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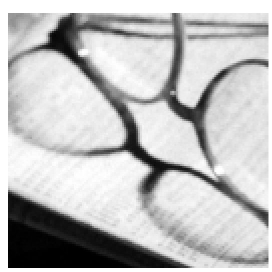
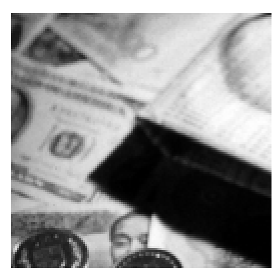

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Market Discipline under Systemic Risk: Evidence from Bank Runs in Emerging Economies

Eduardo Levy-Yeyati　　Maria Soledad Martinez Peria　　Sergio L. Schmukler*

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Abstract

This paper shows that systemic risk exerts a significant impact on the behavior of depositors, sometimes overshadowing their responses to standard bank fundamentals. Systemic risk can affect market discipline both regardless of and through bank fundamentals. First, worsening systemic conditions can directly threaten the value of deposits via dual agency problems. Second, systemic shocks can lead to a future deterioration of fundamentals and affect the exposure to systemic risk, not captured by standard fundamentals. Using data from the recent banking crises in Argentina and Uruguay, we show that market discipline is indeed quite robust once systemic risk is factored in. As the latter increases, the informational content of past fundamentals declines. These episodes also illustrate how few systemic shocks can trigger a run irrespective of ex-ante fundamentals. Overall, the evidence suggests that, in emerging economies, the notion of market discipline needs to account for systemic risk.

JEL classification codes: F30, F41, G14, G21, G28

Keywords: market discipline, idiosyncratic risk, systemic risk, emerging markets, depositor behavior, bank run, banking crises

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1. Introduction

The recent wave of financial crises has revived the interest in market discipline in financial systems and, particularly, in the banking sector. This attention is not merely academic, as it is also patent in the latest policy initiatives, such as the new capital proposal by the Basel Committee on Banking Supervision. The New Basel Capital Accord put forward by this body has three main components or "pillars." Pillar 3 lays out a number of disclosure requirements that banks are recommended to comply with, in order to enhance market discipline. As stated by the Bank for International Settlements (2001), "market discipline has the potential to reinforce minimum capital standards (pillar 1) and the supervisory review process (pillar 2), and so promote safety and soundness in banks and financial systems."[1] These are not just policy recommendations. Following these initiatives, policymakers in many countries have adopted several new regulations to enhance transparency and make information more readily accessible.

Market discipline in banking is commonly interpreted as a situation in which private sector participants (bondholders, stockholders, rating agencies, and depositors) 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).[2] The idea behind market discipline can be framed in the context of common principal-agent problems. The principal (say, the depositor) wants to ensure that the agent (the bank manager) protects her assets. Thus, depositors respond to increases in bank risk via prices or quantities, requiring higher interest rates on their deposits or withdrawing them altogether. This, in turn, penalizes managers for excessive risk taking, disciplining them ex-ante. If present, market discipline leads to a lower probability of individual

[1] Other recent initiatives to enhance market discipline include proposals to make it mandatory for banks to issue subordinated debt. See Calomiris (1997, 1999) and Evanoff and Wall (2000).
[2] In the case of rating agencies, because they do not have a direct economic stake in the financial firms, the costs they suffer if they fail to rate banks according to their risk is primarily a loss in reputation.

bank failures and generalized banking crises, and to a healthier banking sector as a whole (hence, the emphasis on information disclosure as a prudential tool).

The empirical literature on market discipline has grown in recent years and has taken various approaches to study market responses to bank fundamentals. One important strand of the literature focuses on the responses by bank stakeholders (depositors, bondholders, and stockholders) to bank fundamentals during tranquil times, namely, those periods not related to macroeconomic events. Bank fundamentals are intended to measure the banks' capacity to repay deposits, so they typically include the degree of non-performing loans, the return on assets, and the level of capitalization, among others. These measures are mostly meant to capture banks' exposure to idiosyncratic risk, i.e., the risk embedded in banks' assets coming from independent shocks to banks' customers. The evidence for the U.S. is vast and generally supports the existence of market discipline. Flannery (1998) and Flannery and Nikolova (2004) provide an exhaustive review of this literature. Recent work by Sironi (2003) also finds evidence of market discipline for the case of Europe. Similarly, the studies on developing countries during tranquil times tend to be consistent with market discipline. Some examples include Calomiris and Powell (2001) for Argentina, Barajas and Steiner (2000) for Colombia, Budnevich and Franken (2003) for Chile, and Ghosh and Das (2003) for India. Demirgüç-Kunt and Huizinga (2004) find evidence of market discipline in a sample that includes both developed and developing countries.

Other papers have focused on periods of financial distress, testing whether bank runs are random events or reflect the flight of depositors from troubled banks, anticipating their failure. While most of these papers have concentrated on the U.S. experience (see, for example, Gorton 1988, Goldberg and Hudgins 1996, and Calomiris and Mason 1997, 2000), a few have examined bank runs in developing countries during periods of financial distress (for example D'Amato, Grubisic, and Powell 1997 and Schumacher 1999 examine the case of Argentina during the 1994-95 Tequila crisis, while Gonzalez-Hermosillo 1999 looks at depositor behavior in Mexico during the same period and in Colombia during the 1982-87 crisis). More recently, some papers within this last group have highlighted the fact that traditional indicators of bank fundamentals tend to become less significant and explain a lower proportion of the total variance during crisis episodes than during tranquil times. As a result, the typical test of market discipline tends to fail despite the fact that market discipline seems to be present during tranquil times. See Martinez Peria and Schmukler (2001), Arena (2003), and De la Torre, Levy-Yeyati, and Schmukler (2003).

In the present paper, we show in detail that, although mostly ignored by the recent literature, systemic risk (driven by macroeconomic factors) is essential to understand the extent of market discipline and the way in which it materializes, particularly in emerging economies during crises.[3] Moreover, we show that systemic risk can affect market discipline both regardless of, and through bank fundamentals.

The effects of systemic risk on market discipline through bank fundamentals can take place both via a gradual deterioration of traditional bank fundamentals and via exposure to systemic risk not typically captured in these common indicators. An example of the first channel occurs as sovereign risk increases. In this case, a drop in government bond prices will negatively impact the return on assets of those banks holding government paper. Another instance of the first channel is the increase in non-performing loans following the realization of large systemic

[3] In a separate paper, Levy-Yeyati, Martinez Peria, and Schmukler (2004) argue that institutional factors prevalent in emerging markets are also important when analyzing market discipline. Institutional factors may affect market discipline by influencing the degree to which agents react to changes in bank fundamentals. The existence of well-functioning markets, the degree of government ownership of banks, the presence of guarantees, and the level of disclosure and transparency may affect the incentives of and the information available to market participants to respond to banks' idiosyncratic risk.

shocks, which are typically accompanied by a slowdown in economic activity. Regarding the second channel, an example arises in financially dollarized economies, where foreign currency deposits are allowed and banks hedge their currency exposure through foreign currency lending. In this environment, devaluations of the exchange rate will tend to affect foreign currency loans to unhedged borrowers (like those in the non-tradable sector). The commonly used bank fundamentals do not directly reflect this type of exposure. The examples on both channels suggest that although traditional bank fundamentals indeed tend to be affected by systemic factors, they capture the exposure to systemic events at best only partially and with some lags. This implies that the series of bank fundamentals that the market discipline literature has so far used needs to be expanded.

The effects of systemic factors on market discipline beyond bank fundamentals can take place as worsening systemic conditions directly threaten the value of market participants' assets (such as bank deposits). Classic examples of direct systemic effects are currency and sovereign risks. In the first case, depositors might flee from domestic banks irrespective of their individual health, if convertibility to a foreign currency is not an option.[4] In the second case, sovereign risk may affect market reactions as it impinges on the government's capacity to insure deposits or on the central bank's ability to provide liquidity assistance to banks facing deposit withdrawals, increasing the level of bank risk as perceived by depositors.

The incidence of systemic risk on market reaction can be analyzed in the context of a dual agency problem, as opposed to the common agency problem described above (see Tirole 2002). A dual agency problem introduces the government as a second agent affecting banks' capacity to pay. Specifically, governments can affect the value of bank deposits, interfering

[4] It is interesting to note that preventing these types of currency-induced runs was one of the reasons underscoring the lifting of those restrictions in many emerging economies, where the "peso problem" was prevalent.

directly or indirectly in private contracts, through actions that are largely beyond the control of bank managers.[5] As a result, when dual agency problems arise, depositors respond not only to bank-specific risk (disciplining bank managers), but also to the probability that systemic factors erode the value of their deposits irrespective of the managers' behavior.

In light of the above, the presence of systemic risk certainly has important implications for the literature on market discipline. In particular, the failure to find a link between market responses and traditional bank fundamentals does not imply the absence of market discipline. First, systemic risk might overshadow the informational content of observed (past) fundamentals as market participants (such as depositors) react to expected changes in future fundamentals. Second, as noted, traditional fundamentals do not explicitly take into account individual banks' exposure to systemic factors. Therefore, variables omitted in typical specifications need to be taken into account. Third, in addition to bank exposure to systemic risk, the impending risk of government intervention may prompt depositors to pull out from all banks indistinctly. Overall, the failure to observe market discipline in the traditional sense may be indicating that market participants react to relatively more relevant systemic risk factors, a finding that can be interpreted as a signal of market discipline, albeit in a broader sense.

To document the importance of systemic risk on market discipline, we study the evidence from the recent bank runs in Argentina and Uruguay during 2000-02, with a focus on the link between systemic factors and depositor behavior. We show that depositors indeed respond to the direct and indirect exposure to systemic risk as the latter increases. Moreover, we show that relatively few systemic shocks can easily destabilize an entire banking system and explain the

[5] For example, due to "too-big-to-fail" concerns, the government may be prompted to suspend the convertibility of all deposits to protect a few compromised banks. The placing of deposit rate caps and the ulterior suspension of deposit convertibility in Argentina in November-December 2001 may be explained, at least in part, using this argument.

generalized withdrawal experienced during the crises under study. Finally, we illustrate how the informational content of bank fundamentals deteriorates vis-à-vis systemic factors as systemic risk materializes, explaining why depositors may increase their response to systemic indicators at the expense of bank fundamentals. In the concluding section, we use the previous findings to discuss the role of market discipline in emerging economies, where systemic factors are an overriding concern. We argue that discipline should be understood in a broader sense relative to how it has been typically defined. Moreover, we claim that, though depositors are sensitive to risk, the disciplining effect that information disclosure can exert on managers is not obvious when market reaction is driven primarily by exogenous systemic factors.

The paper is organized as follows. Section 2 briefly summarizes the events surrounding the two crises analyzed. Section 3 describes the data and estimates the effects of systemic factors on market discipline. Section 4 estimates the informational content of past bank fundamentals vis-à-vis systemic risk factors. Section 5 discusses policy implications, and concludes.

2. Two Banking Crises

To study how systemic risks materialize in practice and how they affect depositor behavior, we focus on the recent bank runs in Argentina and Uruguay. We chose these episodes for a number of reasons. First, though surely not the only cases where systemic risks have played important roles, the difficulty in gathering detailed data force us to restrict the analysis to just a couple of countries. With the collaboration of the respective central banks, we were able to obtain rich data sets that allow us to test different hypotheses regarding depositor behavior during crises. Second, as described below, the fast collapses of their banking systems have surprised many analysts, particularly given the ex-ante relatively good health of their bank indicators.[6] This suggests that the deteriorating general economic conditions suddenly contaminated the banking sector, making the bank runs difficult to predict far in advance. Third, in both cases, we are able to track a sequence of macroeconomic events and to investigate how they affected bank deposits and interest rates. We start with a description of the Argentine crisis, by summarizing the more detailed analysis provided in De la Torre, Levy-Yeyati, and Schmukler (2003). In the case of Uruguay, our account of the crisis is focused on the description and diagnosis provided in Porto (2002), Fernández, Garda, and Perelmuter (2003), and Vallcorba (2003).

2.1. The Crisis in Argentina

In 1998, right before the beginning of the protracted recession that led to the crisis, Argentina was ranked among the most solid banking sectors within emerging countries. The regulatory reform initiated after the 1995 crisis led to well-capitalized, highly liquid, strongly provisioned banks that prompted the World Bank to place Argentina second among 12 emerging economies based on CAMELOT scores (the World Bank's version of the CAMEL rating).[7]

By December 1999, however, the Argentine economy was caught in a currency-growth-debt (CGD) trap. The currency was overvalued, growth was faltering, and the debt was hard to service.[8] This trap was in no small part due to major external shocks (the devaluation of the Brazilian real, the strong dollar, and high international interest rates, to name a few). Still, even

[6] For example, in both countries bank capital exceeded that observed in other countries in the region. The average capital to asset ratio was approximately 20 percent for banks in Argentina and 14 percent for banks in Uruguay, while it hovered around 13 percent in Chile, Peru, and Mexico, and 11 percent in Colombia.
[7] See World Bank (1998), Argentina Financial Sector Review.
[8] According to computations by Perry and Servén (2003), by mid-1999, the peso was overvalued by about 30 percent, in line with the view of most observers at the time. On the other hand, GDP growth was –3.4 percent in 1999 and –0.8 percent in 2000, which coupled with a high average rate on their public debt led the debt-to-GDP to increase from 39 percent in 1998, to 43.8 percent in 1999 and 46.4 percent in 2000.

by end-2000, based on standard fundamentals, Argentina could have been characterized as having a resilient banking sector.

