This is correlated with the supervisor's policy of providing more and more comprehensive information about individual financial institutions with smaller delays. Of course, it is also related with the fact that in the post-crisis period depositors have stronger incentives to monitor banks since the perception of an unlimited implicit deposit insurance has almost vanished. To what extend do this two elements cause the empirical results that have been shown cannot be answered herein but, in any case, the combination of them appears to have determined an increase in depositors' discipline in the Uruguayan banking sector.

Through the entire sample (January 2000 to December 2004) the quantities' channel works. That is, it is statistically significant that depositors discipline bad banks by withdrawing their deposits (both total and time deposits). The empirical evidence about the use of the other two channels (price and maturity) is less significant. However, the hypothesis that in the post-crisis period depositors disciplined banks not only by withdrawing their deposits but also by requiring higher interest rates and shortening the maturity of their deposits cannot be rejected. This reinforces the main conclusion.

References

Arellano, Manuel and Bond, Stephen, 1991. "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations". *Review of Economic Studies*, 58, pp. 277-297.

Bank for International Settlements, 2003. *The New Basel Capital Accord*. Basel: Bank for International Settlements.

Barajas, Adolfo and Steiner, Roberto, 2000. "Depositor Behavior and Market Discipline in Colombia". Working Paper, International Monetary Fund.

Berger, Allen, 2001. "Market Discipline in Banking". *Proceedings of a Conference on Bank Structure and Competition*, Federal Reserve Bank of Chicago, pp. 419-437.

Calomiris, Charles W. and Powell, Andrew, 2000. "Can Emerging Market Bank Regulators Establish Credible Discipline? The Case of Argentina, 1992-1999". Working Paper 14, Banco Central de la República Argentina.

D'Amato, Laura; Grubisic, Elena and Powell, Andrew, 1997. "Contagion, Banks Fundamentals or Macroeconomics Shock? An Empirical Analysis of the Argentine 1995 Banking Problems". Working Paper Number 2, Banco Central de la República Argentina.

Demirgüc-Kunt, Asli and Huizinga, Harry, 2000. "Market Discipline and Financial Safety Net Design". Working Paper, World Bank.

Diamond, Douglas W. and Dybvig, Philip H, 1983. "Bank Runs, Deposit Insurance, and Liquidity". *The Journal of Political Economy*, June, 91(3), pp. 401-419.

Galindo, Arturo; Powell, Andrew and Loboguerrero, Ana María, 2005. "Latin American Banks, Market Discipline and Official Regulation: Completing the Circle". Working Paper, Inter American Development Bank.

Inter American Development Bank, 2005. *Unlocking Credit. The Quest for Deep and Stable Bank Lending*. Washington: IPES.

Kindleberger, C. P, 1978. *Manias, Panics and Crashes*. New York: Basic Books.

Levy-Yeyati, Eduardo; Martinez-Pería, María Soledad and Schmukler, Sergio L, 2004a. "Market Discipline in Emerging Economies: Beyond Bank Fundamentals". In Hunter, William C.; Kaufman, George G.; Borio, Claudio

and Tsatsaronis, Kostas (Eds.). *Market Discipline across Countries and Industries.* Massachusetts: MIT Press.

_____, 2004b. "Market Discipline under Systemic Risk: Evidence from Bank Runs in Emerging Economies". Working Paper 02/2004, Universidad Torcuato Di Tella.

Maechler, Andrea M. and McDill, Kathleen M, 2003. "Dynamic Depositor Discipline in U.S. Banks". Working Paper, International Monetary Fund.

Martinez-Pería, María Soledad and Schmukler, Sergio L, 2001. "Do Depositors Punish Banks for Bad Behavior? Market Discipline, Deposit Insurance, and Banking Crisis". *The Journal of Finance*, June, 56(3), pp. 1029-1051.

McCandless, George; Gabrielli, María Florencia and Rouillet, María Josefina, 2003. "Determining the Causes of Bank Runs in Argentina During the Crisis of 2001". *Revista de Análisis Económico*, June, 18(1), pp. 87-102.

Nier, Erlend and Baumann, Ursel, 2003. "Market Discipline, Disclosure and Moral Hazard in Banking". Working Paper, Bank or England.

Vallcorba, Martín, 2003. "Comportamiento de las tasas de interés durante la crisis bancaria de 2002". Universidad ORT del Uruguay.

