Contagion, Banks Fundamentals or Macroeconomic Shock?

An empirical Analysis of the Argentine 1995 Banking Problems

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Abstract

The literature on bank runs is divided into those who suggest that depositors can discriminate well between good and bad banks and those who stress that, due to asymmetric information problems, depositors may run a perfectly good bank when a bad bank in the same system is attacked. This is not simply an academic question, but an issue with significant policy implications. If depositors can indeed discriminate and good banks are not subject to erroneous attack, then the role of a wide safety net for bank-creditors (e.g.: unlimited deposit insurance) is reduced. For a number of reasons the problems in the Argentine banking system in 1995 provide a unique and highly appropriate case-study to analyze these issues empirically. The focus of this paper is to attempt to delineate from daily deposit-data the effect of 'bank fundamentals' from the importance of 'contagion' from a third possibility, namely the effects of a generalized macroeconomic shock that might affect all banks in the system simultaneously. We argue that indeed we can separate these effects using panel-data techniques. We find a small number of variables that capture individual 'bank fundamentals' and we find several macro. variables that are significant. We interpret the residual co-movement in the data as 'contagion' and we also estimate interaction effects directly which appear to eradicate residual co-movement. We find therefore that all three effects were significant in the period and that, although 'bank fundamentals' account for 27% of the explained variation in deposits, contagion effects were also present.

Resumen

La literatura sobre crisis bancarias está dividida entre quienes creen que los depositantes son capaces de discriminar entre bancos solventes e insolventes y aquellos que opinan que, debido a la existencia de asimetrías de información, problemas en algún banco pueden dar lugar a un retiro masivo de depósitos aún en los bancos solventes. Esta no es sólo una cuestión puramente académica. Ella tiene importantes implicancias desde el punto de vista de la política económica. Si los depositantes son capaces de discriminar y los bancos "sanos" no están sujetos a la posibilidad de una corrida de depósitos, el rol de una red de seguridad se ve limitado. Por una serie de razones los problemas que afectaron al sistema financiero argentino como consecuencia de la devaluación mexicana de diciembre de 1994, constituyen un caso único y muy apropiado de análisis para el estudio empírico de esta cuestión. El objetivo de este trabajo es tratar de determinar, utilizando información diaria, la importancia relativa que los "fundamentals" de cada banco individual, el efecto "macro" del shock y la presencia de alguna forma de "contagio" entre bancos, tuvieron en explicar la dinámica de los depósitos en ese período. Usando técnicas de panel se encuentra que un reducido número de variables capturan el efecto de los "fundamentals", en tanto algunas variables "macro" resultan también significativas. La persistencia de un efecto aleatorio temporal es interpretada aquí como una evidencia de "contagio". Si se incorporan al modelo las interacciones entre grupos de bancos, se elimina este co-movimiento en los residuos. Se concluye entonces que los tres efectos, "fundamentals", "macro" y "contagio" estuvieron presentes en el período de análisis y que, si bien los "fundamentals" explican el 27% de la variación de depósitos por banco, también existe evidencia de un efecto "contagio".

Classification Number JEL: C33, E51

Keywords: Banking crisis, co-movement, contagion, panel data.

1.Introduction

The literature on bank runs is divided into those who suggest that depositors can discriminate well between good and bad banks and those who stress that, due to asymmetric information problems, depositors may run a perfectly good bank when a bad bank in the same system is attacked. This is not simply an academic question, but an issue with significant policy implications. If depositors can indeed discriminate and good banks are not subject to erroneous attack, then the role of a wide safety net for banks creditors (e.g.: unlimited deposit insurance) is reduced. On the other hand , if 'contagion' is prevalent, this externality may provide a prima facie case for intervention and potentially for the existence of a broad safety net for depositors to stabilize the financial system.

For a number of reasons, the problems in the Argentine banking system in 1995 provide a unique and highly appropriate case-study to analyze this issues empirically. First, the period over the run is clearly defined, being prompted initially by an outside event (the devaluation of the Mexican peso on December 20th 1994), and then spreading through the system until a systemic run in March. This was clearly reverted after the Argentine Presidential election of May 14th 1995. Secondly, at the time of the run, no deposit insurance was in place and indeed the Convertibility Law explicitly prohibited the Central Bank acting as a general monetary lender of last resort. It was well understood than any major rescue-attempt for depositors would have to be transparently fiscal in nature and not recoverable through a subsequent inflation-tax and therefore politically much more costly in nature. Third, the Central Bank of Argentina collects, apart from standard bank by bank characteristics on a monthly basis, deposit figures for each bank on a daily basis. Hence, the data-set is extremely rich, consisting of a panel of daily-data over four months for some 120 financial institutions.

The paper is organized as follows. In section 2 we briefly review the literature on banking panics. Section 3 describes the main effects of the Mexican devaluation on the Argentine Financial System. In section 4 we present the empirical results and finally section 5 concludes.

2. On Bank Runs and Contagion : A Brief Review

There have been a number of theoretical and empirical papers on the vulnerability of financial systems to bank-runs and contagion effects.

A seminal paper is Diamond and Dybvig (1983), in which banking panics are random events, due to shifts in agent's beliefs, not necessarily related to the real economy. Bank-runs according to this view are a poor, self-fulfilling equilibrium in a model with multiple equilibria. The important assumption is that there is a sequential service constraint that makes being at the end of the withdrawal line potentially extremely costly. This assumption implies that a perfectly rational bank run may occur even if the bank is sound but for some reason faces a strong demand for liquidity from depositors.

A drawback with this model is that runs are provoked by changes in agents' expectations which are unobservable. In theory, bank runs might then be provoked by any event which causes such an expectational shift, which includes the possibility of sunspot type equilibria. It is then extremely difficult, if not impossible, to test this type of model in practice.

This shortcoming of the Diamond and Dybvig approach is addressed, to some extent, by models which incorporate information asymmetries explicitly. It might be argued that these models attempt to identify the conditions under which changes in agents' beliefs about the solvency of banks are generated. The main assumption in these models is that there is asymmetric information between banks and their depositors. As normal banking activity consists of providing liquidity services, but investing in assets that are not marketable, agents are not capable of monitoring perfectly bank performance. Depositors may then revise their perception of a bank's risk according to some imperfect signal regarding bank performance. A piece of 'bad news', which may not appear critical in itself, may then lead to a massive withdrawal of deposits.

Chari and Jagannathan (1988) develop a model in this vein with agents which are heterogeneous with respect to their access to information about bank assets. This heterogeneity among agents creates the possibility of a run. In their model, withdrawals motivated by genuine liquidity needs in a bank may be perceived by uninformed agents as a signal that the bank is in trouble, leading them to take their money out of that bank or indeed out of the financial system in general.

A set of more applied papers are also relevant to the analysis presented below. For example, Park (1991) emphasizes the importance of good bank specific information. Park argues that ensuring the provision of this type of information helped to prevent bank runs in an era previous to the creation of the Federal Reserve in the United States. In other words, the argument is that providing depositors with the 'correct' bank fundamental information, hence reducing information asymmetries, may help to stop runs and/or contagion.

On the other hand, Gorton (1988) emphasizes the importance of macroeconomic variables. In a context where depositors are unable to monitor bank performance, it is argued, they may use aggregate information to asses changes in banks' portfolio risks. More specifically, analyzing the banking crisis that took place during the US. free banking era (1863-1914), this author finds a strong correlation between the occurrence of banking panics and the arrival of new information predicting a recession.

There have also been a number of studies which have attempted to specifically isolate contagion effects but there is little agreement on this issue in the literature. For example, Saunders and Wilson (1993) find evidence of ‘contagion’ in panics that took place during the Great Depression in the US. However, Calomiris and Mason (1994) find little evidence of contagion in panics in Chicago in the same period.

Finally, there have been two papers which focus on the case of the Argentine 1995 banking problems. Schumacher (1996) and Dabos (1995) both estimate the probabilities of banks entering into difficulties (merger or suspension) dependent on a set of bank characteristics. Both authors argue that, in general, the banks that entered into difficulties could be predicted reasonably well given prior information. Moreover, Schumacher (1996) concludes that the banks that lost most deposits were those banks that “failed”. These results might then be interpreted as suggesting that depositors discriminated reasonably well and that those banks that were punished were those that deserved to be punished.