The macroeconomic stance deteriorated sharply in 2001. Doubts about the one-to-one peg to the dollar soared after April 2001, when economic minister Cavallo announced the eventual peg of the peso to an equally weighted dollar-euro basket, once these two currencies reached parity, a move perceived as masking a way out of convertibility. In addition, Mr. Cavallo pushed successfully for the resignation of central bank president Pedro Pou (viewed by investors as a strict guardian of monetary and banking system soundness) and used his special powers to reform the central bank charter, removing limits on the ability of the central bank to inject liquidity, thereby effectively dismantling the money-issuance rule that underpinned convertibility.

At the same time, uncertainty about the debt component of the CGD trap grew as the government, instead of attempting an orderly debt reduction, postponed the impending crisis temporarily by absorbing the liquidity of banks and pension funds, rendering the banking system less liquid and more exposed to a government default.[9] As financing sources run out, the threat of money printing became a growing concern, and ultimately a reality through the issuance of small denomination government bonds that differed from currency only formally. This, in turn, added to the misgivings about the margin to preserve the currency board. In the process, debt sustainability and bank solvency became intimately linked to the fate of the currency.

The elements of this CGD trap (continued economic contraction, increasing default risk, and uncertainty about the exchange rate) reinforced each other. This led to a massive run on bank deposits. Between January 2001 and December 2001, time deposits fell by almost 50 percent

[9] Total banking system claims on the government rose from 15 percent at the end of 2000 to 20 percent by end-2001.

(Figure 1). Over the same period, the spread on government bonds as expressed in the EMBI+ index for Argentina rose from 703 to 4,385 basis points, while the difference between the 12-months non-deliverable forward (NDF) exchange rate and the spot peso/dollar exchange rate widened from 410 to 7,102 basis points.

The run on deposits was pervasive throughout the system (Figure 2). Similarly, interest rates on deposits rose for most banks (Figure 3). By the end of 2001, the run precipitated an economic meltdown, which featured the imposition of limits on cash withdrawals from bank accounts ("corralito") and the consequent disruption of the payment system.[10] These events were immediately followed by angry riots that prompted changes in presidents, a default on the government debt, the abandonment of the currency board into floating (an initial 40 percent devaluation immediately proved insufficient), the forcible conversion of dollar denominated deposits (and other financial contracts) into peso denominated ones at a below market exchange rate, and the lengthening of deposit maturities.

2.2. The Crisis in Uruguay

After three consecutive years of real GDP growth exceeding five percent, Uruguay's economy plunged into recession in 1999, when real GDP decreased by 2.8 percent. A number of international and domestic factors explain 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

[10] The name "corralito" ("little fence") was initially adopted because deposits could be used freely inside the financial system but could not leave the system. This measure should not be confused with the forcible reprogramming of time deposits that followed in January 2002, referred to locally as the "corralón" ("large fence").

international interest rates; and, finally, a severe drought that had a sharp negative impact on the agricultural sector.

Many of these adverse conditions (the strong dollar, the recession in Argentina, and high international interest rates) continued throughout 2000-01. 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 and the loss of competitiveness by Uruguayan goods due to the real appreciation of the peso, cast doubts on the sustainability of the prevailing exchange rate regime, and the authorities were forced to adjust the rate of devaluation within the band from 0.6 to 1.2 percent per month.

Despite the recession and all the adverse shocks experienced by Uruguay, confidence in the country's banking system had not been undermined by 2001. In fact, throughout that year, total deposits increased by 12 percent. In particular, U.S. dollar deposits by non-residents (which in 2001 represented almost 40 percent of all deposits) grew by 34 percent, while those from residents increased by 7 percent. 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 for capital flight, in part due to the presence of foreign banks and the implicit and unrestricted government deposit guarantee.

The "good" Argentine contagion towards Uruguay, however, turned bad after December 2001, when authorities in Argentina froze and pesified local deposits. In fact, by January 2002, events in Argentina and the affiliation of some Uruguayan banks to financial institutions in the neighboring country began to take its toll on the Uruguayan banking system. Initially, though, deposits fled only from the country's two largest private banks, Banco Galicia Uruguay (BGU) and Banco Comercial (both affiliated with Argentine banks). Between December 2001 and January 2002, these banks lost a combined total of 564 million dollars. The government suspended the operations of BGU, 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 fuel a generalized run.

By February 2002, the run spread to other banks, especially after Uruguay lost its investment grade rating, an event that highlighted and worsened the country's fiscal problems and lack of resources to forestall the liquidity run on banks. The run, in turn, reduced international reserves as banks withdrew from their dollar liquidity to meet deposit withdrawals, fueling 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 portfolio, already underway due to the economic downturn.

A vicious circle thus ensued, with the run on deposits, the loss of central bank 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 (Figure 1) and no bank was exempt from the run (Figure 2). At the same time, throughout this period the country and currency risks, already high in 2001, rose significantly. Following Uruguay's loss of the investment grade, the spread on sovereign bonds as measured by the Uruguay Bond Index (UBI) jumped from less than 300 to almost 2,000 basis points by July 2002. Similarly, the interest rate spread between peso and dollar time deposits almost doubled over the period, going from 2,310 to 4,520 basis points. Deposit withdrawals throughout July 2002 also reflected the resignation of the minister of economy on July 22.

On July 30, 2002, the government declared a four-day bank holiday, during which it negotiated financial support from the multilateral agencies (for a total of 1.5 billion dollars) to fund a program designed to avoid a general deposit freeze, such as the one imposed in Argentina six months earlier. 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 sight and savings 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. An amendment to this law was approved in December 2002, with the purpose of further strengthening the banking system.[11]

3. Systemic Risk and Depositor Responses

To evaluate depositor responses to systemic risk, we follow two distinct approaches, using two different types of data for the recent crises in Argentina and Uruguay. We begin by running regressions similar to those in the traditional market discipline literature discussed in the introduction. For each country, we conduct panel regressions using monthly bank-level

[11] The amendment imposed reporting obligations on bank employees that acquire knowledge of irregularities, authorized bank regulators to fine state-owned banks, and created a public register for bank shareholders. The new law also provided the basis for the liquidation of the four private banks (whose operations had been suspended during the bank holiday), expanded the powers of the central bank in connection with the liquidation of financial institutions and the application of prudential regulations of state-owned banks, and mandated the creation of a deposit insurance program.

information on deposits, interest rates, and bank fundamentals. We study the impact of systemic risks by adding to such regressions standard measures of country and exchange rate risks, along with bank-level measures of exposures to those risks.

During crisis periods, risks are likely to change daily and news events are expected to affect depositor behavior in ways not likely to be captured by the panel estimations. Thus, as a second approach, we run time-series regressions for each country using daily information on deposits, interest rates, and systemic factors, as well as a chronology of news that are expected to impact on the market's perception of systemic risk. We discuss each of these approaches and present the corresponding empirical results below. A description of all the variables used, along with the data sources is presented in Appendix Tables 1 and 2. Summary statistics are reported in Appendix Table 3.

3.1 Traditional Panel Estimates

Our baseline panel specification is as follows,

$$D_{i,t} = \alpha_i + \beta' F_{i,t-4} + \delta' E_{i,t-4} + \lambda' S_t + \varepsilon_{i,t}\,, \quad (1)$$

where i is the bank identifier and t is the period identifier.

D stands for the depositor reaction, alternatively the log of deposits, the change in deposits, and the interest rate on deposits. For the case of Argentina, we examine the behavior of deposits and interest rates in pesos and U.S. dollars separately. In the case of Uruguay, because prior to the crisis deposit dollarization exceeded 80 percent, we concentrate only on U.S. dollar deposits and interest rates.

F stands for bank fundamentals and is a matrix of bank level ratios that are intended to capture banks' asset quality, profitability, and capitalization levels. In particular, we include the ratio of non-performing loans to total loans, the ratio of equity to capital, and the return over assets. *S* stands for systemic risk; it is a matrix that includes measures of country and exchange rate risks. The former is captured by the spread on Argentine and, separately, Uruguayan sovereign bonds over comparable U.S. bonds, as expressed in Argentina's Emerging Market Bond Index Plus or EMBI+ and the Uruguay Bond Index or UBI, respectively. Exchange rate risk (or more precisely the currency premium) is measured by the 12-month forward (NDF) exchange rate relative to the spot exchange rate for Argentina. For Uruguay, we use the spread of the average interest rate on peso time deposits (with maturity of more than one month and less than six months, in the top private banks) relative to the rate on similar dollar deposits. *E* stands for exposure and is a matrix that includes indicators of individual banks' exposure to systemic risks. More precisely, we use the share of government debt (bonds and loans) over total bank assets as a proxy for exposure to "country" (sovereign default) risk. For exposure to exchange rate risk, we use the ratio of dollar loans over bank capital for Argentina and the ratio of dollars loans over assets for Uruguay.[12] All regressions control for bank specific effects, $\alpha_{i.}$.

Bank fundamentals and the indicators of bank exposure to systemic risks are lagged for two reasons. First, in both countries, balance sheet data are released to the public by bank regulators with a delay of three to four months; hence, the choice of our lag structure, which captures more precisely the information set available to depositors at any point in time. Second, this lag structure also helps to reduce potential endogeneity problems.

Results for Argentina and Uruguay are reported separately in Tables 1 to 6. Simple inspection of the tables reveals a similar pattern. The first column presents a regression of the

[12] The traditional way of measuring exchange rate risk is the difference between dollar assets and liabilities. However, here we are more interested in the embedded credit risk that arises from the dollar loans that banks often grant to debtors without dollar incomes. For Uruguay, we examine the ratio of dollar loans to assets, since equity turned negative for some banks during the crisis period.

different measures of depositor reaction on the set of standard fundamentals. While in many cases the fundamentals display the expected sign, they are generally not significant, neither individually nor jointly.[13] The explanatory power improves slightly with the introduction of the exposure variables (column 2), which tend to be significantly correlated with deposits and interest rates and, in those case, display the expected sign (negative for deposits; positive for interest rates).[14]

The incidence of the exposure to systemic risk, however, virtually disappears once we include the corresponding systemic risk control (columns 3 and 4). In all cases, an increase in country risk or devaluation expectations induces a decline in deposits or, alternatively, a hike in the demanded rate. Interestingly, some fundamentals tend to exhibit a slightly stronger link once omitted systemic risks are controlled for, suggesting that, while small relative to systemic factors, their incidence on market reaction does not disappear completely during crises. For example, return on assets becomes significant in the regressions for the log of peso time deposits for Argentina and capital is significant in the specifications for the change in dollar time deposits for Argentina and Uruguay.

Given the strong correlation of both systemic risk indices, it is not surprising that sometimes the sign of one of them inverts and the coefficient losses significance when included together (column 5). There is, however, another reason why exchange rate risk, once country risk is controlled for, exhibits a significantly positive association with the level of dollar deposits (but a significantly negative one with the level of peso deposits) in the case of Argentina. As noted in the previous section, the Argentine crisis entailed, in its earlier stages, a run from the currency

[13] The specification for the log of dollar time deposits for Argentina is the exception, where capital is positive and significant.

[14] In particular, exposure to country risk is significant in all regressions for Argentina and in the deposit regressions for Uruguay (see column 2).

(that is, from peso to dollar assets) that combined with the run from domestic banks. This was certainly not the case in Uruguay, where time deposits were already almost fully dollarized.

Do these results contradict our view of systemic risk exposure as a key bank-specific factor that explains the evolution of deposits and rates during the crisis? The answer is no. One has to bear in mind that systemic exposure (or, for that matter, any exposure to specific sources of risk) is good or bad according to whether the exposure is excessive, and whether the source of risk materializes. Trivially, high levels of systemic risk would not compromise banks solvency for minimal exposure. Similarly, to the extent that the associated risk factor is perceived to be relatively muted, high levels of exposure would not be a critical determinant of bank solvency. More generally, it is the interaction between exposure and systemic risk levels that matters as a driver of deposit reaction. This is exactly what we show in columns (6) to (8), where the two exposure variables are interacted with the associated risk factors. Interaction coefficients are significant and of the expected sign, indicating that, while systemic exposure per se may be perceived by the market as innocuous (and indeed, in some cases, as a sign of solvency, as suggested by the positive coefficients displayed by the exposure variables in some specifications), they may exert a negative reaction once the associated risk starts to mount.

Finally, note that a key difference between the Argentine and Uruguayan cases lies in the role of Uruguay as a regional financial center that has catered foreign depositors as much as local ones. As a result, dollar interest rates in Uruguay were significantly correlated with international rates (captured in our regressions by the LIBOR), as a reflection of international arbitrage. Moreover, Uruguay was typically perceived as a safe heaven by distressed investors in neighboring countries, particularly Argentina, which translated into portfolio inflows whenever one of these countries was threatened by a financial crisis. The latest Argentine crisis was not an exception. Whereas Uruguayan banks may have ultimately felt the adverse effect of bank failures in Argentina, they did benefit from the deposit run across the border at earlier stages of the crisis, as indicated by the positive and significant impact of the decline in deposits in the neighboring country (see the negative coefficient in column 9 of Tables 4 and 5).[15]

3.2 Dynamic Estimates

While the systemic variables used in the previous section explained reasonably well the evolution of deposits and interest rates at a monthly frequency, it is well known that financial variables tend to display extreme high frequency volatility during crises. This volatility tends to be the result of sudden changes in risk perception, either directly reflected in the systemic risk variables used in the previous tests or associated with specific events or news, which are taken as indicators of new developments in the unraveling of the crisis. At any rate, unlike bank-specific fundamentals, the incidence of systemic factors is likely to be apparent also (and perhaps even more so) at high frequencies.