Table A-1 – Partial Correlations (Macro Variables)

Period 1 (2000.01 - 2001.12)

	EmbiUY	Rin	GDP	Libor	Edeval	Deval	Inflation
EmbiUY	1.0000						
Rin	-0.4303	1.0000					
GDP	-0.3925	-0.7673	1.0000				
Libor	-0.2218	-0.6124	0.9095	1.0000			
Edeval	0.2065	0.5772	-0.8620	-0.8289	1.0000		
Deval	0.2334	0.6352	-0.8942	-0.9353	0.8026	1.0000	
Inflation	0.3425	-0.2731	0.4493	0.5797	-0.6109	-0.5501	1.0000

Period 2 (2002.01 - 2002.07)

	EmbiUY	Rin	GDP	Libor	Edeval	Deval	Inflation
EmbiUY	1.0000						
Rin	-0.9736	1.0000					
GDP	-0.9812	0.9438	1.0000				
Libor	-0.4097	0.3761	0.3324	1.0000			
Edeval	0.9684	-0.9337	-0.9798	-0.3773	1.0000		
Deval	0.9745	-0.9547	-0.9216	-0.4107	0.8987	1.0000	
Inflation	0.9827	-0.9698	-0.9539	-0.4576	0.9302	0.9802	1.0000

Period 3 (2002.08 - 2004.12)

	EmbiUY	Rin	GDP	Libor	Edeval	Deval	Inflation
EmbiUY	1.0000						
Rin	-0.9165	1.0000					
GDP	-0.7731	0.9058	1.0000				
Libor	-0.1850	0.3277	0.6634	1.0000			
Edeval	0.9089	-0.9043	-0.7255	-0.0619	1.0000		
Deval	0.9539	-0.9503	-0.7971	-0.1872	0.9529	1.0000	
Inflation	0.8928	-0.9515	-0.8766	-0.3395	0.8210	0.9225	1.0000

EmbiUY: Uruguay's Emerging Market Bond Index (J.P. Morgan)
Rin: Net International Reserves
GDP: Trend Component of the Gross Domestic Product
Libor: London 180 days Interest Rate
Edeval: Expected devaluation as the spread of the average interest rate on peso time deposits relative to the rate on similar dollar deposits
Deval: Effective devaluation rate
Inflation: Effective inflation rate

Table A-2 – Partial Correlations (Fundamentals - Levels)

Period 1 (2000.01 - 2001.12)

Ltdep	Ldep	Rs	Lmat	Equity L5	Liquidity L5	NPL L5	Roa L5	NFLosses L5	PublicSL L5	NonRes L5	Branch	MS
1.0000												
0.9737	1.0000											
0.0987	-0.0070	1.0000										
0.0242	-0.0229	0.3781	1.0000									
-0.3934	-0.4253	-0.0314	0.0795	1.0000								
-0.0618	-0.1330	0.3552	0.0554	0.2801	1.0000							
-0.3363	-0.3625	0.1785	-0.0124	0.0558	0.1405	1.0000						
0.4122	0.4001	0.0649	0.1741	0.1431	0.1837	-0.2453	1.0000					
-0.2371	-0.2008	-0.0524	0.1523	0.0154	-0.2308	0.2200	-0.2247	1.0000				
0.3215	0.3156	-0.0730	-0.2128	-0.1422	-0.1004	-0.1014	-0.0374	-0.0772	1.0000			
-0.1185	-0.1872	-0.0415	-0.0772	0.3908	0.3994	-0.2441	0.3468	-0.4280	-0.1831	1.0000		
0.4543	0.4264	0.2062	0.2727	-0.3114	-0.0581	0.1322	0.0373	0.2738	0.0479	-0.5521	1.0000	
0.8787	0.8790	0.0017	0.0601	-0.2667	-0.0261	-0.2139	0.5598	-0.1876	0.2060	-0.0480	0.4253	1.0000

Period 2 (2002.01 - 2002.07)