As suggested in the introduction these arguments have strong policy implications. On the one hand, if depositors can discriminate well and contagion effects are slight then the case for a wide safety net is reduced. In this view, market discipline will be effective and should not be too non-discriminating. Banks that stray will be punished by sharp deposit withdrawals and furthermore the threat of such actions may keep banks from straying in the first place. According to this approach, a safety net may actually be damaging in that it may reduce the disciplining powers of the market.

On the other hand, if the 'poor' equilibria of the type of Diamond and Dybvig are a real possibility or if contagion effects are prevalent, then it might be argued that market discipline is a very blunt tool. With no safety net, the market may indeed discipline bad banks, but at the cost of runs being provoked in perfectly good banks or indeed in the system as a whole. In the literature, such potential 'instability' is often used as a justification of a safety net (see for example, Goodhart (1993)).

What appears to be lacking in the literature is a systematic attempt to isolate how important are the different potential causes of bank runs. In turn, we feel such an analysis would have a direct bearing on the policy conundrum outlined above. Our approach in what follows is then to try to assess, during the Argentine 1995 banking problems, how important were ‘bank fundamentals’ (stressed by Park 1991) , how important were macro. variables (stressed by Gorton 1988) and how important were contagion effects. We argue we are able to distinguish these different aspects in the context of a panel data analysis.

3. The effects of the Mexican Devaluation on the Argentine Financial System

The devaluation of the Mexican currency in December 1994 changed international investors' perceptions concerning Argentine country-risk, leading first to a sharp fall in debt prices, and finally to a full-scale run on the banking sector. Deposits in the Argentine Banking System fell 19% between December 1994 and May 1995, while the Central Bank lost 27% of its international reserves during the same period. The dramatic fall in Argentine asset prices initially affected wholesale banks, whose portfolios were mainly composed of Government bonds, and then spread to the remainder of the financial system.

However, the fall in deposits was not homogeneous among banks. As can be seen in Graph and Table 1 there were large differences in the behavior of deposits among eight groups of banks which may be used to classify the Argentine banking sector[1]. Wholesale banks, a group initially affected very strongly by the Mexican devaluation, lost 66% of their deposits during the whole period of the crisis (since December 20th. to May 5th.). At the same time, cooperative and interior banks, both groups composed of a large number of small and medium-size banks lost 39% and 22% of their deposits respectively. On the other hand, the large retail banks lost no more than 9% of their deposits over the period.

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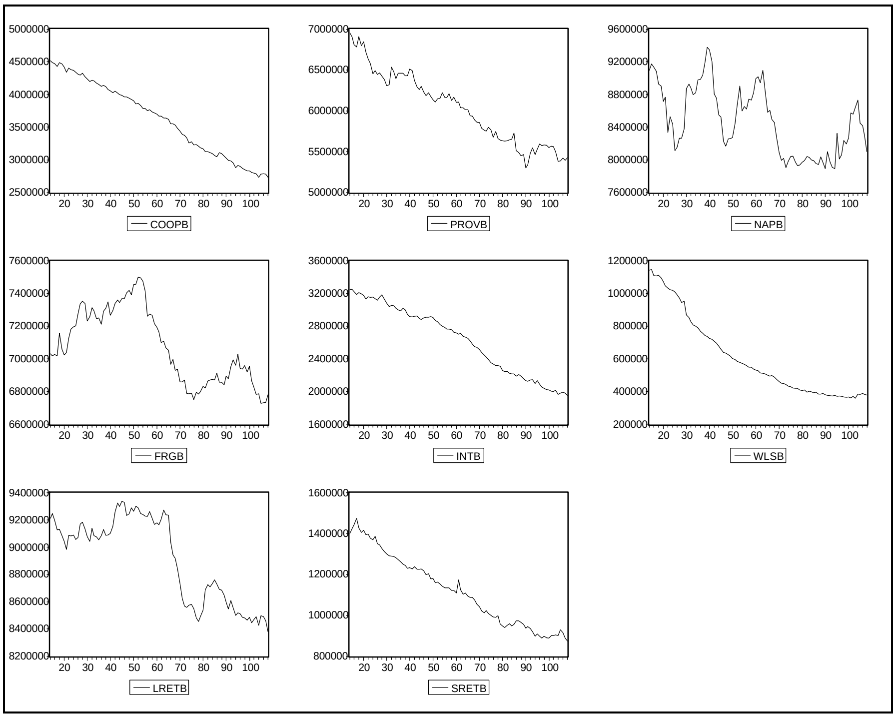
[1] We categorize in eight groups, following a commonly-used classification, which separates banks according to a mixture of ownership, product-mix and location criteria. First, we distinguish between public and private banks. Then, within public banks, we distinguish between national and provincial institutions. Privat banks are separated according to the type and origin of ownership; into domestic private banks, foreign private banks and cooperative banks. Domestic private banks are then broken in retail and wholesale banks and finally, we distinguish the following categories among retail banks: large retail banks, small retail banks and those whose activity is mainly in the provinces, refered to as interior banks. The eight categories are as follows: National public banks: NAPB, Provincial public banks: PROVB, Foreign banks: FRGB Private wholesale banks: WLSB, Cooperative banks: COOPB, Large retail banks: LRETB, Small retail banks: SRETB and Interior banks: INTB

Table 1 - Change in total deposits (%)									
	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB	Entire System
20 Dic - 28 Feb	-19.37	-13.22	0.05	1.08	-17.73	-55.21	0.68	-21.34	-7.41
1 March - 22 Mar	-12.53	-6.23	-10.32	-3.79	-13.42	-19.12	-8.06	-13.64	-8.60
23 Mar - 5 May	-13.66	-3.66	1.61	-0.76	-13.64	-6.84	-1.86	-7.78	-3.16
20 Dic - 5 May	-39.41	-21.96	-10.95	-3.57	-40.00	-66.91	-9.04	-37.58	-18.73

Table 2. Total deposits by group (as % of total deposits)							
COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
10,81	16,45	20,21	16,87	7,72	2,75	21,81	3,37

Graph 1.

Total deposits by group



At first sight these differences between groups might be interpreted as evidence in favor of the "market discipline" hypothesis. The general perception was that the groups that suffered most had weaker fundamentals and hence these were the groups that lost most deposits. However, as pointed out in BCRA (1995) it is also the case that the crisis developed in a set of phases[2].

During the first phase, between December 20th and the last days of February 1995, there was what might be described as a portfolio reallocation (shift to quality) rather than a full-scale run. There was for example, a marked shift in deposits from pesos to dollars, presumably reflecting fears that the fixed exchange rate might have to be abandoned. At the same time there was a clear run from the small to the larger banks of the system. Note that, as shown in

2 Also see Kiguel (1995) and Powell (1996).

Table 1, deposits in national public banks, foreign banks and large retail banks actually slightly increased over this first period as did total deposits in dollars.

Towards the end of February however, this portfolio reallocation turned into a full-scale run where virtually all banks in the system lost deposits. There are several competing explanations for this change. First, there were continuing concerns over the fiscal accounts and it should be remembered that there was no IMF program in place at that time. Second, there was growing election uncertainty as the May 14th Presidential election loomed, and it should be noted here that the election system had changed. In particular, the incumbent president needed more than 50% of the vote to avoid a second stage ("ballotage"). Third, at the end of February, the Central Bank changed its charter to allow a slightly more flexible use of rediscounts to aid banks and this was misinterpreted by some as a relaxation of the Convertibility regime and fourth, there were growing rumors that the authorities were contemplating freezing bank deposits (suspending convertibility of bank deposits). Table 1 details the fall in deposits in the first three weeks of March across all of the eight bank groups. In particular note that the national public banks, the foreign banks and the large retail banks all lost deposits (10%, 4% and 8% respectively) over this second period.

The announcement of a new fiscal package, in the context of an agreement with the IMF and the promise of significant financial support from that institution as well as the other multilaterals and the creation of two Fiduciary Fund stopped the fall in deposits, leading to the third and last phase of the crisis (March 23rd to May 5th) Here again, the dynamics of deposits showed a different pattern among the eight groups of banks (see Graph and Table 1). On average deposits fell 3%, but while cooperative and interior banks lost 14% of their deposits, deposits at the large banks of the system remained nearly invariant, while National Public Banks gained deposits.