In this section, we use daily data to examine the incidence of systemic factors from this different perspective. Specifically, we look at depositor reactions to daily events by estimating the following vector autoregressive regression (VAR) model,

$$y_t = \alpha + \Gamma_1 y_{t-1} + \ldots + \Gamma_p y_{t-p} + \upsilon_t, \quad (2)$$

where y_t is a vector including daily system-wide deposits or interest rates (the latter, due to data availability, only in the case of Argentina) along with measures of country risk, exchange rate risk (again, due to data availability, only in the case of Argentina), and a dummy capturing

[15] Similar results were obtained using Argentina's sovereign risk. However, given the strong trade links between the countries, Argentina's sovereign risk may have affected Uruguayan banks both (positively) through its incidence on the neighbor's financial sector and (negatively) through its adverse real impact on the local economy. In this sense, the decline of deposits lends itself to a clearer interpretation as a substitution effect between different locations.

important news that are expected to affect depositor behavior. The dummy variable takes the value of 1 for bad news and –1 for good news. A chronology of news events for Argentina and Uruguay is reported in Appendix Tables 4 and 5, respectively. $\Gamma_1 \ldots \Gamma_p$ are 3x3 parameter matrices, where p is the lag length, which in our estimations goes from one to ten days. Finally, α is the mean vector and υ_t is the vector of error terms.

Figures 4, 5, and 6 present the impulse response functions of deposits and interest rates estimated by the VAR, which, as can be seen, respond almost immediately to short-run systemic innovations. However, not all systemic factors exhibit the same incidence nor all variables are equally sensitive to systemic events. Peso deposits and interest rates, on one extreme, display the expected sensitivity to all three systemic factors. Effects are persistent for the level of deposits but revert for interest rates within two weeks, suggesting that whereas a deterioration of systemic factors dissuades depositors from renewing their deposits, the costs of withdrawing the funds (and possibly transferring them abroad, as casual evidence suggests was typically the case) make the withdrawal decision somewhat irreversible in the short-run. The same pattern can be observed for dollar deposits and interest rates in Argentina (where responses are relatively weaker) and Uruguay.

Table 7 illustrates the order of magnitude of the previous findings, reporting the cumulative (20-day for Argentina and 10-day for Uruguay) responses to the five largest systemic innovations to each of the three systemic factors considered here. The combined response shown in the last column simply adds the previous responses.[16] Interestingly, merely 15 systemic events are needed in Argentina to explain a decline of nearly 50 and 20 percent in peso and dollar deposits, respectively, over 20 days. This represents about two thirds and more than half of the

[16] Combined responses are calculated by adding the percentage point increases in the case of interest rates and the percentage changes in the case of deposits.

total decline of peso and dollar deposits over the crisis period. In the case of Uruguay, the largest ten shocks account for a decline of almost 15 percent of dollar deposits over a period of ten days, which accounts for more than one third of the total deposit fall during the crisis. These effects, coupled with the fact that deposits tend to display very little, if any, mean reversion, provide additional support to the view that market reaction during the crisis was largely driven by the evolution of systemic factors.

4. Systemic Risk and Bank Fundamentals

An issue that became apparent in the results discussed so far, but that remains to be explained, is why standard bank fundamentals are not significant in most of our estimations. If deposits and interest rates respond to increasingly volatile systemic risk, we would expect the latter to explain a larger share of market reaction. On the other hand, the way in which systemic risk affects the link between market reaction and bank fundamentals, as captured in the regression coefficients reported in Tables 1 to 6, is not straightforward. At best, the explanatory power of these fundamentals appears to be dwarfed by the influence of systemic factors.

As noted in the introduction, there are at least two reasonable explanations for this finding, which are not necessarily mutually exclusive. The first one relates to a dual agency problem. If systemic factors are an indication of the impending risk that a government action may affect the repayment capacity of the bank (as in the event of a sovereign default) or the terms of the deposit contract (due to a political decision not to let the most compromised banks go down), then from a depositor's standpoint the probability of being repaid ceases to depend on the evolution of objective indicators of bank solvency. Indeed, as described in Section 2, this dual agency problem, to different degrees, effectively led to government intervention in the context of the two crises considered here. Though dual agency problems are likely (to some degree) behind market responses, this hypothesis is difficult to test empirically.

A second explanation lies in the information content of fundamentals during crises. More precisely, to the extent that fundamentals are not independent from systemic factors, rapidly changing systemic innovations may detract from the predictive power of bank fundamentals that are released at lower frequencies and with a delay. This second explanation is easier to test in the data. To see how systemic factors can influence standard fundamentals it is enough to consider the case of non-performing loan ratios, which are likely to deteriorate due to the increase in borrowing costs and the downturn in economic activity associated with a systemic crisis.

To illustrate this point, consider the case of a depositor that attempts to assess the future evolution of a bank's portfolio (summarized here by its non-performing loan, NPL, ratio) over different time horizons, based on the most recently released ratio and readily available measures of systemic risk.[17] Assuming, as before, that balance sheet data are released with a four-month delay, this exercise amounts to predicting future values of the non-performing loan ratio using its four-month lag and systemic risk indicators that are currently available. In Table 8, we also report estimations with the NPL ratio lagged one month, to show in more detail how the informational value of the lagged dependent variable changes with the time horizon.

We replicate this exercise by estimating regressions of the type illustrated by the equation below,

$$NPL_{i,t} = \alpha_i + \beta\ NPL_{i,t-j} + \gamma\ S_{t-k} + \varepsilon_t\ , \quad (3)$$

where *NPL* refers to the non-performing loan ratio, *S* is a matrix of systemic factors (country risk and exchange rate risk), α_i refer to the individual bank effects, and ε_t is the error term. The sub-

[17] We focus on the ratio of non-performing loans to total loans, since we expect this variable to reflect bank conditions better than bank capital (which can be increased at any time by bank shareholders) and return on assets (which tends to be a more volatile measure of bank performance).

indexes k and j denote the number of lags in the systemic indicators and in *NPL*, respectively, used for predicting the evolution of bank's non-performing loan ratio.

Since equation (3) is a dynamic panel model, a fixed-effect estimator will be biased. Therefore, we obtain estimates for this model using Arellano and Bond's (1991) generalized method of moments (GMM). Table 8 reports these estimates for Argentina and Uruguay for $k=0$ and 4 and $j=0$, 4, and 8.[18] In both cases, the findings present a clear and common pattern. Systemic risk is a significant predictor of *NPL* even after controlling for its own lag, the more so the longer the time horizon, as reflected in the point estimates and standard errors. Indeed, whereas the explanatory power of systemic risk increases with the time horizon, the coefficient on the lagged non-performing loans ratio declines. This can be seen more clearly in Figure 7, where we plot, for each country, the GMM coefficients for *NPL* and *S* for $k=0$, $k=1$, $k=2$, $k=3$, and $k=4$ (that is, for time horizons that go from zero to four months ahead).

In sum, even if the probability of bank default could be summarized by bank-specific fundamentals, a depositor interested in assessing this probability over the next quarter based on currently available information is expected to monitor systemic variables as much as (if not more than) the latest balance sheet data released by the authorities. While measures of systemic risk are likely to be stable and relatively silent about the standing of individual banks during tranquil times, they become key indicators of bank health and, for that reason, key drivers of market reaction during crises.

[18] Though biased, comparable results are obtained using simple fixed-effects panel regressions.

5. Conclusions

Using evidence from the recent bank runs in Argentina and Uruguay, this paper showed that systemic risk has important effects on the way in which depositors behave and respond to standard bank fundamentals, questioning the traditional notion of market discipline. In particular, the paper illustrated how systemic risk may overshadow the role of bank fundamentals in driving market responses. The impact of systemic risk on market discipline takes place both through bank fundamentals and regardless of fundamentals. Bank fundamentals, useful indicators of bank health in tranquil times, may fail to capture macroeconomic risk exposures that tend to materialize in the run-up to a crisis and may be slow to incorporate the impact of macroeconomic risk once the latter becomes apparent. This is particularly so in crisis-prone emerging economies, where risk is of systemic nature to a larger degree (as the episodes studied here illustrate) and where few systemic shocks can rapidly destabilize banking systems that ex-ante appear to be robust.

The importance of systemic factors has relevant implications for both the literature on market discipline and the policy discussion on how to strengthen banking systems and prevent bank runs. This paper is perhaps the first systematic attempt to document the role of systemic risk. As such, it was not its goal to provide definite answers to either the academic or policy debates, but rather to open a new set of questions that future research might address. At any rate, we believe that the evidence presented here is strong enough to be overlooked by future work on these issues.

The findings of this paper are relevant for the academic literature on market discipline on at least two dimensions. First, the results of the paper imply that the concept of market discipline needs to be broadened, especially in the context of emerging markets, to avoid concluding incorrectly that market participants do not respond to risk.[19] The incidence of systemic risk, while partly accounting for the weaker explanatory power of typical bank fundamentals during crises, indicates that the information set to which market participants respond is wider than usually considered, and that market sensitivity to risk is quite robust when both idiosyncratic and systemic factors are taken into account. Broadening the concept of market discipline implies both using a new set of fundamentals (which measure bank exposure to systemic factors) and incorporating into the analysis the possibility that dual agency problems arise. Second, the fact that depositors react to systemic factors does not imply that fundamentals are not important. In principle, after controlling for systemic risk, depositors should still be (and generally are) sensitive to changing fundamentals. However, the information on past fundamentals, available to depositors, may fail to capture both systemic risk exposures and their own future evolution in the run-up to a crisis, making their information content less reliable relative to that of readily available systemic indicators.

The findings on this paper also yield important lessons for the policy debate. First, the quest for market discipline embedded in Basle's Pillar 3 and related proposals moves in the right direction, by addressing the supervisor's limitations (both in terms of human capital and as a result of agency problems) to enforce the implementation of prudential regulation. Nevertheless, it faces serious shortcomings in the context of emerging markets, where a number of systemic factors alter the relation between market responses and bank fundamentals. In fact, the view of market sensitivity as a disciplining device is indeed questionable when market reaction is driven by macroeconomic conditions largely beyond the control of bank managers.[20] From a prudential perspective, our argument calls for a distinction between market responses to idiosyncratic

[19] This lack of response has been usually attributed to implicit guarantees or imperfect information.
[20] See Cordella and Levy-Yeyati (1998) for an analytical discussion of the link between information disclosure, market discipline, and the nature of the underlying risk.

factors, on one hand, and to systemic factors, on the other. Market responses to idiosyncratic risk can truly discipline bank managers, forcing them to run sound banks with healthy fundamentals. However, market responses to systemic risk may at times be independent of the soundness of bank fundamentals. In this environment, the only action that managers can take to limit adverse market responses is to minimize (to the extent possible) their exposure to systemic factors.

Second, governments and international institutions can help reduce the exposure to systemic factors through prudential regulation. For example, liquid asset and provisioning requirements could take into account the denomination of bank loans. Similarly, the risk assigned to government bonds to compute capital requirement could be based on market considerations. Such simple measures to address systemic exposures, unwarranted in developed countries, have been typically absent from regulations, even when the latter are adopted by emerging economies.

A third policy implication relates to the dual agency problem. The market reaction to systemic risk, through deposit withdrawals and higher interest rates, may indirectly discipline the government and prevent it from taking actions that can reduce the value of bank deposits. However, initiatives to reduce the scope for government intervention (such as transparent banking crisis resolution procedures) might further help to avoid bank runs.

To conclude, much effort has been spent during the last years to strengthen banks in emerging economies. Somewhat surprisingly, however, relatively less emphasis has been placed on limiting the incidence of systemic risk. This paper has shown that a more balanced effort is needed to enhance the stability and resilience of the banking sector where systemic risk prevails.