Ltdep	Ldep	Rs	Lmat	Equity L3	Liquidity L3	NPL L3	Roa L3	NFLosses L3	PublicSL L3	NonRes L3	Branch	MS
1.0000												
0.9696	1.0000											
0.2781	0.1230	1.0000										
0.2982	0.2210	0.5106	1.0000									
-0.5941	-0.5597	-0.2494	-0.0509	1.0000								
-0.1983	-0.2681	0.3496	0.1271	0.3802	1.0000							
-0.4019	-0.4713	0.3832	-0.0032	0.0381	0.3061	1.0000						
0.0701	0.1166	-0.1328	0.0082	0.3060	0.2559	-0.1999	1.0000					
0.1511	0.1322	0.2482	0.1958	-0.0525	-0.1254	-0.0241	-0.0422	1.0000				
0.1138	0.1303	-0.0830	-0.1138	-0.1092	-0.1768	-0.0724	-0.0754	-0.1029	1.0000			
-0.4251	-0.4535	-0.3273	-0.1352	0.4860	0.4544	-0.1519	0.2215	-0.3540	-0.0547	1.0000		
0.5346	0.4604	0.5379	0.4363	-0.3951	-0.1459	0.0336	-0.3159	0.2854	-0.2068	-0.6042	1.0000	
0.7687	0.8242	0.0406	0.0880	-0.4702	-0.1834	-0.2953	0.0237	-0.1110	0.1025	-0.3189	0.4495	1.0000

Perid 3 (2002.08 - 2004.12)

Ltdep	Ldep	Rs	Lmat	Equity L3	Liquidity L3	NPL L3	Roa L3	NFLosses L3	PublicSL L3	NonRes L3	Branch	MS
1.0000												
0.8758	1.0000											
0.1850	-0.1206	1.0000										
0.1376	0.0179	0.3372	1.0000									
-0.7024	-0.6110	-0.1799	-0.1855	1.0000								
-0.2967	-0.2272	-0.0852	0.0028	0.6055	1.0000							
-0.3124	-0.4891	0.3435	0.1686	0.0298	-0.1765	1.0000						
0.2324	0.3041	-0.3232	-0.0796	-0.2481	-0.0257	-0.4918	1.0000					
-0.1598	-0.1324	-0.0736	0.0891	0.0286	-0.0814	0.1931	-0.1642	1.0000				
0.0273	0.1654	0.0512	0.0095	0.1020	0.2124	-0.1660	-0.0055	-0.0723	1.0000			
-0.6306	-0.7162	0.1010	0.0931	0.5496	0.3169	0.2613	-0.0995	-0.0897	-0.0896	1.0000		
0.4526	0.3972	0.2381	0.3789	-0.3768	-0.1824	-0.0667	-0.0084	0.1054	-0.1307	-0.4893	1.0000	
0.6067	0.8115	-0.2232	-0.1548	-0.3555	-0.1391	-0.4568	0.2666	-0.1341	0.1461	-0.4795	0.2914	1.0000

Table A-3 – Partial Correlations (Fundamentals – First Differences)

Period 1 (2000.01 - 2001.12)

Ltdep D	Ldep D	Rs D	Lmat D	Equity L5D	Liquidity L5D	NPL L5D	Roa L5D	NFLosses L5D	PublicSL L5D	NonRes L5D	Branch	MS
1.0000												
0.8377	1.0000											
0.1871	0.1289	1.0000										
0.0600	0.0084	0.3249	1.0000									
0.1316	0.1692	0.0103	0.0533	1.0000								
0.0689	0.0826	-0.0536	-0.0390	-0.0943	1.0000							
0.0889	0.0731	0.0588	0.0525	-0.0188	0.0919	1.0000						
0.1814	0.2494	0.0196	0.0628	0.2643	0.0235	-0.0118	1.0000					
0.0131	0.0103	-0.0594	0.0023	0.0320	-0.0085	-0.0805	-0.0294	1.0000				
0.0378	0.0429	0.0468	0.0910	0.0431	0.0197	0.0113	0.0097	-0.0211	1.0000			
-0.0240	0.0110	-0.0618	-0.0496	-0.0762	-0.0475	-0.1620	-0.0175	0.0931	-0.0089	1.0000		
0.0110	0.0118	0.1159	0.0494	0.0087	0.0072	0.0204	0.0203	-0.0158	-0.0678	-0.0056	1.0000	
0.0304	0.0554	0.0317	0.0200	-0.0077	0.0467	-0.0154	0.2776	-0.0148	-0.0212	-0.0397	0.4223	1.0000

Period 2 (2002.01 - 2002.07)

