

## Inside the Crisis

### An Empirical Analysis of Banking Systems in Distress

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Contemporary banking crises are not accompanied by declines in aggregate bank deposits, and credit does not fall relative to output, but the growth of both deposits and credit does slow down substantially. Output recovery begins the second year after the crisis and is not led by a resumption of credit growth. Instead, banks (including the stronger banks) reallocate their asset portfolio away from loans.

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## Summary findings

Much of the substantial literature on banking crises focuses on early warning indicators. Demirgüç-Kunt, Detragiache, and Gupta look at what happens to the economy and the banking sector *after* a banking crisis breaks out.

Much of the theory of banking crises assigns a central role to depositor runs, with vulnerability to runs viewed as a basic characteristic of banks as financial intermediaries. But banking systems can be financially distressed even when depositors do not withdraw their deposits, if other bank creditors rush for the exit or if banks become insolvent.

Are contemporary banking crises characterized by large declines in deposits?

The authors find that contemporary banking crises are not accompanied by declines in aggregate bank deposits, and credit does not fall relative to output, but the growth of both deposits and credit does slow down substantially. Output recovery begins the second year after the crisis and is not led by a resumption of credit growth. Instead, banks (including the stronger banks) reallocate their asset portfolio away from loans.

This suggests that protecting deposits during a banking crisis may not be enough to protect bank credit, as lack of usable collateral and poor borrower creditworthiness discourage banks from lending. However, protecting bank credit may not be a priority right after a crisis, as the real economy can rebound without it, at least while there is substantial underused capacity.

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This paper—a joint product of Finance, Development Research Group, and the Research Department, International Monetary Fund—is part of a larger effort to study banking crises. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Kari Labrie, room MC3-456, telephone 202-473-1001, fax 202-522-1155, email address [klabrie@worldbank.org](mailto:klabrie@worldbank.org). Policy Research Working Papers are also posted on the Web at [www.worldbank.org/research/workingpapers](http://www.worldbank.org/research/workingpapers). The authors may be contacted at [ademirguckunt@worldbank.org](mailto:ademirguckunt@worldbank.org), [edetragiache@imf.org](mailto:edetragiache@imf.org), or [pgupta@imf.org](mailto:pgupta@imf.org). August 2000. (36 pages)

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## **Inside the Crisis: An Empirical Analysis of Banking Systems in Distress**

by

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## I. Introduction

With the proliferation of banking problems around the world, in the last few years the empirical literature on systemic banking crises has grown substantially. This literature has mostly focussed on the factors associated with the onset of distress, to identify the determinants of the crises or to look for “early warning indicators” of trouble.<sup>1</sup> In this paper, we shift attention to what happens to the economy and to the banking sector *after* a banking crisis breaks out. The evidence comes from both macroeconomic and bank level data. The macroeconomic sample includes 32 banking crises over the period 1980-1995, while the bank-level data covers 16 crisis episodes during 1991-98.

While our main goal is to characterize the “stylized facts” of the post-crisis period, the analysis of the empirical evidence is centered on a few key issues: first, much of the theory of banking crises assigns a central role to depositor runs, and vulnerability to runs is viewed as a basic characteristics of banks as financial intermediaries.<sup>2</sup> However, systemic banking crises in which large segments of the banking system become financially distressed may occur even when depositors do not withdraw their deposits, if it is other bank creditors who “rush for the exit”, or if banks simply become insolvent. So the first question that we take up is whether contemporary banking crises are characterized by large declines in deposits.

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<sup>1</sup> Among the first studies are Demirgüç-Kunt and Detragiache (1998 and 1999), Eichengreen and Rose (1998), and Hardy and Pazarbaşıoğlu (1999); among the second, see Kaminsky and Reinhart (1999) and Demirgüç-Kunt and Detragiache (2000).

<sup>2</sup> For theoretical models of bank runs see, among others, Diamond and Dybvig (1981), Chari and Jaganathan (1988), and Allen and Gale (1998). For a review of the literature, see Bhattacharya and Thakor (1988).