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Table 1
Market Reaction to Bank Fundamentals and Systemic Risk - Argentina
Deposit Level
September 2000 - December 2001

	Log of Peso Time Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	-0.745	-0.671	-0.125	0.001	-0.063	-0.479	-0.653 *	-0.548
	[1.579]	[1.377]	[0.488]	[0.003]	[0.248]	[1.252]	[1.759]	[1.632]
Capital/Assets (t-4)	-0.004	-0.003	-0.001	0.005	0.002	0.001	-0.002	0.000
	[0.639]	[0.411]	[0.180]	[1.365]	[0.448]	[0.231]	[0.504]	[0.048]
Return on Assets (t-4)	0.017	0.009	0.039 ***	0.043 ***	0.041 ***	0.021	0.006	0.012
	[0.888]	[0.460]	[4.560]	[4.774]	[4.996]	[1.262]	[0.378]	[0.867]
Log of Assets (t-4)	1.723 ***	1.688 ***	0.070	0.176	0.036	0.811 ***	0.866 ***	0.623 ***
	[6.910]	[6.795]	[0.562]	[1.352]	[0.301]	[3.639]	[4.560]	[3.584]
Bank Exposure to Country Risk (t-4)		-0.802	-0.095		-0.023	1.482 ***		0.955 **
		[2.065]**	[0.453]		[0.107]	[3.356]		[2.308]
Bank Exposure to Exchange Rate Risk (t-4)		0.001		0.001	0.002		0.014 ***	0.011 ***
		[0.495]		[0.784]	[1.183]		[2.874]	[2.617]
Country Risk (t)			-4.019 ***		-2.777 ***			
			[14.966]		[5.058]			
Exchange Rate Risk (t)				-1.848 ***	-0.652 ***			
				[16.069]	[3.374]			
Bank Exposure to Country Risk (t-4) * Country Risk (t)						-11.670 ***		-6.392 **
						[4.803]		[2.460]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							-0.403 ***	-0.286 ***
							[10.769]	[5.562]
Observations	536	535	535	536	535	535	536	535
Adjusted R-squared	0.969	0.969	0.988	0.987	0.989	0.978	0.980	0.982
F-test for Bank Fundamentals	0.850	0.640	7.480	9.580	9.540	0.917	1.221	1.021
P-value of F-test	0.460	0.590	0.000	0.000	0.000	0.432	0.301	0.383

	Log of Dollar Time Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	-0.342	-0.318	-0.188	-0.189	-0.208	-0.267	-0.311	-0.268
	[1.618]	[1.564]	[1.127]	[1.026]	[1.294]	[1.491]	[1.553]	[1.502]
Capital/Assets (t-4)	0.005 **	0.005 **	0.006 ***	0.007 ***	0.005 **	0.007 ***	0.006 **	0.006 ***
	[2.112]	[2.232]	[2.845]	[3.104]	[2.528]	[2.903]	[2.366]	[2.835]
Return on Assets (t-4)	-0.001	-0.003	0.002	0.002	0.001	-0.001	-0.005	-0.003
	[0.193]	[0.431]	[0.438]	[0.371]	[0.181]	[0.205]	[0.651]	[0.401]
Log of Assets (t-4)	0.340 ***	0.333 ***	-0.043	0.051	-0.033	0.126	0.193 **	0.107
	[3.406]	[3.254]	[0.528]	[0.611]	[0.403]	[1.302]	[2.058]	[1.165]
Bank Exposure to Country Risk (t-4)		-0.155	0.023		-0.002	0.403 *		0.343
		[0.848]	[0.139]		[0.014]	[1.786]		[1.486]
Bank Exposure to Exchange Rate Risk (t-4)		0.002 *		0.002	0.002		0.004 **	0.003 *
		[1.743]		[1.428]	[1.533]		[2.375]	[1.895]
Country Risk (t)			-1.117 ***		-1.703 ***			
			[8.882]		[6.272]			
Exchange Rate Risk (t)				-0.389 ***	0.288 ***			
				[6.998]	[2.978]			
Bank Exposure to Country Risk (t-4) * Country Risk (t)						-3.166 ***		-2.487 **
						[3.379]		[2.248]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							-0.076 ***	-0.034 *
							[5.584]	[1.925]
Observations	531	530	530	531	530	530	531	530
Adjusted R-squared	0.997	0.997	0.998	0.997	0.998	0.997	0.997	0.997
F-test for Bank Fundamentals	2.990	3.160	3.340	4.020	2.840	3.672	3.287	3.600
P-value of F-test	0.030	0.020	0.020	0.010	0.040	0.012	0.021	0.014

This table reports fixed-effects regressions with robust standard errors of peso and dollar time deposits on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over equity. Country risk is measured by the spreads on Argentine sovereign bonds over comparable U.S. bonds (as expressed in the Argentine part of the EMBI+). Exchange rate risk is measured as the 12-month NDF exchange rate relative to the spot exchange rate. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 1.

Table 2
Market Reaction to Bank Fundamentals and Systemic Risk - Argentina
Deposit Change
September 2000 - December 2001

	Percent Change in Peso Time Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	-0.166	-0.134	-0.098	-0.054	-0.107	-0.151	-0.203	-0.177
	[0.646]	[0.543]	[0.617]	[0.309]	[0.685]	[0.819]	[0.973]	[0.987]
Capital/Assets (t-4)	-0.002	-0.001	0.002	0.004	0.002	0.002	0.001	0.002
	[0.575]	[0.244]	[1.049]	[1.615]	[0.864]	[0.915]	[0.273]	[0.922]
Return on Assets (t-4)	0.001	-0.003	0.007	0.008	0.006	0.002	-0.003	0.000
	[0.112]	[0.311]	[1.131]	[1.191]	[0.997]	[0.229]	[0.360]	[0.042]
Bank Exposure to Country Risk (t-4)		-0.435 **	-0.100		-0.114	0.517 **		0.370 *
		[2.100]	[0.605]		[0.696]	[2.320]		[1.727]
Bank Exposure to Exchange Rate Risk (t-4)		0.002		0.002	0.002		0.007 ***	0.005 **
		[1.367]		[1.425]	[1.576]		[2.790]	[2.378]
Country Risk (t)			-1.253 ***		-1.587 ***			
			[15.194]		[6.429]			
Exchange Rate Risk (t)				-0.543 ***	0.172			
				[11.003]	[1.410]			
Bank Exposure to Country Risk (t-4) *						-4.476 ***		-3.011 ***
Country Risk (t)						[7.274]		[4.704]
Bank Exposure to Exchange Rate Risk (t-4) *							-0.138 ***	-0.073 ***
Exchange Rate Risk (t)							[9.054]	[3.888]
Observations	536	535	535	536	535	535	536	535
Adjusted R-squared	-0.029	-0.019	0.304	0.240	0.305	0.190	0.165	0.218
F-test for Bank Fundamentals	0.210	0.190	1.160	1.680	0.870	0.571	0.512	0.696
P-value of F-test	0.890	0.910	0.320	0.170	0.450	0.634	0.675	0.555

	Percent Change in Dollar Time Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	-0.140	-0.120	-0.104	-0.093	-0.125	-0.124	-0.150	-0.129
	[0.983]	[0.885]	[1.131]	[0.868]	[1.406]	[1.271]	[1.204]	[1.312]
Capital/Assets (t-4)	0.001	0.001	0.003 **	0.003 **	0.002	0.003 **	0.002	0.003 **
	[0.549]	[0.879]	[2.137]	[2.355]	[1.470]	[2.190]	[1.249]	[2.140]
Return on Assets (t-4)	0.004	0.001	0.005 *	0.006 *	0.004	0.003	0.001	0.002
	[0.751]	[0.258]	[1.794]	[1.653]	[1.431]	[0.816]	[0.239]	[0.639]
Bank Exposure to Country Risk (t-4)		-0.246 **	-0.075		-0.103	0.249 *		0.213
		[2.101]	[0.723]		[1.043]	[1.836]		[1.551]
Bank Exposure to Exchange Rate Risk (t-4)		0.000		0.000	0.000		0.002 **	0.001
		[0.313]		[0.449]	[0.800]		[2.429]	[1.309]
Country Risk (t)			-0.705 ***		-1.272 ***			
			[13.556]		[10.635]			
Exchange Rate Risk (t)				-0.256 ***	0.275 ***			
				[7.713]	[5.111]			
Bank Exposure to Country Risk (t-4) *						-2.562 ***		-2.179 ***
Country Risk (t)						[5.971]		[4.329]
Bank Exposure to Exchange Rate Risk (t-4) *							-0.061 ***	-0.018 *
Exchange Rate Risk (t)							[6.276]	[1.877]
Observations	531	530	530	531	530	530	531	530
Adjusted R-squared	-0.028	-0.013	0.343	0.211	0.380	0.247	0.140	0.252
F-test for Bank Fundamentals	0.690	0.750	3.170	3.120	1.960	2.438	1.237	2.344
P-value of F-test	0.560	0.520	0.020	0.030	0.120	0.064	0.296	0.072

This table reports fixed-effects regressions with robust standard errors of the percent change in peso and dollar time deposits on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over equity. Country risk is measured by the spreads on Argentine sovereign bonds over comparable U.S. bonds (as expressed in the Argentine part of the EMBI+). Exchange rate risk is measured as the 12-month NDF exchange rate relative to the spot exchange rate. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 1.

Table 3
Market Reaction to Bank Fundamentals and Systemic Risk - Argentina
Interest Rates
September 2000 - December 2001

	Interest Rates on Total Peso Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	0.032	0.021	0.041	0.065	0.056	0.053	0.078 *	0.078 *
	[0.917]	[0.525]	[0.922]	[1.390]	[1.192]	[1.234]	[1.721]	[1.734]
Capital/Assets (t-4)	-0.001	-0.001	-0.001	-0.001 *	-0.001	-0.001	-0.001 **	-0.001 **
	[0.623]	[1.019]	[1.263]	[1.980]	[1.938]*	[1.527]	[1.997]	[2.133]
Return on Assets (t-4)	0.000	0.001	0.000	-0.001	0.000	0.000	0.000	0.000
	[0.110]	[1.165]	[0.041]	[0.629]	[0.134]	[0.121]	[0.099]	[0.080]
Bank Exposure to Country Risk (t-4)		0.113 **	0.054		0.045	-0.021		-0.007
		[2.495]	[1.365]		[1.093]	[0.517]		[0.136]
Bank Exposure to Exchange Rate Risk (t-4)		-0.002		-0.005	-0.004		-0.011 ***	-0.010 **
		[0.717]		[1.602]	[1.302]		[2.766]	[2.532]
Country Risk (t)			0.077 ***		-0.114			
			[3.888]		[0.901]			
Exchange Rate Risk (t)				0.048 ***	0.109			
				[4.653]	[1.570]			
Bank Exposure to Country Risk (t-4) * Country Risk (t)						0.319 ***		0.085
						[5.030]		[0.697]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							0.015 ***	0.013 **
							[4.648]	[2.321]
Observations	162	162	162	162	162	162	162	162
Adjusted R-squared	0.355	0.386	0.540	0.552	0.552	0.503	0.579	0.577
F-test for Bank Fundamentals	0.610	0.880	0.980	2.670	2.290	1.475	2.496	2.972
P-value of F-test	0.610	0.450	0.400	0.050	0.080	0.225	0.064	0.035

	Interest Rates on Total Dollar Deposits							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Non-Performing Loans/Total Loans (t-4)	0.048	0.020	0.053	0.052 *	0.042	0.067 **	0.062 **	0.061 **
	[1.576]	[0.626]	[1.562]	[1.750]	[1.409]	[2.019]	[2.067]	[2.059]
Capital/Assets (t-4)	0.001	0.001	0.000	0.001	0.001	0.000	0.001	0.000
	[0.809]	[1.053]	[0.430]	[0.802]	[0.717]	[0.168]	[0.864]	[0.618]
Return on Assets (t-4)	0.001	0.003 **	0.002	0.001	0.002	0.001	0.002	0.002
	[0.909]	[2.096]	[1.273]	[0.995]	[1.279]	[1.328]	[1.381]	[1.534]
Bank Exposure to Country Risk (t-4)		0.113 ***	0.042		0.047	-0.028		-0.011
		[2.716]	[1.128]		[1.459]	[0.790]		[0.315]
Bank Exposure to Exchange Rate Risk (t-4)		0.004 **		0.003	0.002		-0.002	0.001
		[2.018]		[1.500]	[1.236]		[0.743]	[0.523]
Country Risk (t)			0.062 ***		0.278 ***			
			[5.385]		[3.656]			
Exchange Rate Risk (t)				0.035 ***	-0.123 ***			
				[5.395]	[2.849]			
Bank Exposure to Country Risk (t-4) * Country Risk (t)						0.288 ***		0.203 ***
						[6.212]		[3.121]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							0.010 ***	0.004 *
							[5.726]	[1.696]
Observations	161	161	161	161	161	161	161	161
Adjusted R-squared	0.395	0.457	0.603	0.586	0.625	0.607	0.576	0.622
F-test for Bank Fundamentals	1.540	2.950	1.550	1.910	1.640	2.057	3.307	2.693
P-value of F-test	0.210	0.040	0.210	0.130	0.180	0.110	0.023	0.050

This table reports fixed-effects regressions with robust standard errors of peso and dollar deposit interest rates on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over equity. Country risk is measured by the spreads on Argentine sovereign bonds over comparable U.S. bonds (as expressed in the Argentine part of the EMBI+). Exchange rate risk is measured as the 12-month NDF exchange rate relative to the spot exchange rate. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 1.

Table 4
Market Reaction to Bank Fundamentals and Systemic Risk - Uruguay
Deposit Level
January 2001 - July 2002

	Log of Dollar Time Deposits								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Non-Performing Loans/Total Loans (t-4)	-1.634 *	-1.411	1.692 ***	1.485 **	1.925 ***	0.027	1.008	1.337 *	0.970
	[1.775]	[1.576]	[2.768]	[2.352]	[3.183]	[0.031]	[1.464]	[1.813]	[1.372]
Capital/Assets (t-4)	-1.104	-0.503	-0.838	-0.983	-0.988	-1.214	-0.088	-0.679	-0.369
	[1.031]	[0.520]	[1.056]	[1.345]	[1.306]	[1.294]	[0.124]	[0.927]	[0.525]
Return on Assets (t-4)	2.411	2.022	-0.284	-0.488	-0.482	2.761	-0.203	0.606	0.573
	[1.426]	[1.210]	[0.171]	[0.338]	[0.288]	[1.836]*	[0.196]	[0.570]	[0.557]
Log of Assets (t-4)	0.690 ***	0.701 ***	0.437 ***	0.816 ***	0.514 ***	0.624 ***	0.864 ***	0.798 ***	0.725 ***
	[3.132]	[3.391]	[2.985]	[5.319]	[3.478]	[3.788]	[5.414]	[5.729]	[5.350]
Bank Exposure to Country Risk (t-4)		-2.075 *	0.144		0.859	2.751 ***		2.768 ***	2.480 ***
		[1.917]	[0.167]		[1.043]	[3.113]		[3.499]	[3.065]
Bank Exposure to Exchange Rate Risk (t-4)		-0.095		0.267	0.407		0.771 **	0.743 **	0.786 **
		[0.184]		[0.898]	[1.445]		[2.418]	[2.493]	[2.431]
Country Risk (t)			-5.242 ***		-4.279 ***				
			[12.187]		[6.420]				
Exchange Rate Risk (t)				-1.538 ***	-0.439 **				
				[12.981]	[2.459]				
Bank Exposure to Country Risk (t-4) * Country Risk (t)						-42.470 ***		-21.744 ***	-20.293 ***
						[6.663]		[4.797]	[4.455]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							-2.181 ***	-1.869 ***	-2.324 ***
							[14.932]	[12.034]	[13.831]
Total Deposits in Argentina (t)									-0.009 ***
									[5.545]
Observations	538	538	538	538	538	538	538	538	538
Adjusted R-squared	0.970	0.971	0.985	0.982	0.986	0.977	0.983	0.984	0.985
F-test for Bank Fundamentals	1.610	1.990	9.390	14.000	13.230	2.350	3.940	11.160	4.190
P-value of F-test	0.190	0.110	0.000	0.000	0.000	0.070	0.010	0.000	0.010

This table reports fixed-effects regressions with robust standard errors of dollar time deposits on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over total assets. Country risk is measured by the spreads on Uruguayan sovereign bonds over comparable U.S. bonds (as expressed in the Uruguay Bond Index or UBI). Exchange rate risk is measured as the spread of the average interest rate of peso time deposits with a maturity of more than one month and less than six months in the top private banks relative to similar deposits in dollars. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 2.