Ltdep D	Ldep D	Rs D	Lmat D	Equity L3D	Liquidity L3D	NPL L3D	Roa L3D	NFLosses L3D	PublicSL L3D	NonRes L3D	Branch	MS
1.0000												
0.9615	1.0000											
0.2128	0.1915	1.0000										
0.1204	0.0835	0.1226	1.0000									
0.0640	0.1212	-0.1250	-0.0407	1.0000								
0.0423	0.0545	0.1367	0.0670	-0.0212	1.0000							
0.0235	-0.0221	-0.2007	-0.1242	0.1166	-0.3034	1.0000						
0.1222	0.1364	-0.0018	0.0562	0.5060	-0.0019	-0.0443	1.0000					
-0.0873	-0.0746	0.0858	0.0198	-0.0069	0.0702	-0.0316	-0.0921	1.0000				
0.0208	0.0374	0.0314	0.1309	0.0695	-0.0359	-0.0979	0.0706	0.1475	1.0000			
-0.0607	-0.0685	0.0939	0.1073	-0.1243	-0.0749	-0.2445	0.1050	0.0379	0.0521	1.0000		
0.2340	0.1913	0.0215	-0.1486	-0.1154	-0.0942	-0.0134	-0.1622	-0.0548	-0.0156	0.1064	1.0000	
0.1657	0.1566	0.0670	0.0210	-0.0720	-0.1185	-0.1384	-0.1088	0.0241	0.1163	0.0079	0.4648	1.0000

Perid 3 (2002.08 - 2004.12)

Ltdep D	Ldep D	Rs D	Lmat D	Equity L3D	Liquidity L3D	NPL L3D	Roa L3D	NFLosses L3D	PublicSL L3D	NonRes L3D	Branch	MS
1.0000												
0.6132	1.0000											
-0.0786	-0.1191	1.0000										
-0.1113	-0.2358	0.2058	1.0000									
0.0692	0.0446	0.0211	-0.0214	1.0000								
0.0912	0.4059	-0.0171	-0.1621	-0.0152	1.0000							
0.0172	0.0424	-0.0418	-0.0180	0.0021	-0.1030	1.0000						
0.0138	0.0220	-0.0057	0.0120	-0.1084	0.0919	-0.2366	1.0000					
-0.0115	-0.0343	-0.0201	-0.0694	0.1470	-0.0340	-0.0079	-0.0581	1.0000				
-0.3591	-0.2264	0.0017	0.0860	0.0451	0.0044	0.0074	-0.0770	0.0191	1.0000			
0.0030	-0.0879	0.0209	0.0200	-0.0209	-0.0140	-0.0408	-0.0396	-0.1240	-0.0016	1.0000		
-0.0098	-0.0132	-0.0376	0.0338	-0.0608	-0.0061	0.0234	-0.0069	0.0453	-0.0179	0.0230	1.0000	
-0.0112	0.0094	0.0160	0.0025	-0.0593	0.0065	0.0524	-0.0130	0.0080	-0.0401	-0.0469	0.2977	1.0000