4. Empirical Analysis

4.1. A First Analysis using VARs

For an initial analysis of the interactions within the dataset, we first estimated a series of VARs for the daily deposit data, over the whole period, aggregating banks according to the classification described in section 3. Our objective in this first analysis was simply to assess (i) if there were interesting interactions within the groups which deserved further analysis and (ii) to attempt to suggest whether certain groups of banks 'led' others according to causality-type tests. Significant interactions and significant causality relations would give prima-facie evidence towards the presence of 'contagion'.

We first estimated a VAR with all 8 groups with the dependent variables being the percentage change in the total deposits of each group. We also tried various 'macro' variables as both endogenous and exogenous in the specification. We found there was support to include the price of the most highly traded Argentine bond (the FRB) as an exogenous variable lagged[3]. Once the FRB was included then no other macro. variable appeared to be significant, including the change in the total deposits of the financial system. This result suggests that the

[3] However the inclusion of the FRB bond price as an endogenous variable was not supported in the sense that the change in the deposits of none of the groups was significant as an explanatory variable for the FRB price.

FRB price appeared to be a leading indicator of the change in deposits and that the FRB price appeared to reflect all of the relevant information with regards to 'macro' developments.

We also found that dummy variables for the days of the week were important to pick up 'seasonal' type effects associated with the payments system with a Monday effect being particularly significant.

Our preferred model included 2 lags of all of the endogenous variables and the full results from the VAR estimations are included the Appendix, as well as the results of variance decomposition analysis and graphs of the impulse response functions. Here in the text we present only the result of a set of Granger-Causality tests between the variables calculated from the VAR equation statistics.. In Table 3 we present the results of the G-C tests for each equation of the VAR. The figures in bold represent significant Granger-causal relationships and the sign of the relation is also displayed

There are clearly a number of interesting interactions in the dataset. First, recalling the story of the shock presented in section 3, it is not surprising that the wholesale banks appear to Granger-Cause (G-C) three other groups positively: namely cooperative, interior and small retail banks. Moreover, small retail banks G-C interior banks.

The large retail banks are significant in explaining the dynamics of deposits in cooperative, interior and small retail banks as well as wholesale banks. On the other hand large retail banks do not appear to be influenced by the other groups; except the national public banks.

Table 3 . Granger -Causality Tests (VAR 8 Groups)

	Equation							
	PROVB	NAPB	FRGB	COOPB	INTB	WLSB	LRETB	SRETB
Excluded var.								
COOPB	0.7582	0.2586	1.8596		0.4519	0.9575	1.0819	0.4006
PROVB		0.3474	1.1673	**2.0636 (+)**	0.1261	0.7285	0.1332	**2.3624(+)**
NAPB	**3.1569(-)**		1.8053	1.1930	1.0930	0.4013	**2.0139(+)**	1.8764
FRGB	0.2757	0.1775		0.2096	1.4608	1.6359	0.5659	0.8189
INTB	0.9558	**2.5936(-)**	0.2986	0.5481		1.7013	1.7642	0.1915
WLSB	0.0276	0.4927	**3.1763(-)**	**3.0793(+)**	**2.4487(+)**		0.9321	**2.1179(+)**
LRETB	0.6939	0.7719	0.8687	**2.773(+)**	**5.3704(+)**	**2.4451(+)**		**4.2860(+)**
SRETB	0.7628	-0.0785	0.1900	**2.4989(+)**	**2.5644(+)**	0.4820	0.9154	
FRB	**2.1506(-)**	0.0257	1.0859	0.0322	0.0420	**3.2805(+)**	**6.8573(+)**	**2.1798(+)**

Fstat 10%: 2.38
Fstat 5%: 3.12

There are also two negative Granger Causality relationships. In particular, wholesale banks negatively G-C foreign banks and this might be thought of as a 'flight to quality' effect. Another interesting result is that cooperative banks, a group that lost a very high proportion of its deposits, is Granger-Caused by no less than four other groups. Finally, our 'macro' variable, the price of the FRB bond, anticipates with a positive sign the behavior of deposits at wholesale, large and small retail banks.

On close inspection of the results, it is interesting to note that there appear to be virtually no interactions between the groups of large retail banks, foreign banks and the national public banks whereas there are a set of very strong interactions between the groups of wholesale, interior, cooperative and small retail banks. This result supports the hypothesis that contagion effects may be more important in these latter groups where, perhaps, public information on bank quality is less known or is less credible and where banks clearly had no explicit state guarantee. In conclusion, our first approach to the analysis of the dynamics of deposits during the crisis, using a VAR analysis, provides some prima facie evidence of contagion effects, which seem to be present in groups of banks where information is poorer.

4.2. Fundamentals, contagion or macro shock? A panel data analysis

In this section, we consider a panel data analysis of the variation of deposits in the Argentine banking system using daily individual bank data. Our objective is to attempt to delineate the importance of ‘bank fundamentals’, ‘macro. variables’and ‘contagion’ effects during the crisis. We first discuss the methodological issues regarding testing for contagion and propose a new methodology (4.2 (a)). We then discuss the nature of the ‘bank fundamentals’and ‘macro. variables’ to be included in the model (4.2 (b) and (c)) and then, in section 4.2.(d) we present the results of the panel analysis.

(a) methodological issues in testing for contagion.

There have been a number of recent empirical papers that have attempted to 'test' for contagion effects. In these papers, contagion is generally associated with an excess co-movement in the data. For example, Shiller (1989) argues that stock prices display excess co-movement across countries and Valdés (1996) finds 'contagion' in emerging market debt prices. In each case, the methodology adopted is to attempt to 'model' the variables in question, as a function of explanatory variables suggested by economic theory, and then having controlled for 'fundamentals' interpret any residual co-movement in the data as contagion. However, the methodological problem is that this excess co-movement could simply be the result of some missing variable that has not been included. A second technique is to include 'contagion variables' directly in the regression. In other words in the case of emerging market debt prices, the lagged price of the change in a second country's bond price could be included as an explanatory variable. However, once again this technique is subject to criticism, namely that the second country's debt price may again be reflecting some other 'fundamental variable' which has been left out of the equation. In this paper, we propose a new methodology for testing for contagion. This methodology combines the two methodologies outlined and with panel date techniques, we argue, provides a more robust test for contagion.

The type of model we estimate is then of the general form of Equation 1 below, where X represents a vector of ‘bank fundamentals’, Z a vector of ‘macro. variables’ and W a set of 'contagion' or 'interaction' terms

$$\Delta \ln dep_{it} = \alpha_0 + \sum_{k=1}^{K} \beta_{kt} x_{kt} + \sum_{k=1}^{K} \delta_{kt} z_{kt} + \sum_{k=1}^{K} \gamma_{kt} w_{kt} + u_{it} \qquad (1)$$

with a two-way error components disturbance

$$u_{it} = \mu_i + \lambda_t + \nu_{it} \qquad i=1....,N \quad t=1....T$$

where μ_i denotes the unobservable individual effect , λ_t denotes the unobservable time effect and ν_{it} is the remainder stochastic disturbance term.
The disturbances are homoskedastic with $var(u_{it}) = \sigma^2_\mu + \sigma^2_\lambda + \sigma^2_\nu$ for all i and t, and

$$\begin{aligned} cov(u_{it}, u_{js}) &= \sigma^2_\mu \quad \text{for} \quad i=j,\ t \neq s \\ &= \sigma^2_\lambda \quad \text{for} \quad i \neq j,\ t=s \end{aligned}$$

and zero otherwise. This means that the correlation coefficient is

$$\begin{aligned} correl(u_{it}, u_{js}) &= \sigma^2_\mu /(\sigma^2_\mu + \sigma^2_\lambda + \sigma^2_\nu) && \text{for} \quad i=j,\ t \neq s \\ &= \sigma^2_\lambda /(\sigma^2_\mu + \sigma^2_\lambda + \sigma^2_\nu) && \text{for} \quad i \neq j,\ t=s \\ &= 1 && \text{for} \quad i=j,\ t=s \\ &= 0 && \text{for} \quad i \neq j,\ t \neq s\ . \end{aligned}$$

As we are interested in verifying the presence of some comovement in the data, after controlling for ‘fundamentals’ and ‘macro. variables’, the finding of time effect ($\sigma^2_\lambda \neq 0$), factors, peculiar to specific time periods but affecting individuals equally, will support the assumption of a ‘contagion’effect. The Breusch-Pagan LM test is used to verify the existence of a random time effect in a two way error component model ($H_0 : \sigma^2_\lambda = 0$).