Table 5
Market Reaction to Bank Fundamentals and Systemic Risk - Uruguay
Deposit Change
January 2001 - July 2002

	Percent Change in Dollar Time Deposits								
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
Non-Performing Loans/Total Loans (t-4)	-0.337	-0.242	0.493 ***	0.416 **	0.519 ***	0.044	0.265	0.313 *	0.274
	[1.607]	[1.284]	[2.881]	[2.433]	[3.016]	[0.244]	[1.592]	[1.853]	[1.628]
Capital/Assets (t-4)	0.400	0.687 ***	0.724 ***	0.360 *	0.525 **	0.585 ***	0.574 ***	0.640 ***	0.727 ***
	[1.578]	[3.217]	[3.465]	[1.840]	[2.520]	[2.855]	[2.997]	[3.369]	[3.731]
Return on Assets (t-4)	0.019	-0.173	-0.733	-0.676	-0.783	-0.055	-0.576	-0.579	-0.618
	[0.036]	[0.352]	[1.372]	[1.405]	[1.589]	[0.115]	[1.457]	[1.492]	[1.591]
Bank Exposure to Country Risk (t-4)		-1.102 ***	-0.556 ***		-0.365 *	-0.137		-0.219	-0.278
		[5.161]	[3.070]		[1.877]	[0.605]		[1.029]	[1.285]
Bank Exposure to Exchange Rate Risk (t-4)		-0.124		0.055	0.000		0.190 **	0.119	0.127 *
		[1.609]		[0.667]	[0.001]		[2.469]	[1.538]	[1.758]
Country Risk (t)			-1.043 ***		-0.376 ***				
			[11.395]		[3.270]				
Exchange Rate Risk (t)				-0.409 ***	-0.296 ***				
				[13.149]	[6.287]				
Bank Exposure to Country Risk (t-4) *						-7.506		-1.606 *	-1.289
Country Risk (t)						[5.881]		[1.789]	[1.361]
Bank Exposure to Exchange Rate Risk (t-4) *							-0.583 ***	-0.539 ***	-0.628 ***
Exchange Rate Risk (t)							[15.602]	[12.494]	[11.729]
Total Deposits in Argentina (t)									-0.002 ***
									[2.901]
Observations	538	538	538	538	538	538	538	538	538
Adjusted R-squared	0.031	0.076	0.293	0.339	0.353	0.149	0.370	0.375	0.384
F-test for Bank Fundamentals	6.010	18.550	4.370	2.700	3.850	6.290	4.160	4.600	5.760
P-value of F-test	0.000	0.000	0.000	0.040	0.010	0.000	0.010	0.000	0.000

This table reports fixed-effects regressions with robust standard errors of the percent change in dollar time deposits on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over total assets. Country risk is measured by the spreads on Uruguayan sovereign bonds over comparable U.S. bonds (as expressed in the Uruguay Bond Index or UBI). Exchange rate risk is measured as the spread of the average interest rate of peso time deposits with a maturity of more than one month and less than six months in the top private banks relative to similar deposits in dollars. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 2.

Table 6
Market Reaction to Bank Fundamentals and Systemic Risk - Uruguay
Interest Rates
January 2001 - July 2002

	Interest Rates on Dollar Time Deposits								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Non-Performing Loans/Total Loans (t-4)	0.014	0.014	-0.011	0.016	-0.021	0.004	0.019	0.004	0.005
	[0.397]	[0.392]	[0.344]	[0.460]	[0.645]	[0.109]	[0.523]	[0.115]	[0.135]
Capital/Assets (t-4)	0.015	0.013	0.000	0.017	-0.015	0.011	0.025	0.020	0.022
	[0.428]	[0.332]	[0.006]	[0.464]	[0.416]	[0.280]	[0.667]	[0.518]	[0.557]
Return on Assets (t-4)	-0.039	-0.037	-0.016	-0.041	-0.030	-0.038	-0.051	-0.057	-0.052
	[0.539]	[0.508]	[0.242]	[0.588]	[0.463]	[0.520]	[0.708]	[0.777]	[0.717]
LIBOR (t)	0.709 ***	0.714 ***	0.763 ***	0.697 ***	0.602 ***	0.723 ***	0.646 ***	0.630 ***	0.721 ***
	[17.225]	[16.905]	[17.923]	[13.372]	[9.796]	[16.469]	[13.270]	[12.349]	[9.886]
Bank Exposure to Country Risk (t-4)		0.013	-0.002		0.009	-0.017		-0.019	-0.018
		[0.487]	[0.090]		[0.376]	[0.729]		[0.669]	[0.616]
Bank Exposure to Exchange Rate Risk (t-4)		0.005		0.003	0.003		0.005	0.011	0.011
		[0.428]		[0.276]	[0.283]		[0.585]	[1.025]	[1.050]
Country Risk (t)			0.037		0.101 ***				
			[2.192]**		[3.449]				
Exchange Rate Risk (t)				-0.002	-0.036 ***				
				[0.276]	[3.142]				
Bank Exposure to Country Risk (t-4) * Country Risk (t)						0.227 *		0.396 **	0.383 **
						[1.737]		[2.565]	[2.469]
Bank Exposure to Exchange Rate Risk (t-4) * Exchange Rate Risk (t)							-0.012 *	-0.021 ***	-0.021 ***
							[1.912]	[2.818]	[2.920]
Total Deposits in Argentina (t)									0.000
									[1.737]*
Observations	578	578	578	578	578	578	578	578	578
Adjusted R-squared	0.719	0.718	0.723	0.718	0.732	0.719	0.720	0.722	0.723
F-test for Bank Fundamentals	0.130	0.120	0.070	0.160	0.320	0.090	0.230	0.210	0.180
P-value of F-test	0.940	0.950	0.980	0.920	0.810	0.970	0.880	0.890	0.910

This table reports fixed-effects regressions with robust standard errors of dollar time deposit interest rates on bank fundamentals and systemic risk indicators. Bank exposure to country risk is calculated as government bonds and loans to the public sector over total assets. Bank exposure to exchange rate risk is measured as dollar loans over total assets. Country risk is measured by the spreads on Uruguayan sovereign bonds over comparable U.S. bonds (as expressed in the Uruguay Bond Index or UBI). Exchange rate risk is measured as the spread of the average interest rate of peso time deposits with a maturity of more than one month and less than six months in the top private banks relative to similar deposits in dollars. The F-test reported is a joint test that all of the fundamentals included in the regression (non-performing loans over total loans, capital over total assets, and return on assets) are jointly equal to zero. A constant is estimated but not reported. t-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. For a complete description of the data and sources see Appendix Table 2.

Table 7
Response of Deposits and Interest Rates to Crisis Shocks

Argentina - 20-day Cumulative Response

	News	Country Risk	Exchange Rate Risk	Combined Response
System Peso Time Deposits	-19.2%	-11.5%	-15.5%	-46.1%
System Dollar Time Deposits	-9.7%	-4.3%	-5.6%	-19.6%
Average Interest Rate on Peso Time Deposits for the System	5.1	7.8	17.5	30.3
Average Interest Rate on Dollar Time Deposits for the System	2.2	1.0	5.7	8.9

Uruguay - 10-day Cumulative Response

	News	Country Risk	Combined Response
System Dollar Deposits	-7.7%	-7.0%	-14.7%

These tables show the cumulative (20-day for Argentina and 10-day for Uruguay) response of interest rates and deposits to the five largest shocks in each series. In the case of interest rates, the figures shown represent percentage point increases, while in the case of deposits, the figures represent percent changes. The combined response column shows the effects of joint shocks to news, country risk, and exchange rate risk. Combined responses are calculated by adding the percentage point increases in the case of interest rates and adding the changes in the case of deposits. See Appendix Tables 1 and 2 for the definition of the variables.

Table 8
Fundamentals Reaction to Past Fundamentals and Systemic Risk

Argentina
September 2000 - December 2001

	Non-Performing Loans/Total Loans (t)					
	j=1,k=0	j=4,k=0	j=4,k=0	j=8,k=4	j=4,k=0	j=8,k=4
Non-Performing Loans/Total Loans (t-j)	0.926 ***	0.518	0.385	0.049	0.379	0.083
	[3.645]	[1.399]	[1.302]	[0.450]	[1.301]	[1.625]
Country Risk (t-k)			0.084	0.598 **		
			[1.482]	[2.204]		
Exchange Rate Risk (t-k)					0.044 *	0.213 **
					[1.843]	[1.980]
Observations	496	493	493	487	493	487
Number of Banks	49	49	49	47	49	47
Hansen Test of Overid. Restrictions: P-value	1.00	1.00	1.00	1.00	1.00	1.00

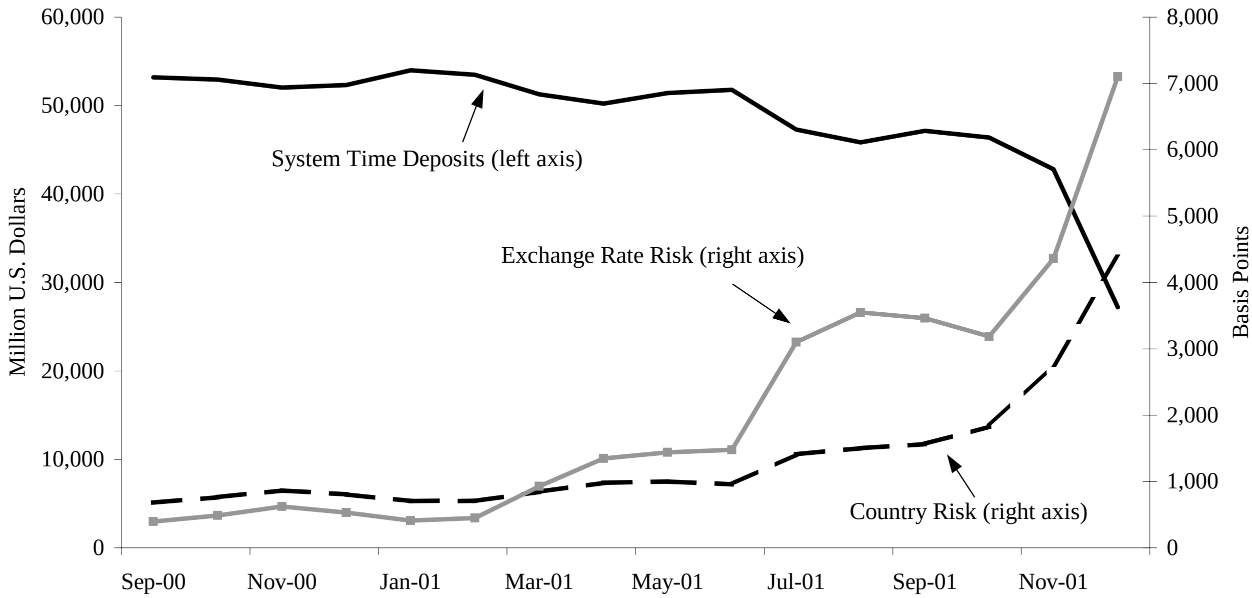
Uruguay
January 2001 - July 2002

	Non-Performing Loans/Total Loans (t)					
	j=1,k=0	j=4,k=0	j=4,k=0	j=8,k=4	j=4,k=0	j=8,k=4
Non-Performing Loans/Total Loans (t-j)	1.004 ***	0.865 ***	0.475 ***	0.310 ***	0.514 ***	0.177 **
	[18.456]	[4.611]	[9.139]	[2.710]	[5.709]	[2.070]
Country Risk (t-k)			0.359 ***	1.607 ***		
			[6.989]	[4.898]		
Exchange Rate Risk (t-k)					0.104 ***	0.262 ***
					[6.971]	[5.915]
Observations	482	474	507	499	507	499
Number of Banks	30	29	31	31	31	31
Hansen Test of Overid. Restrictions: P-value	1.00	1.00	1.00	1.00	1.00	1.00