Table A-4 – Total Deposits Reaction

Period		1		2		3	
Variable Name	Lags	(2000.01-2001.12)		(2002.01-2002.07)		(2002.08-2004.12)	
Ldep	LD	0.7331 ***	0.7147 ***	-0.1654	0.1518	0.1755 ***	0.1783 ***
		(0.0909)	(0.0818)	(0.1405)	(0.1134)	(0.0383)	(0.0383)
	L2D	-0.1817 **	-0.1235			0.1180 ***	0.1179 ***
		(0.0826)	(0.0836)			(0.0353)	(0.0353)
	L3D	0.3456 ***	0.2914 ***				
		(0.0702)	(0.0763)				
	L4D	-0.0681	-0.0202				
		(0.1047)	(0.1131)				
	L5D	-0.1945 **	-0.2152 ***				
		(0.0781)	(0.0796)				
Rs	D1	0.0298 **	0.0212 **	0.1650 ***	0.1655 ***	0.0224	0.0231
		(0.0117)	(0.0085)	(0.0401)	(0.0346)	(0.0173)	(0.0173)
	LD	0.0102		-0.0378	0.0876 **	0.0039	0.0037
		(0.0272)		(0.0599)	(0.0438)	(0.0172)	(0.0172)
	L2D	-0.0151		0.1784 **	0.1943 ***	-0.0479 ***	-0.0482 ***
		(0.0230)		(0.0781)	(0.0709)	(0.0146)	(0.0147)
Equity	L3D			0.0440 ***	0.0379 ***	0.0068 **	0.0064 **
				(0.0135)	(0.0117)	(0.0027)	(0.0027)
	L5D	0.0001					
		(0.0044)					
Liquidity	L3D			0.0000		0.0015 ***	0.0015 ***
				(0.0004)		(0.0002)	(0.0002)
	L5D	0.0001					
		(0.0001)					
NPL	L3D			-0.0032		-0.0024 *	-0.0024 *
				(0.0103)		(0.0013)	(0.0013)
	L5D	0.0011					
		(0.0009)					
Roa	L3D			0.0052		-0.0030 ***	-0.0030 ***
				(0.0269)		(0.0007)	(0.0007)
	L5D	0.0318 ***	0.0269 ***				
		(0.0112)	(0.0090)				
NFLosses	L3D			-0.0006		-0.0032	
				(0.0083)		(0.0024)	
	L5D	-0.0001					
		(0.0008)					
PublicSL	L3D			0.0161		-0.0108 ***	-0.0107 ***
				(0.0567)		(0.0019)	(0.0019)
	L5D	0.0120					
		(0.0147)					
NonR	L3D			-0.0145		-0.0139 ***	-0.0136 ***
				(0.0115)		(0.0025)	(0.0025)
	L5D	-0.0011					
		(0.0036)					
EmbiUY	D1	0.0043	0.0055	-0.0499 ***	-0.0379 ***	-0.0067 ***	-0.0066 ***
		(0.0082)	(0.0088)	(0.0105)	(0.0103)	(0.0017)	(0.0017)
Branch		0.0022	0.0030	1.3211	0.6385	0.0109	0.0116
		(0.0056)	(0.0055)	(1.0657)	(1.1714)	(0.0135)	(0.0135)
MS		0.0048	0.0033	0.0135	0.0248	-0.0018	-0.0022
		(0.0038)	(0.0033)	(0.0173)	(0.0175)	(0.0020)	(0.0020)
Type1		-0.0033	-0.0113		0.8105	0.0345	0.0392
		(0.0043)	(0.0137)		(1.9724)	(0.0419)	(0.0465)
Type2		-0.0857 *	-0.0650 *	2.9098	1.7337	0.0169	0.0515 ***
		(0.0446)	(0.0372)	(2.6515)	(3.5506)	(0.0421)	(0.0095)
Type3		0.0075	0.0146	0.1813	1.7110	-0.0070	-0.0283
		(0.0193)	(0.0162)	(0.1341)	(2.7440)	(0.0462)	(0.0494)
Obs.		455	532	124	153	372	372
Groups		24	28	19	29	18	18
AR1 Test		0.0079	0.0039	0.0000	0.0003	0.0000	0.0000
AR2 Test		0.4909	0.3855	0.8848	0.7568	0.8259	0.6974
Sargan Test		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Fundam. Test		0.0047	0.0030	0.0014	0.0010	0.0000	0.0000

Estimation method is Arellano and Bond (1991), one-step, Rs included as and endogenous variable, constant and individual effects (not reported). Dependent variable is the first difference of Ldep. Standard deviations in brackets. *** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent. LiD is the order i lag of the first difference of the variable. D1 is the first difference of the variable. ARi Test is the p-value of the test of no autocorrelation of degree i; Sargan Test is p-value of the test of over-identifying restrictions. Fundam. Test is the p-value of a test on the null that all fundamental variables are non-significant.