Our methodology proceeds in two steps. First, following the first methodology outlined above we estimate a panel, in our case for the daily deposit movements for individual banks in the Argentine banking crisis, as a function of our 'fundamental variables' (the bank fundamentals and macroeconomic variables). The residual co-movement in the deposit data, after controlling for these fundamentals, can then be tested simply by testing for a standard 'time effect' in a panel data analysis. This is then a first 'test' for contagion, a test of the residual co-movement in the data after controlling for the explanatory variables as suggested by economic theory. However, the 'time effect' may be picking up not only contagion but other missing variables and this is then the criticism of the first methodology outlined above. In a second step, we therefore propose adding explicitly the 'contagion variables' (in our case the lagged deposits of other banks) and then testing again for residual co-movement, in other words again testing for a time effect in the panel. If we find that the test statistic for the time effect is reduced in value significantly, then we argue that we cannot reject the hypothesis that contagion effects are present. Note that this is more robust than the second methodology outlined above, as in the context of the panel, the introduction of individual and time effects

control for other missing variables. Hence this constitutes a test for 'contagion' controlling, not only for 'fundamentals', but also controlling for other missing variables as represented by the time and individual effects.
We now discuss the variables employed in the Panel analysis ;

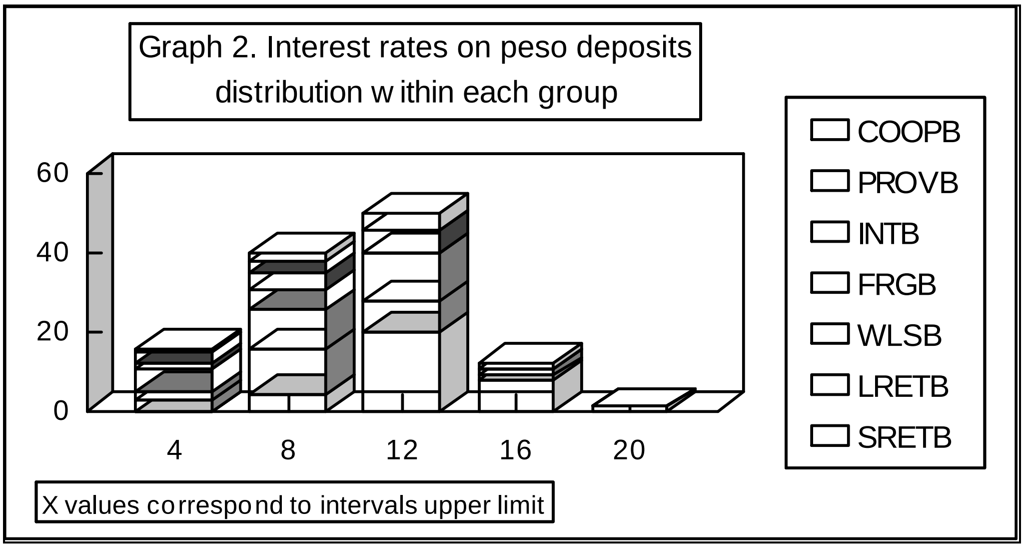
(b) bank fundamentals

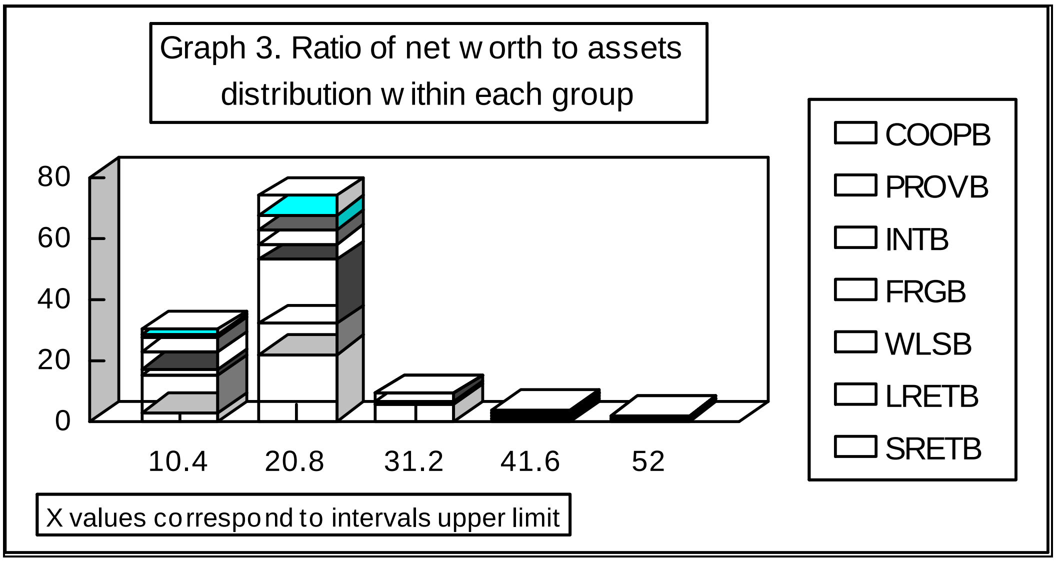
The literature on banking crises suggests many potential 'bank fundamentals' that might be of interest to depositors concerned about bank safety[4]. Note that throughout this period in Argentina there was no official deposit insurance in operation and the Convertibility program was widely believed to imply that there were only very limited lender of last resort facilities available. In this context, we would expect variables related to bank safety to be important fundamentals.

In the results to follow, we found that three 'fundamental' variables stood out as highly significant in all of the specifications we adopted. These were (i) the average interest rate paid by the bank on its liabilities in dollars and (ii) the same variable but for peso liabilities and (iii) the capital ratio of the bank (capital divided by total assets). The banking literature suggests that the interest rate paid by the bank on its liabilities should summarize the market's view of the riskiness of the bank. It is the return required by the market given the market's perception of the bank's risk. The capital ratio of the bank is a signal of the riskiness of the bank and this appeared to convey extra information not captured in the interest paid by banks. All three variables used were their end of November 1994 values and hence reflected the state of the bank before the crisis commenced. In terms of the panel, these variables are then constant across time but vary across the banks.

We illustrate the interest rate paid on peso liabilities and the capital ratio of the bank in Graphs 2 and 3 for each bank group. It is interesting to note that considering these distributions banks belonging to the same group, display fairly similar patterns, although cooperative banks appear to be the most heterogeneous. It is also clear, looking at Graphs 2 and 3 that there are important differences in interest rates and capitalization ratios between banks belonging to different groups. In particular interest rates are clearly lower for large retail banks and for foreign banks compared to the other groups.

[4] In the case of Argentina Dabos (1996) and Schumacher (1996) consider as 'bank fundamentals' variables including capitalization ratios mesured by net worth as a proportion of assets, the ratio of actual to required capital and non-preforming loans as a proportion of total loans. Also, variables related to profitability, such as the ratio of total returns to assets (ROA) are used as risk indicators.


Graph 2. Interest rates on peso deposits distribution w ithin each group
60
40
20
0
4
8
12
16
20
X values correspond to intervals upper limit
COOPB
PROVB
INTB
FRGB
WLSB
LRETB
SRETB


Graph 3. Ratio of net w orth to assets distribution w ithin each group
80
60
40
20
0
10.4
20.8
31.2
41.6
52
X values correspond to intervals upper limit
COOPB
PROVB
INTB
FRGB
WLSB
LRETB
SRETB

(c) macro-variables

The role of the 'macro. variables' is to control for shocks which affect the whole banking sector. Candidate 'macro. variables' with a daily frequency, in common with our deposit data, are the change in the total deposits of the banking system, the change in Argentine bond prices (eg: the FRB bond price), the change in the Argentine stock market index (Merval), the change in the level of Central Bank reserves and the level of interest rates (eg: the average interest rate in the inter-bank market). We do not propose any specific model here as to how these variables affect the banking sector. Suffice to say that the FRB price and the level of the Merval index summarize changing perceptions of the Argentine economy in general which depositors might expect to impact the banking sector (in the same spirit as Gorton (1988)) , whereas the level of Central Bank reserves, the total deposits in the banking system and the interbank interest rate summarize developments in the financial and banking sector more specifically. In particular, these latter variables should capture changes in liquidity in the banking sector which, following the theoretical model outlined in section 2, should be a crucial determinant for depositors' decisions, whether to make deposit withdrawals. Note that these variables then vary across time but are identical for each individual.