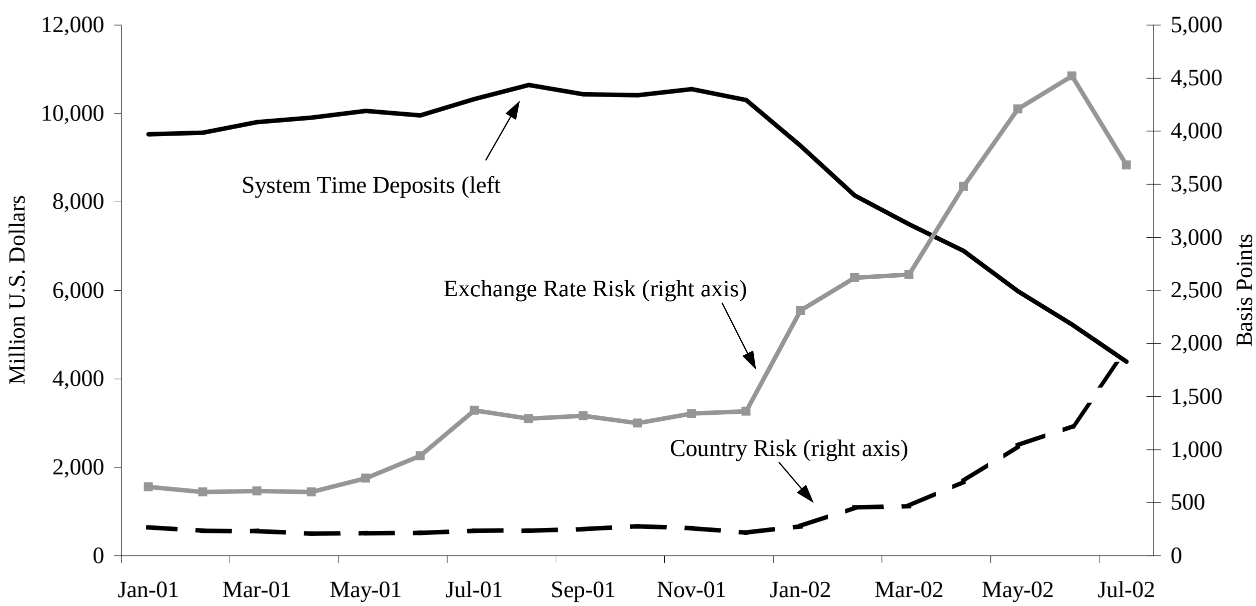
These tables report regressions of the non-performing loans ratio on its lagged values and systemic risk factors, estimated using Arellano and Bond's (1991) GMM procedure with heteroskedasticity robust standard errors. The Hansen test reported is a test of overidentyfying restrictions. The joint null hypothesis is that the instruments are valid (uncorrelated with the error term). z-statistics are in brackets. *, **, *** mean significance at ten, five, and one percent, respectively. See Appendix Tables 1 and 2 for the definition of the variables.

Figure 1
Evolution of Time Deposits and Systemic Factors

Argentina
(September 2000-December 2001)



Uruguay
(December 2001-July 2002)



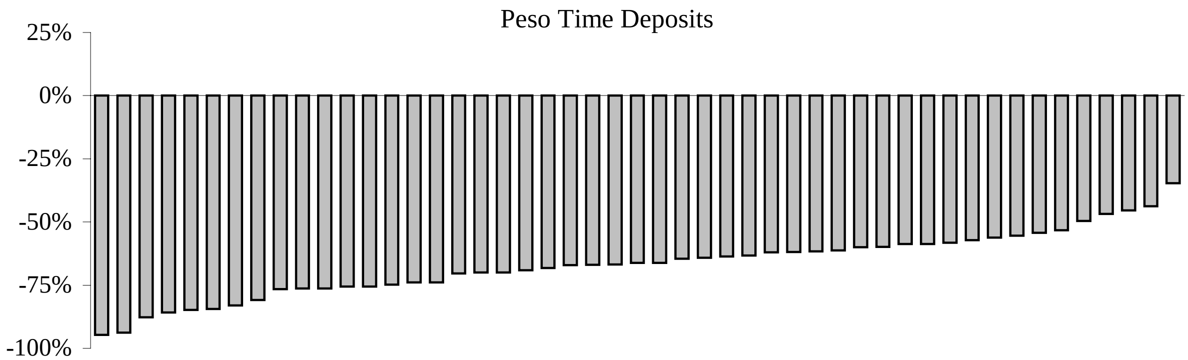
These figures show the monthly evolution of system time deposits, country risk, and exchange rate risk for Argentina and Uruguay. See Appendix Tables 1 and 2 for the definition of the variables.

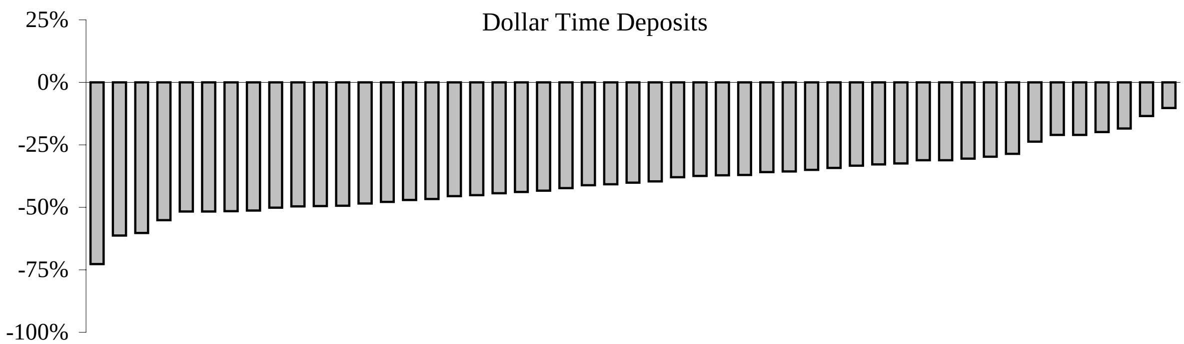
Source: Bloomberg, Central Bank of Argentina, Central Bank of Uruguay, J.P. Morgan, República AFAP

Figure 2
Change in Time Deposits by Bank

Argentina

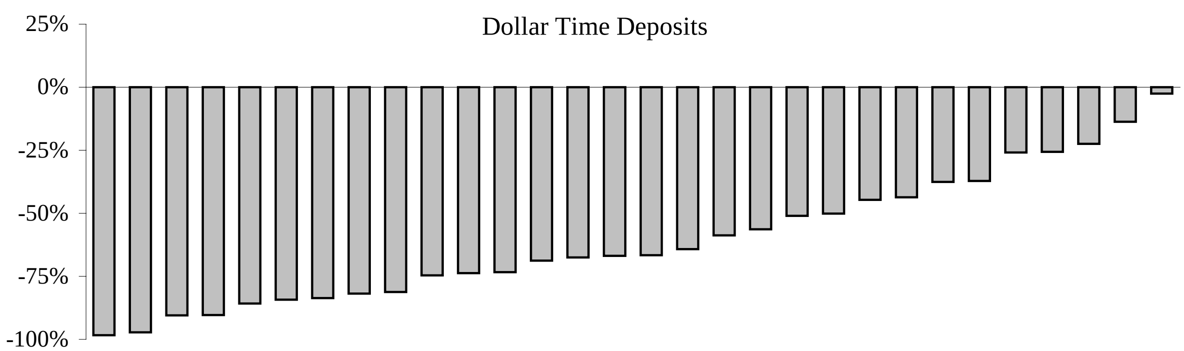
(June 2001-December 2001)





Uruguay

(December 2001 - July 2002)

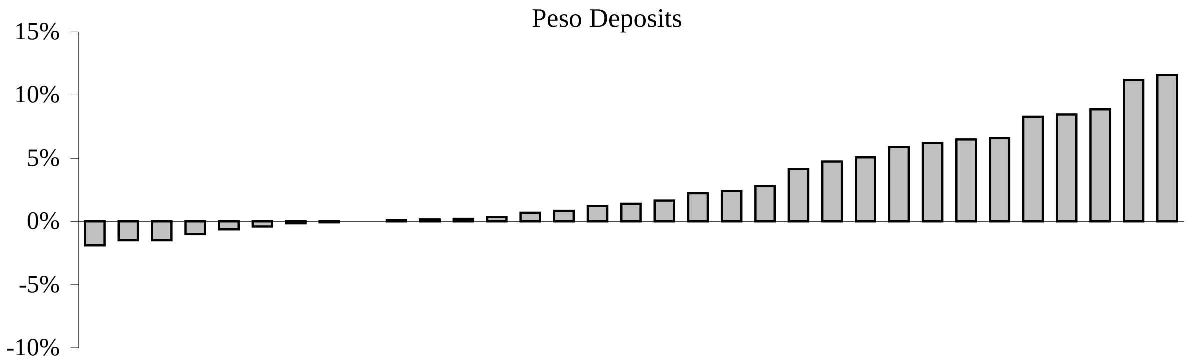


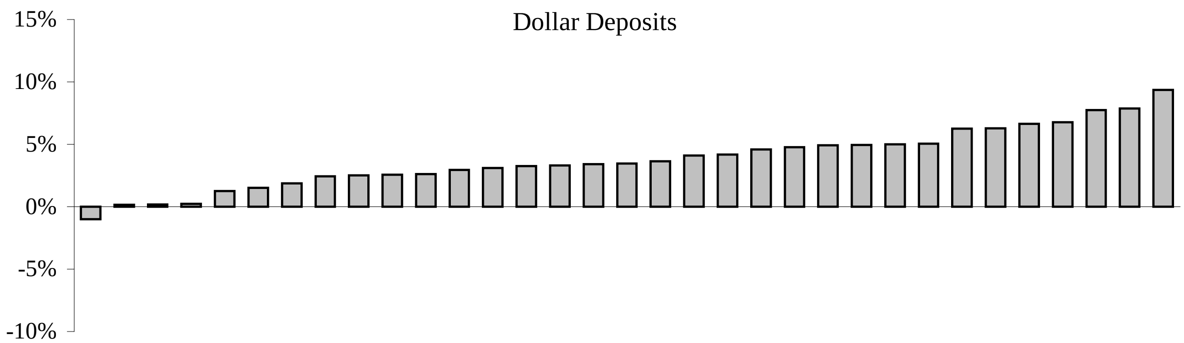
These figures show the percent change in dollar and peso time deposit for Argentina from June 2001 to December 2001, and the percent change in dollar time deposits for Uruguay from December 2001 to July 2002, by bank. Each bar represents a bank. Banks are sorted from left to right according to the size of the percent change in deposits.

Source: Central Bank of Argentina, Central Bank of Uruguay

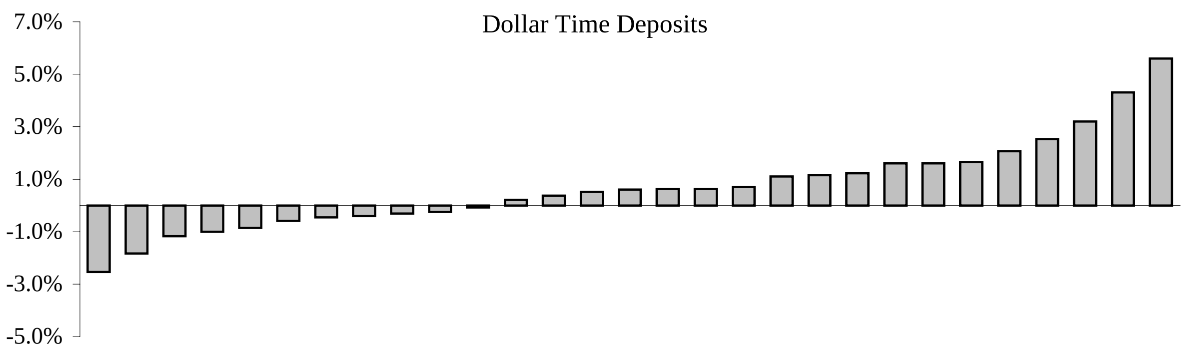
Figure 3
Change in Interest Rates by Bank

Argentina
(June 2001-December 2001)