The recent banking crises in Mexico and East Asia were accompanied by a strong but short-lived downturn in output; in both cases, the speed of the recovery has been attributed to the expansionary effects of the sharp real exchange rate depreciation associated with the crisis.<sup>3</sup> The second question that we examine is whether this pattern is typical of banking crises in general, or if it is a special feature of these recent cases. This is an important question in designing post-crisis macroeconomic policies. A third issue is to what extent the behavior of output is driven by that of aggregate bank credit. If the crisis forces banks to cut lending, and if the resulting “credit crunch” is important in the propagation of the crisis, then restoring the flow of credit should be a priority for policy-makers in the immediate aftermath of banking crises.<sup>4</sup> We also examine whether the need to support a weak banking system leads monetary authorities to pursue expansionary monetary policies that fuel inflation and, possibly, exchange rate depreciation. Finally, we will consider the effects of banking crises on government budgets since, as documented by Caprio and Kliengebiel (1996), a number of recent banking crises resulted in expensive government bailouts.<sup>5</sup>

In the second part of the paper we study how the profitability, capitalization, liquidity, asset and liability structure, and cost-efficiency of banks change following a systemic crisis using bank-level data. If depositor runs are the major cause of banking crises, we expect to see

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<sup>3</sup> On Mexico, see for instance Krueger and Tornell (1999). On the Asian crises see IMF (1999).

<sup>4</sup> Bernanke (1983) argued that the contraction in credit brought about by the banking crisis was instrumental in the propagation of the Great Depression in the U.S.. Recent attempts to test for a credit crunch effect in East Asia include Ding, Domaç, and Ferri (1998), Ghosh and Ghosh (1999), and Borensztein and Lee (2000).

<sup>5</sup> Burnside, Eichenbaum, and Rebelo (1998) argue that prospective government deficits arising from bank bailout costs caused the 1997 East Asian currency crises.

deposits decline both in absolute terms and as a share of bank assets. Also, under the credit crunch hypothesis bank loans should decline, while the ratio of loans to assets should increase, as banks attempt to maintain funding levels for their customers.

To identify the stylized facts of the post-crisis period, we test whether the variable of interest in each of the years immediately following a crisis is significantly different from the mean of the pre-crisis period. Thus, the exercise provides information as to which variables appear to be significantly affected by the occurrence of the crisis, but also as to how the response changes while the crisis unfolds. Besides looking at average behavior, we also try to identify differences in “aftermath behavior” among groups of countries and of banks.

The paper is organized as follows: the next section discusses sample selection and methodology. The evidence from the aggregate data is in Section III. Section IV discusses foreign exchange valuation effects, while Section V presents the analysis of bank level data. Section VI concludes.

## **II. Sample Selection and Methodology**

### **A. The Sample**

We define a banking crisis as a period in which significant segments of the banking system become illiquid or insolvent. To identify systemic crisis episodes, we look at evidence of large scale bank failures, at the enactment of emergency measures by the government (deposit freezes, nationalizations, deposit guarantees, bank recapitalization plans), at whether there were reports of significant depositor runs, at the level of non-performing loans (at the peak of the crisis), and at the costs of the bailout. The baseline sample for the present study includes 36 banking crises in 35 countries (see Appendix I for a list of countries and dates). For each

variable of interest, a panel of observations is formed by pooling the 36 time series consisting of the three years before the crisis, the crisis year, and the three years following a crisis. For some variables, the panel may exclude one or more countries because of lack of data or because of outliers.