(d) contagion

The first panel specification detailed here includes all of these 'macro. variables' (Table 4, Model A), and the second one also the three 'bank fundamental' variables(Table 4, Model B). Note that as we are including variables that vary across individuals but not across time ('bank fundamentals') and variables that vary across time but not across individuals ('macro. variables') it makes little sense to estimate a 'fixed-effects' model. Instead we estimate a random-effects model. Our interest is then to analyze the resulting residuals from the panel to ascertain whether conditioning on these fundamental and 'macro. variables' capturing 'individual effects' and 'time effects' there persists a comovement in daily changes in deposits by banks providing support for a 'contagion' effect.

The results of our 'two way random effects model' are shown in Table 4(Model B). First note that the three 'bank fundamental' variables are significant with the expected signs (CAP RATIO=Capital Ratio, IPESOS=interest rate in pesos and IDOLLARS=interest rate in dollars). Of the macro effects, again we found the FRB, lagged two and five days, to be significant (FRB2 and FRB5 jointly significant) and the interbank interest rate (CALL) and the reserves of the Central Bank (LRES) to be on the margins of significance. Again, we also found seasonal effects, and again particularly on Mondays, to be important.

A particularly startling result is that given this specification, according to the Breusch-Pagan LM test we cannot reject the null that there is no significant individual random effects (H_0 : $\sigma^2_\mu = 0$). In other words, the individual effects are apparently fully captured by our three 'bank fundamental' variables. Note that running the panel without the bank fundamental variables, this test shows significant individual random effects. So, introducing just three bank fundamental variables appears to capture differences in bank behavior across the sample[5].

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[5] Without the 'bank fundamentals' in the Panel the B-P LM test for individual random effects has a value of 12.03 and a probability value of 0.05% whereas when the 'bank fundamentals' are included the LM test value falls to 0.04 with a probability value of 83%.

However, as the B-P LM test for random time effects shows, the same is not true for time effects. In other words, even including all the significant macro-effects the standard test suggests that there remain significant random time effects ($H_0 : \sigma^2_\lambda = 0$).

Our interpretation of this random time-effect, controlling for ‘macro. variables’ and ‘bank fundamentals’, is that this represents contagion. As the standard test for random 'time-effects' is based on a test on the comovement of the residuals of the individuals over time, this is precisely a test of unexplained comovement. We therefore interpret this result as an indication that, although ‘bank fundamentals’ and macro effects were clearly important, there is also an unexplained co-movement. This, we suggest, may be contagion.

Our second approach is to attempt to model 'contagion' more directly. Here we draw on the results of the VAR and note that there were important interactions between the groups of banks according to a traditional classification system. What we suggest here is that depositors in individual banks may have been influenced by the, lagged, movement in deposits of the various groups defined in section 3. We interpret these interaction effects as a more direct estimation of 'contagion'.

The results of this analysis are presented in Table 4 below[6]. First note that the coefficients on the ‘bank fundamentals’ and on the ‘macro. variables’ remain similar to the previous panel and retain their level of significance. This indicates that there are no serious problems of multicollinearity. However, also note that the group variables introduced are significant, mostly with positive sign. In particular the lagged deposits of wholesale banks (WLSB1, WLSB2) are highly significant with positive sign as are also the lagged deposits of large retail banks (LRETB1, LRETB5), with small retail banks (SRETB1) and cooperative banks (COOPB2) less significant. The only rather curious effect is the negative sign on the provincial public banks which appear to have the opposite influence on the deposits of other banks (PROVB1, PROVB5).

Apart from the significance of the group variables, the strong result with model C, is that with the group effects added, according to the B-P LM test, we cannot reject the hypothesis that there is no random time effect remaining. In other words, controlling for these interaction effects, we appear to have eliminated the unexplained comovement in the data. Our argument is then that our interpretation of the unexplained comovement in the data as contagion, appears to be supported as when we model contagion directly using interaction terms we find we can eliminate this unexplained comovement[7]

Table 4

Dependent variable : **Vardep**
Std : 0.0355

Exogenous Variables	Model A	Model B	Model C
CAP RATIO	-	0.0002	0.0002
		(3.488)	(3.729)
IPESOS	-	-0.0006	-0.0006

[6] As our model is based on daily data, there is a tremendous amount of noise and hence we have very low R^2 values. There also appear to be a number of strong outliers. Including dummies for the outliers greater than 3 standard deviations , we find the R^2 increased to 0.54 for model C.

[7] Heteroskedasticity was tested using Breusche-Pagan Test. H(0) is that residuals are homoskedastic. The statistic is distributed as chi-squared (20) under the null. We obtained a value of 923.64, rejecting the null hypothesis at a 5% level. The model was corrected using White’s method.

		(-5.067)	(-5.416)
IDOLLARS	-	-0.0004	-0.0004
		(-2.100)	(-2.245)
FRB2	0.0129	0.0129	0.0178
	(1.112)	(1.092)	(1.857)
FRB5	0.0122	0.0122	0.0106
	(1.099)	(1.080)	(1.159)
CALL	-0.0012	-0.0012	-0.0006
	(-1.821)	(-1.789)	(-1.134)
LRES	0.0419	0.0419	0.0200
	(1.766)	(1.735)	(1.050)
PROVB1	-	-	-0.0556
			(-1.617)
WLSB1	-	-	0.0533
			(2.395)
LRETB1	-	-	0.1411
			(2.132)
SRETB1	-	-	0.0413
			(1.575)
COOPB2	-	-	0.0757
			(1.218)
PROVB2	-	-	-0.0743
			(-2.265)
WLSB2	-	-	0.0380
			(1.638)
PROVB5	-	-	-0.0779
			(-2.221)
LRETB5	-	-	0.1004
			(1.589)
SRETB5	-	-	-0.0438
			(-1.627)
MON	0.0087	0.0087	0.0086
	(6.014)	(5.908)	(7.256)
TUE	0.0033	0.0033	0.0029
	(2.350)	(2.308)	(2.439)
WEN	0.0019	0.0019	0.0009
	(1.303)	(1.280)	(0.735)
THU	0.0016	0.0016	0.0014
	(1.148)	(1.128)	(1.157)
Constant	-0.0062	-0.0013	-0.0006
	(-4.512)	(-0.711)	(-0.353)
Indiv. Effect	random	random	random
B-P LM test	12.03 (pv= .0005)	0.04(pv= .8344)	0.05(pv= .8187)
Time Effect	random	random	random
B-P LM test	26.18(pv= .000002)	14.56(pv= .0007)	3.13(pv= .209)
adj. R2	0.0095	0.0139	0.0164
Stand dev	0.03517	0.03518	0.03524

Note: t-value in parentheses

Finally, we can asses the relative importance of the ‘bank fundamentals’, ‘macro. variables’ and the 'contagion' or 'interaction' terms. To do this we simply calculated the relative contribution of each group of variables to the explained variation in the dependent variable. As Table 6 shows, all three effects are important. Perhaps somewhat surprisingly the ‘macro. variables’ only account for 11% of the explained variation although it should be remembered, as noted above, that there is considerable variation in the experience of banks during the period. The 'contagion' or 'interaction' terms account for some 17% and the '‘bank fundamentals’' account for some 27% of the explained variation. Hence although the results give some support that depositors did discriminate according to ‘bank fundamentals’ and indeed this appeared to be the single largest determinant of the explained movement in deposits, contagion effects were also evident.