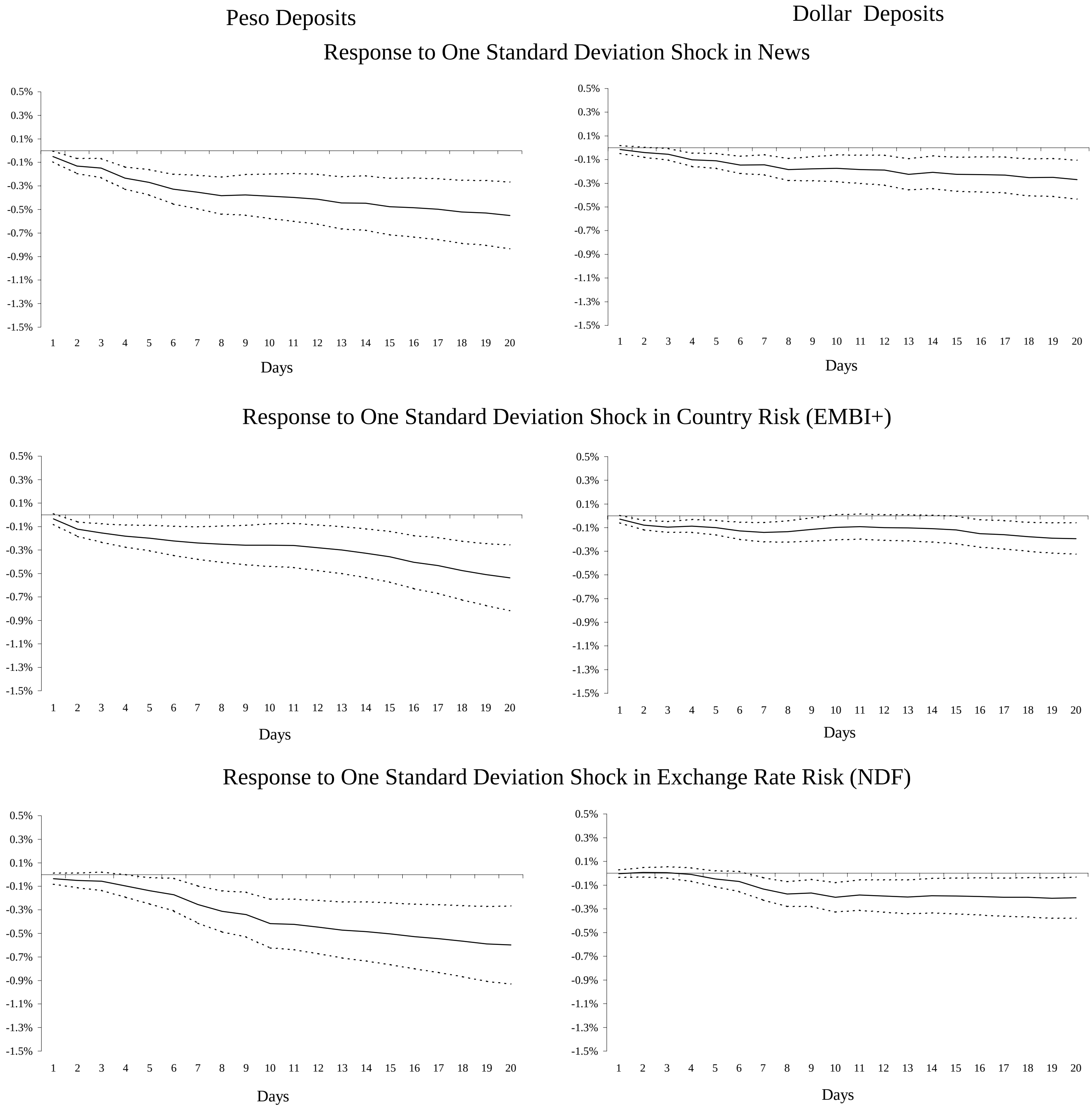
Uruguay
(December 2001 - July 2002)



These figures show the change in interest rates on dollar and peso deposits for Argentina from June 2001 to December 2001, and the change in interest rates on dollar time deposits for Uruguay from December 2001 to July 2002, by bank. The change in interest rates is measured as the difference between annualized interest rates on these dates. Each bar represents a bank. Banks are sorted from left to right according to the size of the change in interest rates.

Source: Central Bank of Argentina, Central Bank of Uruguay

Figure 4
Impulse Response Functions of Time Deposits by Currency - Argentina



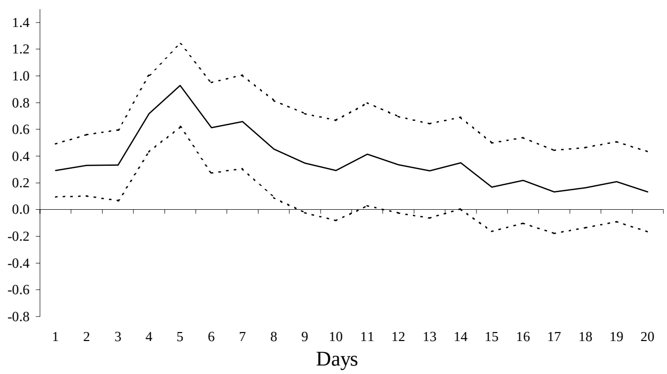
These figures show impulse response functions based on a VAR with ten lags. The model is estimated using daily data for 2000 and 2001 and includes the following set of variables: Log (system time deposits), news, NDF, and EMBI+ for Argentina. See Appendix Tables 1 and 4 for details on the variables used.

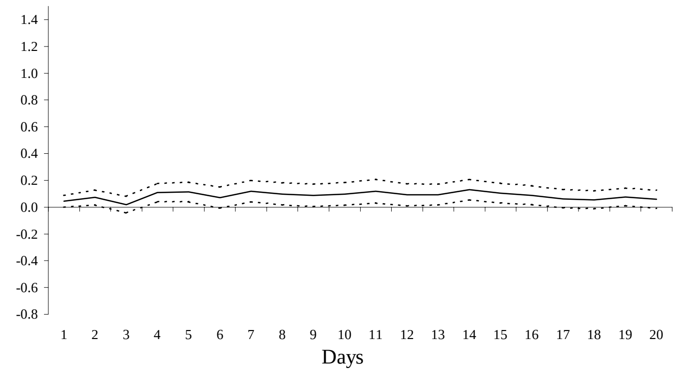
Sources: Bloomberg, Central Bank of Argentina, J.P. Morgan

Figure 5
Impulse Response Functions of Interest Rates by Currency - Argentina

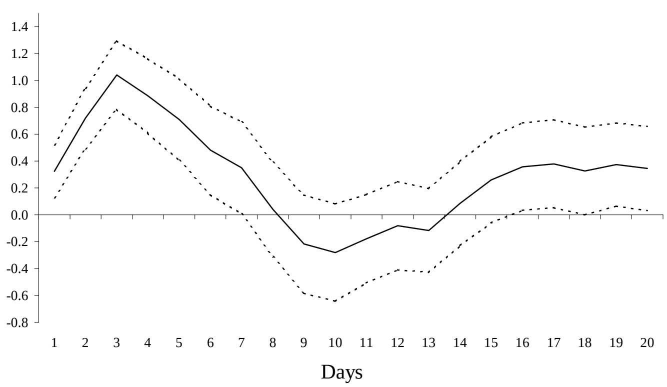
Peso Deposits | Dollar Deposits

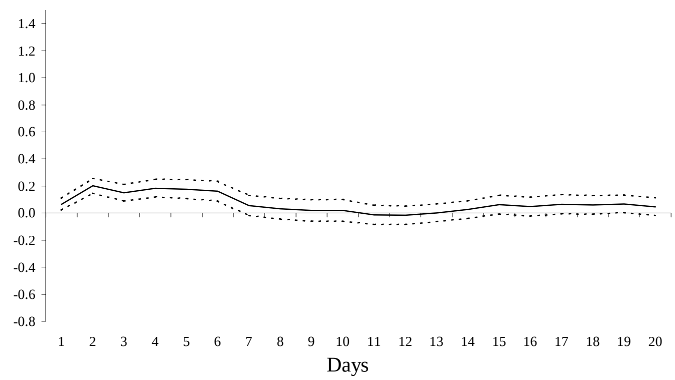
Response to One Standard Deviation Shock in News



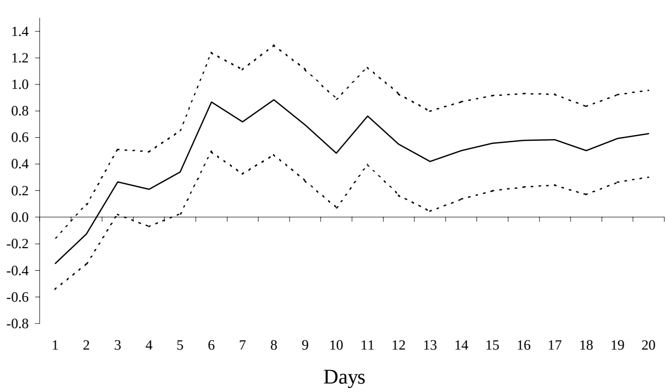


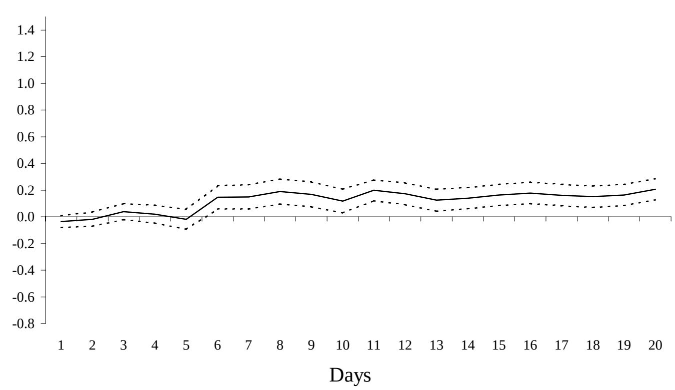
Response to One Standard Deviation Shock in Country Risk (EMBI+)





Response to One Standard Deviation Shock in Exchange Rate Risk (NDF)



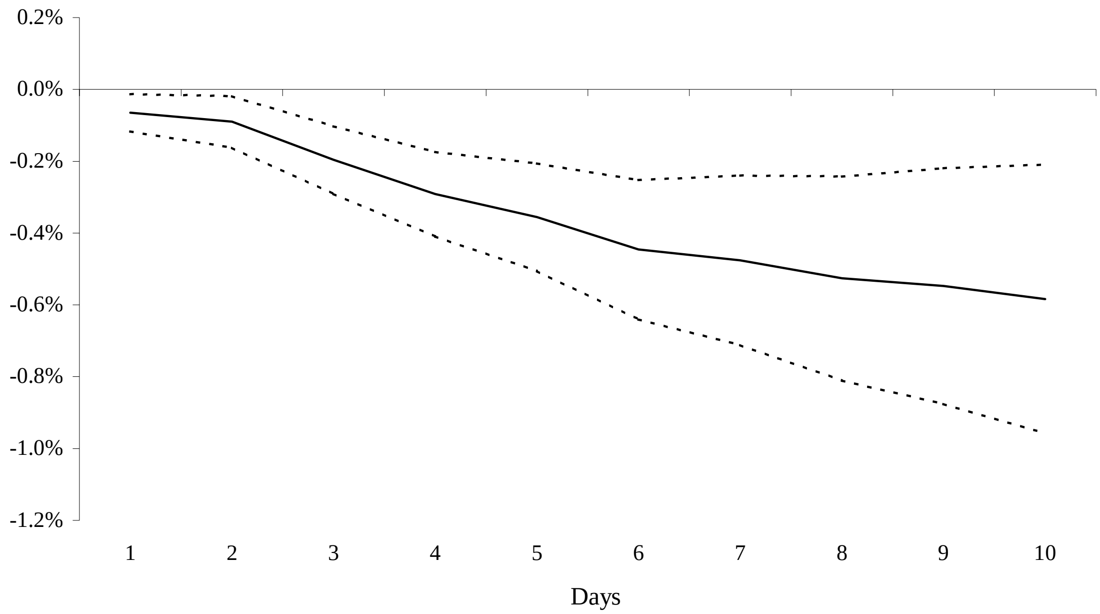


These figures show impulse response functions based on a VAR with ten lags. The model is estimated using daily data for 2000 and 2001 and includes the following set of variables: Interest rates, news, NDF, and EMBI+ for Argentina. See Appendix Tables 1 and 4 for details on the variables used.

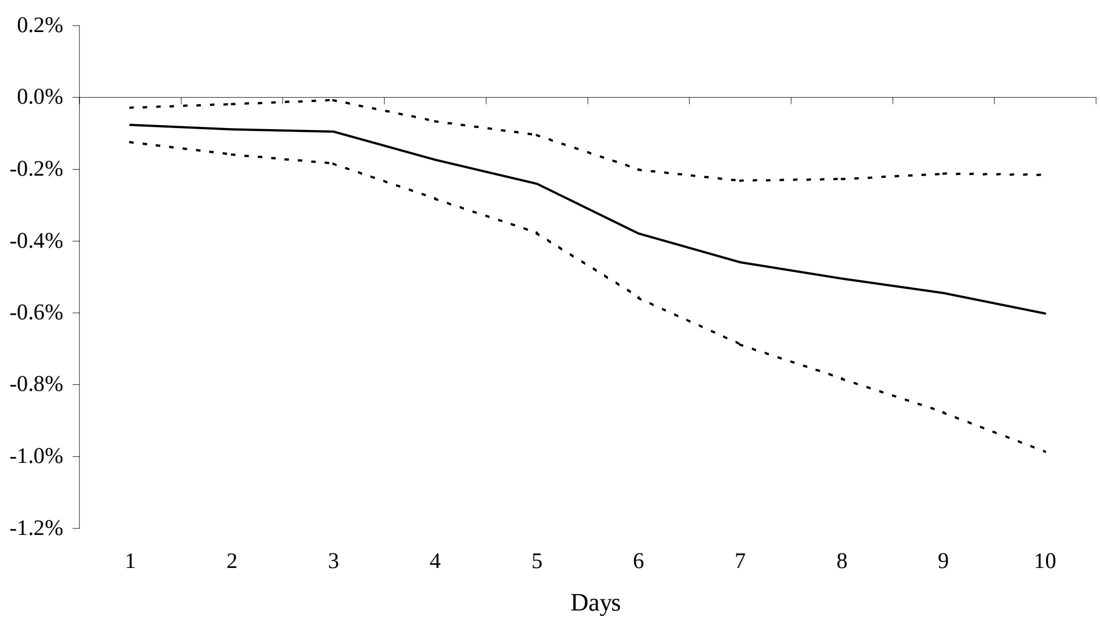
Sources: Bloomberg, Central Bank of Argentina, J.P. Morgan