Table A-5 – Time Deposits Reaction

Period		1		2		3	
Variable Name	Lags	(2000.01-2001.12)		(2002.01-2002.07)		(2002.08-2004.12)	
Ltdep	LD	0.7760 ***	0.7709 ***	-0.1670	0.1094	-0.0184	-0.0257
		(0.0487)	(0.0435)	(0.1325)	(0.1120)	(0.0499)	(0.0491)
	L2D	-0.0714	-0.0487			0.3697 ***	0.3549 ***
		(0.0621)	(0.0565)			(0.0493)	(0.0467)
	L3D	0.2808 ***	0.2609 ***				
		(0.0609)	(0.0570)				
	L4D	-0.1250 **	-0.0974 *				
		(0.0619)	(0.0591)				
	L5D	-0.1575 ***	-0.1815 ***				
		(0.0575)	(0.0533)				
Rs	D1	0.0642 ***	0.0385 ***	0.1709 ***	0.1666 ***	0.0072	0.0223
		(0.0180)	(0.0093)	(0.0431)	(0.0364)	(0.0410)	(0.0391)
	LD	-0.0047		-0.0253	0.1021 **	0.0287	0.0283
		(0.0225)		(0.0646)	(0.0463)	(0.0413)	(0.0407)
	L2D	-0.0197		0.1831 **	0.2134 ***	-0.0461	-0.0361
		(0.0197)		(0.0843)	(0.0747)	(0.0352)	(0.0342)
Equity	L3D			0.0424 ***	0.0347 ***	0.0053	
				(0.0148)	(0.0124)	(0.0065)	
	L5D	-0.0001					
		(0.0054)					
Liquidity	L3D			0.0000		0.0009 **	0.0008 **
				(0.0005)		(0.0004)	(0.0004)
	L5D	0.0002					
		(0.0001)					
NPL	L3D			0.0003		-0.0009	
				(0.0111)		(0.0030)	
	L5D	0.0011					
		(0.0024)					
Roa	L3D			0.0019		-0.0019	
				(0.0283)		(0.0016)	
	L5D	0.0213 ***	0.0166 ***				
		(0.0055)	(0.0047)				
NFLosses	L3D			-0.0018		-0.0149 **	-0.0142 **
				(0.0089)		(0.0059)	(0.0059)
	L5D	0.0005					
		(0.0018)					
PublicSL	L3D			-0.0389		-0.0194 ***	-0.0186 ***
				(0.0621)		(0.0047)	(0.0047)
	L5D	0.0232 *	0.0290 **				
		(0.0137)	(0.0126)				
NonR	L3D			-0.0131		-0.0201 ***	-0.0185 ***
				(0.0124)		(0.0060)	(0.0057)
	L5D	0.0006					
		(0.0027)					
EmbiUY	D1	-0.0063	-0.0068	-0.0452 ***	-0.0351 ***	-0.0103 **	-0.0109 ***
		(0.0100)	(0.0085)	(0.0112)	(0.0108)	(0.0042)	(0.0040)
Branch		-0.0042	-0.0046	1.3435	0.6945	-0.0078	-0.0132
		(0.0105)	(0.0096)	(1.1467)	(1.2344)	(0.0325)	(0.0321)
MS		0.0069 *	0.0061 *	0.0291	0.0361 *	-0.0012	-0.0017
		(0.0036)	(0.0033)	(0.0188)	(0.0185)	(0.0048)	(0.0043)
Type1		-0.0501	-0.0101 *		2.1653	-0.0087	
		(0.0308)	(0.0054)		(3.8654)	(0.1033)	
Type2		-0.1326 **	0.0201	4.1763	2.2205	-0.0147	0.0255
		(0.0564)	(0.0136)	(3.5826)	(3.8618)	(0.1060)	(0.0524)
Type3			0.0255	0.1864	1.8874	-0.0053	0.0311
			(0.0275)	(0.1443)	(3.0095)	(0.0595)	(0.1180)
Obs.		455	514	124	153	372	372
Groups		24	26	19	23	18	18
AR1 Test		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
AR2 Test		0.1132	0.3506	0.4152	0.8653	0.4771	0.3761
Sargan Test		1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Fundam. Test		0.0030	0.0001	0.0099	0.0050	0.0000	0.0000

Estimation method is Arellano and Bond (1991), one-step, Rs included as and endogenous variable, constant and individual effects (not reported). Dependent variable is the first difference of Ltdep. Standard deviations in brackets. *** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent. LiD is the order i lag of the first difference of the variable. D1 is the first difference of the variable. ARi Test is the p-value of the test of no autocorrelation of degree i; Sargan Test is the p-value of the test of over-identifying restrictions. Fundam. Test is the p-value of a test on the null that all fundamental variables are non-significant