Table 6. Contribution of each group of variables to the explained variability of the model	
Fundamentals	27 %
Daily changer in deposits by group	17 %
'macro. variables'	11 %

5. Conclusions

This paper analyses the dynamics of the daily changes in deposits of individual banks in the Argentine financial system during the Tequila Crisis. An initial analysis using a VAR methodology shows that there were considerable interaction effects between bank groups, according to a standard classification of banks, especially among those groups of banks where it might be envisaged that information was less available. Secondly, using panel data techniques we attempted to separate three main determinants of movements in the deposits of individual banks; namely macro. variables, 'bank fundamentals' and interaction effects. The results indicate that, although bank 'fundamentals' were extremely important in driving the dynamics of deposits as well as 'macro' effects of the shock, there was also evidence of 'contagion' effects. These results have non trivial policy implications. Although the results might be interpreted as showing that depositors did indeed discriminate they also indicate that this discrimination was not perfect. This result should therefore be incorporated into any cost-benefit analysis of the need for safety-net type interventions such as deposit insurance.

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Apendix

Table1. VAR results

Sample: 14 108

Included observations: 95

Standard errors & t-statistics in parentheses

	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
COOPB(-1)	-0.082605	-0.012676	0.141299	-0.2582	0.119140	-0.187132	0.031133	-0.23903
	(0.13068)	(0.24478)	(0.46263)	(0.14244)	(0.16186)	(0.35530)	(0.12861)	(0.30573)
	(-0.63211)	(-0.05179)	(0.30542)	(-1.81272)	(0.73606)	(-0.52669)	(0.24207)	(-0.78182)
COOPB(-2)	-0.16757	0.293900	-0.281196	0.065971	-0.084664	-0.461647	-0.18009	-0.152704
	(0.12836)	(0.24043)	(0.45441)	(0.13991)	(0.15898)	(0.34898)	(0.12632)	(0.30030)
	(-1.30548)	(1.22238)	(-0.61882)	(0.47154)	(-0.53253)	(-1.32283)	(-1.42565)	(-0.50851)

PROVB(-1)	-0.112601	-0.204248	-0.11925	0.010189	-0.020926	0.119428	-0.011658	-0.29295
	(0.05898)	(0.11048)	(0.20880)	(0.06429)	(0.07305)	(0.16036)	(0.05804)	(0.13799)
	(-1.90914)	(-1.84878)	(-0.57113)	(0.15849)	(-0.28645)	(0.74477)	(-0.20084)	(-2.12305)
PROVB(-2)	-0.054237	-0.130488	0.110061	-0.09478	0.026486	-0.135461	-0.030582	0.027734
	(0.05871)	(0.10996)	(0.20783)	(0.06399)	(0.07271)	(0.15961)	(0.05777)	(0.13734)
	(-0.92388)	(-1.18665)	(0.52958)	(-1.48123)	(0.36426)	(-0.8487)	(-0.52933)	(0.20193)
NAPB(-1)	0.050817	0.109374	0.057466	-0.068762	-0.005899	0.032390	0.058264	0.149912
	(0.03350)	(0.06274)	(0.11858)	(0.03651)	(0.04149)	(0.09107)	(0.03296)	(0.07836)
	(1.51710)	(1.74324)	(0.48462)	(-1.88341)	(-0.14219)	(0.35567)	(1.76750)	(1.91301)
NAPB(-2)	-0.013734	0.120286	0.048238	0.011106	-0.067198	0.081002	-0.037634	0.020175
	(0.03697)	(0.06925)	(0.13087)	(0.04029)	(0.04579)	(0.10051)	(0.03638)	(0.08649)
	(-0.37151)	(1.73709)	(0.36859)	(0.27562)	(-1.46758)	(0.80592)	(-1.03444)	(0.23327)
FRGB(-1)	-0.033035	0.013868	-0.193838	0.034440	0.027705	-0.116965	-0.077323	-0.348858
	(0.11731)	(0.21974)	(0.41529)	(0.12786)	(0.14530)	(0.31894)	(0.11545)	(0.27445)
	(-0.2816)	(0.06311)	(-0.46675)	(0.26935)	(0.19067)	(-0.36673)	(-0.66976)	(-1.27112)
FRGB(-2)	0.061542	0.143885	0.141085	0.132445	0.217056	-0.495511	0.086226	-0.028455
	(0.10360)	(0.19406)	(0.36676)	(0.11292)	(0.12832)	(0.28167)	(0.10196)	(0.24238)
	(0.59404)	(0.74146)	(0.38468)	(1.17291)	(1.69153)	(-1.75918)	(0.84571)	(-0.1174)
INTB(-1)	-0.082255	0.067508	-0.4071	0.087884	-0.147626	0.488122	-0.152034	-0.148354
	(0.11277)	(0.21124)	(0.39923)	(0.12292)	(0.13968)	(0.30661)	(0.11098)	(0.26383)
	(-0.72939)	(0.31958)	(-1.01971)	(0.71498)	(-1.05689)	(1.59200)	(-1.36988)	(-0.5623)
INTB(-2)	0.077743	-0.270224	0.761643	0.038166	-0.010839	0.300578	0.130497	-0.073578
	(0.10879)	(0.20378)	(0.38514)	(0.11858)	(0.13475)	(0.29579)	(0.10707)	(0.25452)
	(0.71460)	(-1.32605)	(1.97758)	(0.32187)	(-0.08044)	(1.01620)	(1.21885)	(-0.28908)
WLSB(-1)	0.100511	0.015910	-0.124099	-0.113289	0.101875	0.002365	0.042856	0.201156
	(0.04179)	(0.07827)	(0.14793)	(0.04555)	(0.05176)	(0.11361)	(0.04112)	(0.09776)
	(2.40532)	(0.20326)	(-0.83889)	(-2.48734)	(1.96832)	(0.02082)	(1.04213)	(2.05760)
WLSB(-2)	-0.036493	-0.012229	0.094432	0.028860	-0.064567	0.416293	-0.042934	-0.008487
	(0.04479)	(0.08389)	(0.15855)	(0.04881)	(0.05547)	(0.12177)	(0.04408)	(0.10478)
	(-0.81483)	(-0.14577)	(0.59560)	(0.59122)	(-1.16395)	(3.41882)	(-0.97411)	(-0.081)
LRETB(-1)	0.249820	-0.090066	0.505619	0.151961	0.482256	-0.497428	0.429417	0.485897
	(0.12241)	(0.22928)	(0.43333)	(0.13342)	(0.15161)	(0.33280)	(0.12046)	(0.28637)
	(2.04092)	(-0.39282)	(1.16681)	(1.13899)	(3.18086)	(-1.49467)	(3.56470)	(1.69673)