Figure 6
Impulse Response Functions of Dollar Deposits - Uruguay

Response to One Standard Deviation Shock in News



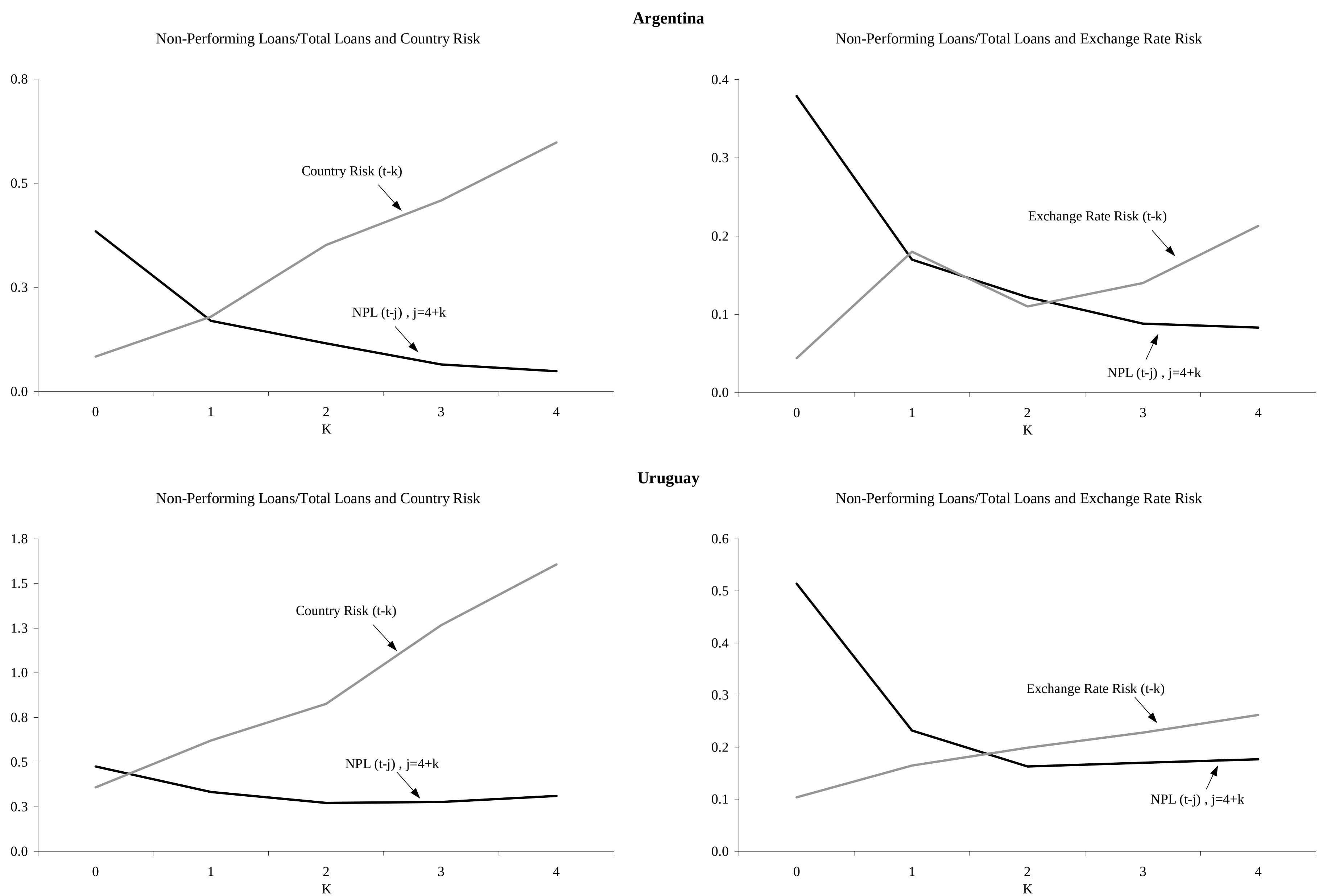
Response to One Standard Deviation Shock in Country Risk (UBI)



These figures show impulse response functions based on VAR with ten lags. The model is estimated using daily data from February 28, 2002 to July 29, 2002 and includes the following set of variables: Log (system dollar deposits), news, and UBI Index. See Appendix Tables 2 and 5 for details on the variables used.

Sources: Central Bank of Uruguay, República AFAP

Figure 7
Predictive Power of Lagged Fundamentals and Systemic Risk



These figures show point estimates of the coefficients from regressions of the non-performing loans ratio on its lagged values and systemic risk factors, estimated using Arellano and Bond's (1991) GMM procedure. See Appendix Tables 1 and 2 for the definition of the variables.

Appendix Table 1
Series Description and Data Sources - Argentina

Series Name	Description	Source
Dollar (Peso) Time Deposits (used in VAR)	Constructed by adding private sector time deposits in U.S. dollars (pesos) in the top 50 banks. Daily data from January 2000 to December 2001.	Central Bank of Argentina
Interest Rate on Dollar (Peso) Time Deposits (used in VAR)	Interest rate on time deposits in U.S. dollars (pesos). Average for the system. Daily data from January 2000 to December 2001.	Central Bank of Argentina
Dollar (Peso) Time Deposits by Bank (used in panel regressions)	Private sector time deposits in U.S. dollars (pesos) in the top 50 banks. Monthly data from September 2000 to December 2001.	Central Bank of Argentina
Interest Rate on Dollar (Peso) Deposits by Bank (used in panel regressions)	Implicit interest rate on deposits in U.S. dollars (pesos). Monthly data from September 2000 to December 2001.	Central Bank of Argentina
Non-Performing Loans/Total Loans*	Non-performing loans over total loans. Monthly data from January 2000 to December 2001.	Central Bank of Argentina
Return on Assets*	Net income over total assets. Monthly data from May 2000 to August 2001.	Central Bank of Argentina
Capital/Assets*	Capital over risk-weighted assets. Monthly data from May 2000 to August 2001.	Central Bank of Argentina
Country Risk	Spreads on Argentine sovereign bonds over comparable U.S. bonds (as expressed in the Argentine part of the Emerging Market Bond Index Plus or EMBI+). Monthly averages and daily figures from January 2000 to December 2001.	J.P. Morgan
Exchange Rate Risk	12-month non-deliverable forward (NDF) exchange rate relative to the spot exchange rate, also known as currency premium. Calculated as (Log(NDF outright)-Log(spot rate))*100. Monthly averages and daily figures from January 2000 to December 2001.	Bloomberg
Bank Exposure to Country Risk*	Government bonds and loans to the public sector over total assets. Monthly data from May 2000 to August 2001.	Central Bank of Argentina
Bank Exposure to Exchange Rate Risk*	Loans in U.S. dollars over equity. Monthly data from May 2000 to August 2001.	Central Bank of Argentina

* Since these variables are lagged in the regressions, their sample period differs from that of dependent variables.

Appendix Table 2
Series Description and Data Sources - Uruguay

Series Name	Description	Source
Dollar Deposits (used in VAR)	Aggregate non-financial sector deposits in U.S. dollars. Daily data from February 28, 2002 to July 29, 2002.	Central Bank of Uruguay
Dollar Time Deposits by Bank (used in panel regressions)	Private non-financial sector time deposits in U.S. dollars. Monthly data from January 2001 to July 2002.	Central Bank of Uruguay
Interest Rate on Dollar Time Deposits by Bank (used in panel regressions)	Implicit interest rate on private non-financial sector time deposits in U.S. dollars. Monthly data from January 2001 to July 2002.	Central Bank of Uruguay
Non-Performing Loans/Total Loans*	Non-performing loans over total loans. Monthly data from May 2000 to July 2002.	Central Bank of Uruguay
Return on Assets*	Net income over total assets. Monthly data from September 2000 to March 2002.	Central Bank of Uruguay
Capital/Assets*	Equity over total assets. Monthly data from September 2000 to March 2002.	Central Bank of Uruguay
Country Risk	Spreads on Uruguayan sovereign bonds over comparable U.S. bonds (as expressed in the Uruguay Bond Index or UBI). Monthly averages and daily figues from January 2001 to July 2002.	República AFAP (State-owned pension fund)
Exchange Rate Risk	Spread of the average interest rate of peso time deposits with a maturity of more than one month and less than six months in the top private banks relative to similar deposits in dollars. Monthly data from January 2001 to July 2002.	Central Bank of Uruguay
LIBOR	Six-month London Interbank Offered Rate. Monthly averages from January 2001 to July 2002.	Central Bank of Uruguay
Bank Exposure to Country Risk*	Government bonds and loans to the public sector over total assets. Monthly data from September 2000 to March 2002.	Central Bank of Uruguay
Bank Exposure to Exchange Rate Risk*	Loans in U.S. dollars over total assets. Monthly data from September 2000 to March 2002.	Central Bank of Uruguay
Argentina Total Deposits	Total deposits in the Argentine financial system, stated in U.S. dollars. Monthly data from January 2001 to July 2002.	Central Bank of Argentina

* Since these variables are lagged in the regressions, their sample period differs from that of dependent variables.

Appendix Table 3

Summary Statistics

	Argentina			Uruguay		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Dependent Variables						
Dollar Time Deposits (Million U.S. Dollars)	785	170	1,427	282	120	433
Monthly Change in Dollar Time Deposits	-0.013	-0.001	0.077	-0.021	-0.005	0.082
Interest Rate on Dollar Deposits	0.078	0.076	0.020	0.043	0.044	0.020
Peso Time Deposits (Million U.S. Dollars)	165	33	269	-	-	-
Monthly Change in Peso Time Deposits	-0.054	-0.037	0.167	-	-	-
Interest Rate on Peso Deposits	0.052	0.045	0.027	-	-	-
Independent Variables						
Non-Performing Loans/Total Loans	0.185	0.152	0.123	0.053	0.022	0.077
Capital/Assets	0.211	0.192	0.088	0.094	0.080	0.059
Return on Assets	0.000	-0.005	0.027	0.000	0.001	0.004
Total Assets (Million U.S. Dollars)	2,678	710	4,385	704	320	1,043
Bank Exposure to Country Risk	0.173	0.162	0.098	0.046	0.024	0.054
Bank Exposure to Exchange Rate Risk	3.012	2.420	4.560	0.699	0.725	0.207
Country Risk	0.115	0.086	0.076	0.042	0.025	0.040
Exchange Rate Risk	0.166	0.093	0.161	0.174	0.132	0.118
LIBOR	-	-	-	0.031	0.023	0.012
Total Deposits in Argentina (Billion U.S. Dollars)	-	-	-	77.1	77.2	6.6

This table reports summary statistics of the dependent and independent variables used in the regressions reported in Tables 1 to 6. Dependent variables are bank-level monthly data from September 2000 to December 2001 for Argentina, and from January 2001 to July 2002 for Uruguay. Since bank fundamentals and exposure variables have a four-month lag, these data cover the period May 2000 to August 2001 for Argentina, and September 2000 to March 2002 for Uruguay. Systemic risk indicators are monthly values from September 2000 to December 2001 for Argentina, and from January 2001 to July 2002 for Uruguay. See Appendix Tables 1 and 2 for the definition of the variables.

Appendix Table 4
News Description - Argentina

Date	News Value	Description
October 6, 2000	1	Vice president Carlos Alvarez resigns.
March 16 , 2001	1	The newly appointed economy minister Ricardo Lopez Murphy resigns after two weeks in office.
April 16, 2001	1	Domingo Cavallo, newly appointed economy minister, proposes an amendment to the convertibility law according to which the peso would be pegged to an equally weighted basket of U.S. dollars and euros.
April 25, 2001	1	The president of the central bank, Pedro Pou, resigns amid disagreements with Cavallo.
July 10, 2001	1	After being forced to pay 1,410 basis point over treasury to place a short-term bond, the government announces a zero deficit rule making clear that international capital markets are closed to Argentina.
August 21, 2001	-1	After long deliberation, the U.S. Treasury decides to support an extra loan for eight billion U.S. dollars from the International Monetary Fund (IMF)
October 26, 2001	1	The negotiations towards an agreement with the provinces on the distribution of tax revenues fail (again).
October 29, 2001	1	Cavallo starts negotiations towards a debt exchange operation seeking support from the IMF. This exchange would be voluntary and the old debt would be exchanged for bonds paying seven percent per year and guaranteed by tax revenues. The IMF and U.S. Treasury ask for compliance with the zero deficit rule and an agreement with the provinces on tax revenue sharing before giving their support for this operation.

News takes the value 1 for bad news and -1 for good news.

Appendix Table 5
News Description - Uruguay

Date	News Value	Description
March 25, 2002	-1	The executive board of the IMF approves a new stand-by credit for about 743 million U.S. dollars, intended to support the country's economic program during 2002-04.
May 14, 2002	1	Standard and Poor's lowers Uruguay's foreign currency sovereign credit rating from BB+ to BB-.
May 28, 2002	-1	IMF managing director Horst Köhler signals increased support for Uruguay, indicating his willingness to propose a significant increase in IMF financial assistance.
June 20, 2002	1	The central bank allows the peso to float, abandoning the “crawling peg” system.
June 21, 2002	1	The central bank takes control of Banco Montevideo/La Caja Obrera, Uruguay’s third largest private bank, and removes its management.
June 25, 2002	-1	The IMF increases its stand-by credit to Uruguay by about 1.5 billion U.S. dollars, to a total of 2.3 billion U.S. dollars.
July 19, 2002	1	Political leaders (president Battle, the president of the Partido Nacional Luis Alberto Lacalle, and ex-president Julio Sanguinetti) agree to replace the central bank board.
July 23, 2002	1	Economy minister Alberto Bensión resigns after losing the support of part of the ruling coalition government.
July 26, 2002	1	Standard and Poor's downgrades Uruguay's foreign currency sovereign credit rating to B.

News takes the value 1 for bad news and -1 for good news.

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