Table A-6 – Interest Rate Reaction

Period		1			2			3		
Variable Name	Lags	(2000.01-2001.12)			(2002.01-2002.07)			(2002.08-2004.12)		
Rs	LD	0.6412	***	0.6383	***	0.3560	**	0.1514	0.5521	***	0.5432	***
		(0.0505)		(0.0464)		(0.1435)		(0.1039)	(0.0498)		(0.0475)	
	L2D	0.1270	**	0.1724	***				-0.1851	***	-0.1829	***
		(0.0620)		(0.0565)					(0.0547)		(0.0522)	
	L3D	0.0179		0.0313					-0.1433	***	-0.1399	***
		(0.0633)		(0.0580)					(0.0456)		(0.0430)	
	L4D	0.1099	*	0.0445								
		(0.0614)		(0.0563)								
	L5D	-0.1368	***	-0.1008	**							
		(0.0526)		(0.0478)								
Lmat	D1	0.2925	***	0.3218	***	0.1546		0.3014	*	0.2521	***	0.2915	***
		(0.0452)		(0.0435)		(0.1792)		(0.1626)		(0.0710)		(0.0599)	
	LD	-0.1584	***	-0.2001	***	-0.4416	**			-0.1237	*	-0.1655	***
		(0.0479)		(0.0457)		(0.2027)				(0.0717)		(0.0610)	
Equity	L3D					-0.0254				0.0009			
						(0.0324)				(0.0086)			
	L5D	0.0075											
		(0.0147)											
Liquidity	L3D					0.0010				-0.0010	*	-0.0011	***
						(0.0011)				(0.0005)		(0.0004)	
	L5D	0.0004		0.0006	**								
		(0.0003)		(0.0002)									
NPL	L3D					-0.0210				-0.0252	***	-0.0179	***
						(0.0237)				(0.0052)		(0.0041)	
	L5D	-0.0026											
		(0.0064)											
Roa	L3D					0.0548				-0.0092	***	-0.0088	***
						(0.0668)				(0.0021)		(0.0020)	
	L5D	-0.0096											
		(0.0141)											
NFLosses	L3D					-0.0076				0.0008			
						(0.0438)				(0.0159)			
	L5D	0.0024											
		(0.0098)											
PublicSL	L3D					-0.0346				0.0027			
						(0.1319)				(0.0063)			
	L5D	0.0592	*	0.0676	*								
		(0.0355)		(0.0348)									
NonR	L3D					-0.0219				-0.0229	**	-0.0242	***
						(0.0269)				(0.0095)		(0.0087)	
	L5D	-0.0110											
		(0.0072)											
EmbiUY	D1	-0.0453		-0.0725		0.0855	***	0.0478	*	0.0525		0.0233	
		(0.2550)		(0.2484)		(0.0245)		(0.0273)		(0.0780)		(0.0590)	
Branch		-0.0361		-0.0468	*	0.1385		-0.7212		-0.0328		-0.0263	
		(0.0274)		(0.0269)		(2.5032)		(2.8421)		(0.0463)		(0.0438)	
MS		-0.0205	**	-0.0191	**	-0.0261		0.0275		0.0155	**	0.0130	**
		(0.0084)		(0.0081)		(0.0429)		(0.0427)		(0.0066)		(0.0061)	
Type1		-0.2945	***	-0.3154	***	0.4619		-1.5737				0.1017	
		(0.0950)		(0.0943)		(4.5170)		(5.0771)				(0.2728)	
Type2		0.0332		-0.0104		0.4891		-2.2215		-0.0466		-0.5226	
		(0.0834)		(0.0800)		(6.2319)		(7.0420)		(0.1608)		(0.3679)	
Type3				-0.1951	**	0.0102		-0.0692		0.1003		0.2018	
				(0.0872)		(0.3180)		(0.3535)		(0.1675)		(0.2404)	
Obs.		443		498		123		152		372		393	
Groups		24		26		19		23		18		21	
AR1 Test		0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
AR2 Test		0.4800		0.8386		0.3705		0.1183		0.1727		0.1230	
Sargan Test		1.0000		1.0000		1.0000		1.0000		1.0000		1.0000	
Fundam. Test		0.1883		0.0069		0.8436				0.0000		0.0000	
Lmat Test		0.0185		0.0233						0.1419		0.1107	

Estimation method is Arellano and Bond (1991), one-step, Lmat included as and endogenous variable, constant, time and individual effects (not reported). Dependent variable is the first difference of Rs. Standard deviations in brackets. *** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent. LiD is the order i lag of the first difference of the variable. D1 is the first difference of the variable. ARi Test is the p-value of the test of no autocorrelation of degree i; Sargan Test is the p-value of the test of over-identifying restrictions. Fundam. Test is the p-value of a test on the null that all fundamental variables are non-significant. Lmat Test is the p-value of the test on the null that the sum of the Lmat effects is equal to zero.