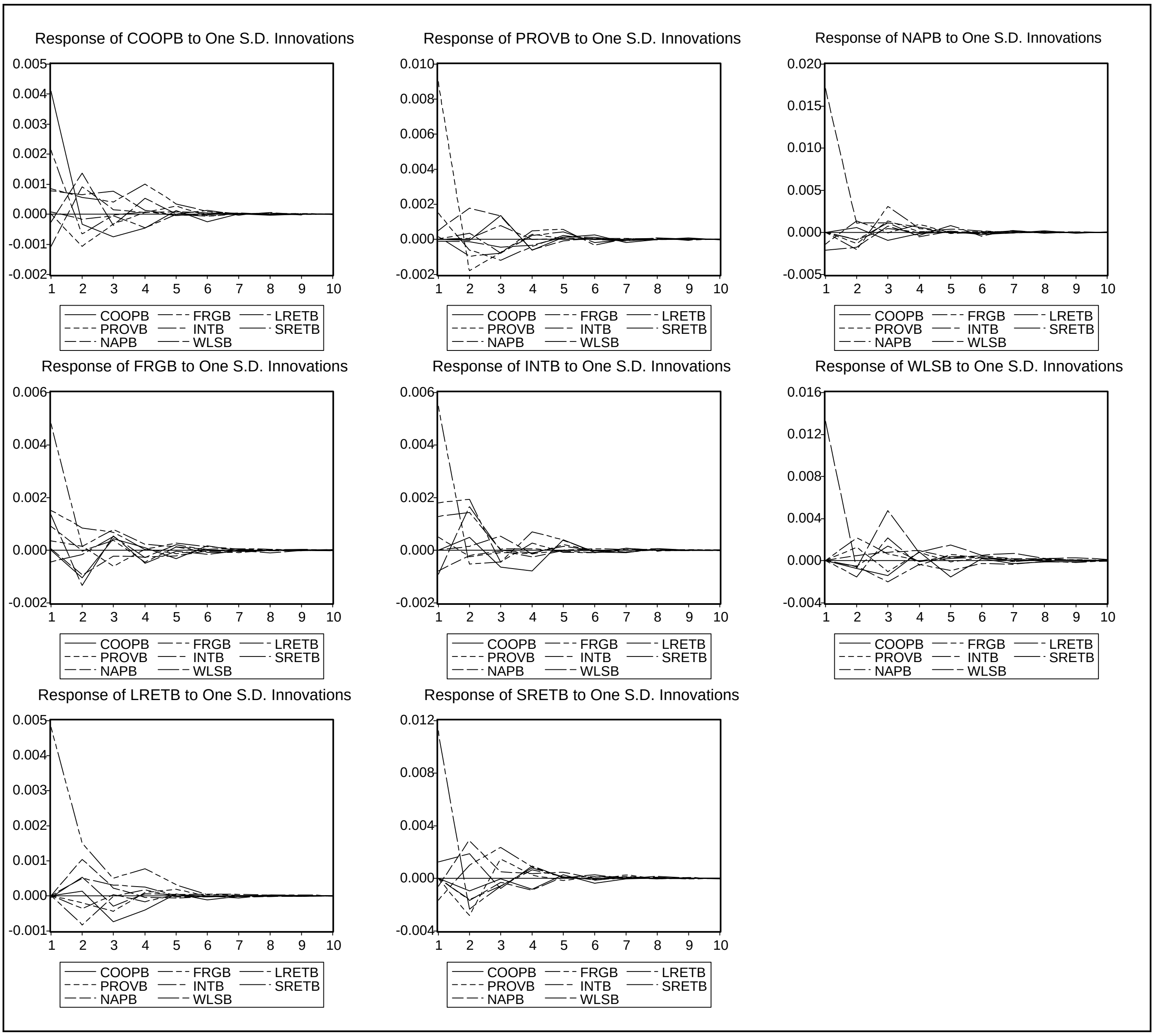
LRETB(-2)	0.070981	-0.229975	-0.337678	0.043317	-0.265368	0.696233	-0.005575	0.543374
	(0.12881)	(0.24128)	(0.45601)	(0.14040)	(0.15955)	(0.35022)	(0.12677)	(0.30136)
	(0.55105)	(-0.95314)	(-0.74051)	(0.30853)	(-1.66328)	(1.98801)	(-0.04398)	(1.80308)
SRETB(-1)	0.072942	-0.090717	-0.048941	-0.005741	0.138501	-0.097496	0.057063	-0.18511
	(0.04963)	(0.09297)	(0.17570)	(0.05410)	(0.06147)	(0.13494)	(0.04884)	(0.11611)
	(1.46968)	(-0.97582)	(-0.27855)	(-0.10612)	(2.25305)	(-0.72252)	(1.16829)	(-1.59422)
SRETB(-2)	0.092145	-0.083102	0.035875	0.029378	0.040955	0.065049	0.043089	-0.073305
	(0.04725)	(0.08850)	(0.16726)	(0.05150)	(0.05852)	(0.12845)	(0.04650)	(0.11053)
	(1.95031)	(-0.93902)	(0.21449)	(0.57048)	(0.69986)	(0.50640)	(0.92671)	(-0.66319)
C	-0.009765	-0.006561	-0.002245	-0.002791	-0.006463	-0.00229	-0.001793	-0.00286
	(0.00202)	(0.00378)	(0.00714)	(0.00220)	(0.00250)	(0.00548)	(0.00198)	(0.00472)
	(-4.84392)	(-1.73746)	(-0.31453)	(-1.27008)	(-2.5882)	(-0.41772)	(-0.90384)	(-0.60649)
FRB(-3)	0.003013	0.042554	-0.008837	0.017576	-0.005619	0.076193	0.039931	0.053462
	(0.01548)	(0.02899)	(0.05479)	(0.01687)	(0.01917)	(0.04208)	(0.01523)	(0.03621)
	(0.19467)	(1.46792)	(-0.1613)	(1.04196)	(-0.29313)	(1.81078)	(2.62170)	(1.47653)
MON	0.012299	0.006516	0.002532	0.006853	0.009783	-0.002329	0.002790	-0.007557
	(0.00221)	(0.00414)	(0.00782)	(0.00241)	(0.00274)	(0.00601)	(0.00217)	(0.00517)
	(5.56751)	(1.57464)	(0.32382)	(2.84620)	(3.57550)	(-0.38785)	(1.28312)	(-1.46216)
TUE	0.005468	0.003586	0.007589	0.000498	0.000521	-0.006367	0.000169	0.001065
	(0.00230)	(0.00431)	(0.00814)	(0.00251)	(0.00285)	(0.00625)	(0.00226)	(0.00538)
	(2.37831)	(0.83278)	(0.93242)	(0.19862)	(0.18291)	(-1.01859)	(0.07453)	(0.19796)
WEN	0.001253	0.002662	-0.005533	-0.001321	-0.000934	0.003912	0.000108	-0.00849
	(0.00229)	(0.00430)	(0.00812)	(0.00250)	(0.00284)	(0.00624)	(0.00226)	(0.00537)
	(0.54611)	(0.61959)	(-0.6814)	(-0.52841)	(-0.32886)	(0.62729)	(0.04805)	(-1.58233)
THU	0.003927	0.002245	0.005139	0.000413	0.000570	-0.014837	0.000983	-0.005385
	(0.00200)	(0.00374)	(0.00708)	(0.00218)	(0.00248)	(0.00544)	(0.00197)	(0.00468)
	(1.96434)	(0.59947)	(0.72603)	(0.18970)	(0.23007)	(-2.72966)	(0.49960)	(-1.15125)
R-squared	0.587957	0.285406	0.116969	0.372960	0.453680	0.371426	0.351883	0.323964
Adj. R-squared	0.469424	0.079838	-0.137054	0.192578	0.296519	0.190604	0.165438	0.129488
Sum sq. resids	0.002264	0.007943	0.028371	0.002689	0.003473	0.016734	0.002193	0.012391
S.E. equation	0.005569	0.010431	0.019714	0.006070	0.006897	0.015140	0.005480	0.013028
Log likelihood	370.8192	311.1962	250.7234	362.6359	350.4912	275.8003	372.3387	290.0739
Akaike AIC	-10.18143	-8.926211	-7.6531	-10.00915	-9.753474	-8.181033	-10.21342	-8.481532
Schwartz SC	-9.590009	-8.334787	-7.061676	-9.417728	-9.16205	-7.589609	-9.621997	-7.890108
Mean dep.	-0.005301	-0.00248	-0.001163	-0.000337	-0.005435	-0.011801	-0.000895	-0.004959
S.D. dependent	0.007645	0.010874	0.018488	0.006755	0.008224	0.016829	0.005999	0.013964

Table 2. Variance Decomposition

Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
COOPB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.004882	70.33297	0.000446	4.789870	0.024525	18.97540	0.288487	3.034570	2.553731
2	0.005385	58.19763	3.922620	6.844411	0.114116	17.07770	6.697302	3.608759	3.537462
3	0.005529	57.01922	4.060092	6.564671	0.115758	16.20328	6.792140	3.972555	5.272285
4	0.005684	54.60420	3.851007	6.220814	0.748598	15.34721	7.307383	6.878797	5.041983
5	0.005702	54.29634	4.041452	6.200752	0.743894	15.25467	7.260733	7.187166	5.014986
6	0.005711	54.32054	4.039193	6.189251	0.758523	15.21000	7.291123	7.189969	5.001402
7	0.005711	54.31117	4.038569	6.189917	0.759928	15.21453	7.292936	7.189310	5.003635
8	0.005712	54.30160	4.038903	6.189890	0.761915	15.21191	7.300666	7.191132	5.003982
9	0.005712	54.29936	4.039562	6.189640	0.762764	15.21275	7.300640	7.191391	5.003899
10	0.005712	54.29870	4.039838	6.189539	0.762984	15.21259	7.301222	7.191288	5.003838
PROVB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.009144	0.000000	96.90187	0.311672	0.000000	0.000000	0.015014	2.745670	0.025777
2	0.009566	0.002943	92.08161	3.754115	0.004713	0.137790	0.036386	2.916741	1.065707
3	0.009958	1.881100	85.53031	5.219134	0.635854	0.768012	0.233738	4.125882	1.605965
4	0.010027	2.220982	84.43725	5.502837	0.627588	0.991051	0.347699	4.241018	1.631573
5	0.010056	2.219456	83.94630	5.477919	0.625972	1.307898	0.360201	4.265832	1.796420
6	0.010068	2.278427	83.75087	5.466388	0.628390	1.425005	0.371042	4.255982	1.823902
7	0.010071	2.307038	83.70715	5.464071	0.632322	1.424597	0.376807	4.264914	1.823104
8	0.010071	2.306761	83.69493	5.463491	0.633732	1.428141	0.377098	4.270689	1.825158
9	0.010072	2.312059	83.68709	5.463018	0.633759	1.430018	0.378037	4.270397	1.825621
10	0.010072	2.313394	83.68503	5.462908	0.633793	1.429985	0.378523	4.270780	1.825583
NAPB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.017281	0.000000	0.000000	97.84751	0.000000	0.000000	1.503184	0.649309	0.000000
2	0.017692	0.106906	0.573721	93.75430	0.270792	1.412473	2.429191	1.197341	0.255279
3	0.018122	0.374285	1.101411	89.75315	0.320869	4.186019	2.473759	1.142155	0.648348
4	0.018174	0.379031	1.096655	89.32642	0.319133	4.226203	2.499015	1.399702	0.753837
5	0.018198	0.378235	1.093987	89.10125	0.362890	4.222720	2.692755	1.396165	0.752000
6	0.018208	0.393527	1.094160	89.01288	0.370017	4.217801	2.753401	1.398856	0.759360
7	0.018212	0.394464	1.094779	88.98141	0.370071	4.219787	2.766756	1.411015	0.761712
8	0.018214	0.405154	1.095289	88.96302	0.371475	4.221037	2.768740	1.412148	0.763134
9	0.018214	0.408863	1.095958	88.95884	0.371463	4.220832	2.768828	1.412111	0.763102
10	0.018214	0.409279	1.095946	88.95767	0.371495	4.220910	2.769356	1.412108	0.763236
FRGB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.005321	0.000000	0.428012	0.008867	81.56533	2.864759	6.363293	8.080742	0.688998
2	0.005738	3.394131	0.431374	2.799098	70.20730	2.467717	10.92404	9.099591	0.676749
3	0.005943	3.700597	1.472105	2.759654	67.18913	2.698231	11.01913	9.781274	1.379887
4	0.005997	3.661606	1.449291	2.899498	66.09035	3.222839	11.50249	9.605689	1.568232
5	0.006024	3.925542	1.485928	3.011413	65.55165	3.239085	11.40476	9.709946	1.671671
6	0.006031	3.990835	1.482574	3.008554	65.40826	3.251396	11.45220	9.737496	1.668687
7	0.006032	3.989750	1.483095	3.013450	65.37823	3.276279	11.44794	9.736310	1.674940
8	0.006033	3.988936	1.482639	3.013921	65.35410	3.275660	11.47748	9.732215	1.675047
9	0.006034	3.989366	1.483422	3.014680	65.34947	3.276730	11.47727	9.734118	1.674945
10	0.006034	3.989988	1.483427	3.014739	65.34573	3.277062	11.48021	9.733670	1.675168
INTB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.006046	0.000000	0.664690	1.709338	0.000000	81.97190	2.283323	8.849703	4.521045
2	0.006766	0.519727	0.667676	1.457341	0.044199	66.08055	7.800129	15.28293	8.147448
3	0.006848	1.388009	0.671069	1.424783	0.647875	64.93320	7.614125	15.36523	7.955708
4	0.006942	2.629953	0.688822	1.532421	0.673260	63.33689	7.435543	15.95680	7.746309
5	0.006969	2.939350	0.769252	1.520951	0.668085	62.86572	7.419163	16.12858	7.688901
6	0.006971	2.946903	0.768901	1.520158	0.672157	62.83853	7.414129	16.13651	7.702718
7	0.006974	2.965191	0.778667	1.519253	0.672414	62.81043	7.418868	16.12616	7.709018
8	0.006974	2.972208	0.778932	1.519565	0.672622	62.80270	7.418315	16.12750	7.708151
9	0.006974	2.972114	0.779630	1.519770	0.673239	62.80085	7.418407	16.12749	7.708493
10	0.006974	2.972625	0.779993	1.519756	0.673229	62.79999	7.418598	16.12724	7.708570
WLSB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.013272	0.000000	0.000000	0.000000	0.000000	0.000000	100.0000	0.000000	0.000000
2	0.013668	0.314180	0.867420	0.124607	0.177825	2.517989	94.55648	1.283895	0.157608

3	0.014988	1.161720	1.225598	0.387956	1.942130	2.276596	88.83335	3.182785	0.989869
4	0.015097	1.472288	1.488504	0.798552	1.966267	2.243970	87.83343	3.218577	0.978411
5	0.015297	2.440876	1.456762	0.805930	2.303987	2.243036	86.50433	3.270455	0.974625
6	0.015329	2.445524	1.485129	0.889032	2.327910	2.305577	86.25624	3.280271	1.010315
7	0.015355	2.465277	1.482080	0.899783	2.377702	2.300908	86.18590	3.277298	1.011054
8	0.015360	2.470773	1.485830	0.909209	2.378481	2.320333	86.14457	3.275962	1.014846
9	0.015364	2.473373	1.484984	0.910976	2.389991	2.319844	86.12908	3.277222	1.014529
10	0.015365	2.473161	1.486359	0.912796	2.390111	2.320339	86.12577	3.277048	1.014418
LRETB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.004804	0.000000	0.000000	0.000000	0.000000	0.000000	0.009915	99.99009	0.000000
2	0.005276	0.058352	0.153131	3.871742	0.489570	2.508638	0.990083	91.02617	0.902316
3	0.005390	1.939793	0.819092	3.871937	0.471804	2.404234	1.249042	88.07097	1.173127
4	0.005473	2.439557	0.820543	3.761154	0.555015	2.426639	1.223639	87.42861	1.344844
5	0.005486	2.437445	0.922956	3.758458	0.554870	2.420434	1.221102	87.34611	1.338628
6	0.005488	2.481742	0.923022	3.756785	0.562519	2.422372	1.221488	87.29043	1.341639
7	0.005488	2.481985	0.924233	3.758263	0.566951	2.422062	1.233748	87.27129	1.341467
8	0.005489	2.483187	0.924389	3.760854	0.567563	2.422629	1.233929	87.26495	1.342496
9	0.005489	2.483189	0.924367	3.761572	0.568884	2.422494	1.236290	87.26068	1.342522
10	0.005489	2.483168	0.924686	3.761691	0.568990	2.422529	1.236658	87.25977	1.342508
SRETB									
Period	S.E.	COOPB	PROVB	NAPB	FRGB	INTB	WLSB	LRETB	SRETB
1	0.011421	0.000000	0.000000	0.286580	0.000000	0.000000	1.145645	2.146088	96.42169
2	0.012776	0.586703	4.920420	5.315970	1.759527	1.636994	3.047515	2.319746	80.41312
3	0.013132	0.557198	5.877129	5.166312	1.724687	1.752197	3.223484	5.373136	76.32586
4	0.013292	0.954247	5.761203	5.105170	2.155563	1.928674	3.623022	5.640283	74.83184
5	0.013305	0.990985	5.767757	5.209433	2.158269	1.929186	3.616624	5.630590	74.69716
6	0.013316	1.076769	5.761383	5.201148	2.166381	1.934489	3.650748	5.630315	74.57877
7	0.013319	1.077973	5.767721	5.199029	2.165439	1.964728	3.649002	5.628924	74.54718
8	0.013320	1.077930	5.766774	5.198288	2.166772	1.965415	3.660162	5.630017	74.53464
9	0.013321	1.077987	5.766792	5.198217	2.167471	1.965345	3.660030	5.632223	74.53194
10	0.013321	1.079344	5.766743	5.198112	2.167847	1.965592	3.660237	5.632089	74.53004
Ordering: WLSB LRETB NAPB SRETB PROVB INTB FRGB COOPB									

Graph 1. Impulse respons functions



Documentos de Trabajo Publicados

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