Table A-7 – Maturity Reaction

Period		1			2			3		
Variable Name	Lags	(2000.01-2001.12)			(2002.01-2002.07)			(2002.08-2004.12)		
Lmat	LD	0.2919	***	0.2964 ***	-0.2605	**	-0.2823 ***	0.2255	***	0.2220 ***
		(0.0464)		(0.0423)	(0.1075)		(0.0986)	(0.0523)		(0.0503)
	L2D							0.0951	*	0.1007 **
								(0.0503)		(0.0484)
Rs	D1	0.3271	***	0.3256 ***	0.0274		0.0813 **	0.1686	***	0.1276 ***
		(0.0472)		(0.0406)	(0.0487)		(0.0391)	(0.0389)		(0.0323)
	LD	-0.2159	***	-0.1856 ***	0.1850	**		-0.1281	***	-0.0931 ***
		(0.0591)		(0.0410)	(0.0773)			(0.0404)		(0.0295)
	L2D	0.0454			-0.1034			0.0146		
		(0.0502)			(0.0963)			(0.0342)		
Equity	L3D				-0.0118			0.0052		
					(0.0161)			(0.0062)		
	L5D	-0.0097								
		(0.0142)								
Liquidity	L3D				0.0009		0.0011 **	-0.0001		
					(0.0005)		(0.0005)	(0.0004)		
	L5D	-0.0005								
		(0.0003)								
NPL	L3D				-0.0008			-0.0010		
					(0.0123)			(0.0029)		
	L5D	0.0043								
		(0.0065)								
Roa	L3D				0.0163			0.0014		
					(0.0313)			(0.0015)		
	L5D	0.0432	***	0.0392 ***						
		(0.0136)		(0.0115)						
NFLosses	L3D				0.0038			-0.0014		
					(0.0098)			(0.0057)		
	L5D	0.0048								
		(0.0049)								
PublicSL	L3D				0.0266			-0.0101	**	-0.0105 **
					(0.0658)			(0.0043)		(0.0042)
	L5D	-0.0266								
		(0.0359)								
NonR	L3D				0.0047			0.0007		
					(0.0137)			(0.0055)		
	L5D	0.0056								
		(0.0071)								
EmbiUY	D1	0.0619	**	0.0651 ***	0.0062		0.0051	-0.0101	**	-0.0096 ***
		(0.0264)		(0.0214)	(0.0118)		(0.0085)	(0.0039)		(0.0036)
Branch		0.0290		0.0272	-1.4857		-0.9720	0.0414		0.0393
		(0.0277)		(0.0253)	(1.2672)		(1.3719)	(0.0315)		(0.0279)
MS		-0.0012		0.0007	0.0503	**	0.0318	0.0051		0.0034
		(0.0084)		(0.0077)	(0.0205)		(0.0199)	(0.0046)		(0.0038)
Type1		0.0580		-0.0294			-2.0903			-0.0241
		(0.0802)		(0.0662)			(2.4441)			(0.0891)
Type2		0.0413		-0.0793	-3.2916		-1.8568	-0.1130		0.0763
		(0.1408)		(0.1111)	(3.1542)		(3.3940)	(0.1112)		(0.0875)
Type3				-0.0725	-0.2939	*	-2.3450	-0.0323		0.0418
				(0.0755)	(0.1604)		(3.3427)	(0.1139)		(0.0564)
Obs.		446		518	123		152	372		384
Groups		24		28	19		23	18		18
AR1 Test		0.0000		0.0000	0.0057		0.0000	0.0000		0.0000
AR2 Test		0.9028		0.9587	0.6119		0.1233	0.3736		0.6852
Sargan Test		1.0000		1.0000	1.0000		1.0000	1.0000		1.0000
Fundam. Test		0.0210		0.0010	0.7057		0.0019	0.3700		0.0130
Rs Test		0.0000		0.0000				0.2098		0.2794

Estimation method is Arellano and Bond (1991), one-step, Rs included as and endogenous variable, constant and individual effects (not reported). Dependent variable is the first difference of Lmat. Standard deviations in brackets. *** significant at 1 percent; ** significant at 5 percent; * significant at 10 percent. LiD is the order i lag of the first difference of the variable. D1 is the first difference of the variable. ARi Test is the p-value of the test of no autocorrelation of degree i; Sargan Test is the p-value of the test of over-identifying restrictions. Fundam. Test is the p-value of a test on the null that all fundamental variables are non-significant. Rs Test is the p-value of the test on the null that the sum of the Rs effects is equal to zero.

Table A-8 – Interest Rate Mean Reversion

Period	1 (2000.01 - 2001.12)	2 (2002.01 - 2002.07)	3 (2002.08 - 2004.12)	
Obs.	544	154	423	
Groups	28	23	22	
Rsquare	0.3708	0.2926	0.2345	
Coef.	-0.0236	-0.0096	-0.0971	***
Standard Deviation	(0.0184)	(0.0316)	(0.0176)	
Lower (95%)	-0.0597	-0.0716	-0.1316	
Upper (95%)	0.0125	0.0524	-0.0626	
Mean Reversion Time (months)	29.7	72.5	7.5	
Min. Reversion Time (months)	12.0	10.0	5.6	
Max. Reversion Time (months)	---	---	11.4	

Estimation method is Panel Data Random Effects. Constant, group and time effects included but no reported. Standard deviations in brackets. *** significant at 1 percent; ** significant at 5 percent and * significant at 10 percent.