#### B. A regression framework to identify stylized facts

To assess whether the behavior of the variables of interest changes following a banking crisis compared to the pre-crisis period, we examine whether in the crisis year and in each of the three aftermath periods the variable in question took on values significantly different from the average of the three years preceding the crisis. To this end, we estimate OLS regressions in which each variable is regressed on four time dummies, one for the year of the crisis, and one each for the three periods following the crisis. To control for heterogeneity across countries, we also introduce country dummy variables in the regression. More formally, let  $N$  denote the number of countries, and let  $y_{it}$  be an observation for variable  $y$  in period  $t$  and country  $i$ . Furthermore, let  $u_{it}$  be a disturbance term, let  $\gamma$  and  $\beta$  be regression coefficients, and define as  $T$  the year of the crisis. Then, in the empirical model we estimate:

$$y_{it} = \gamma_i + u_{it}$$

for  $t=T-1, T-2,$  and  $T-3$  and  $i=1, \dots, N,$  and

$$y_{it} = \gamma_i + \beta_t + u_{it}$$

for  $t= T, T+1, T+2,$  and  $T+3$  and  $i=1, \dots, N.$  In this framework, the OLS estimate of each beta (the coefficient of the period  $t$  dummy) is the mean difference between the value of the variable at  $t$  and the mean of the pre-crisis period. Thus, if the estimated betas are significantly different



from zero, then the variable behaves differently in the post-crisis period than in the pre-crisis years. Furthermore, comparing the coefficients of the time dummies with one another allows us to trace the dynamic evolution of the variable over the post-crisis period. Because of heterogeneity across countries, we use heteroskedasticity-consistent standard errors to do hypothesis testing.

## **II. Evidence from Aggregate Data**

### **A. The Behavior of Bank Deposits**

The rate of growth in demand deposits falls significantly relative to the pre-crisis period in the crisis year, but by the following year the difference is no longer significant (Table 1). Furthermore, deposits as a share of output do not decline significantly; in fact, the sign of the coefficient is positive, although not significant except in the third year after the crisis. Total deposits, which include time and foreign currency deposits, are larger than in the pre-crisis period, but this may reflect in part the revaluation of foreign currency deposits in countries where a large currency depreciation accompanied the banking crisis, an issue that is examined in more detail in Section IV below. Of course, some banks may experience runs and lose deposits, but these deposits may be reinvested elsewhere in the banking system, so banks do not lose demand deposits in the aggregate.<sup>6</sup> Also, runs may be short-lived, and not be captured in annual data, as was the case of Argentina in 1995.

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<sup>6</sup> Aggregate deposits did not decline during the recent Asian crises, while depositors switched from small to large banks and from domestic to foreign banks (Domaç and Ferri, 1999, Lindgren et al., 1999). The Asian crises are not included in our macro sample.

These findings suggest that, in contrast with the historical experience which has inspired much of the theoretical literature, depositor panics have not been a major element of contemporary banking crises. But why is it that depositors do not run in the presence of widespread insolvency in the banking system? There are two possible, and not mutually exclusive, explanations: one is that even in the most dire crises there remains a segment of the banking system that is perceived to be safe, and depositors flee there rather than to cash. Another hypothesis is that depositors in many of the sample countries were protected through a generous safety net, including explicit deposit insurance, “lender of last resort” facilities, ex post guarantees of deposits, and prompt government rescues of troubled institutions.

#### D. Output, Investment, and Bank Credit

The banking crisis is accompanied by a sharp decline in output growth, of the order of four percentage points (Table 1). Growth remains depressed in the year following the crisis, but returns to its pre-crisis level thereafter. The ratio of investment to GDP is below its pre-crisis level in all the periods, but significantly so only in T+1. Thus, while financial distress wreaks havoc in the banking system and it often takes many years to clear up the mess, the effects on the real economy seem to be short-lived. This is consistent with the observed “U-shaped” output recovery following the Mexican 1995 crisis and the 1997 Asian crises.

The observed decline in output and investment growth may be as much the consequence of the adverse shocks that contributed to the banking crisis as the effect of the crisis itself. Disentangling causality in this context is an impervious task. However, if bank distress contributes significantly to the downturn, we should see credit to the private sector decline along with output. In fact, while the rate of growth of bank credit falls below its pre-crisis level

beginning in the crisis year, credit as a share of GDP remains significantly *above* pre-crisis levels for the entire aftermath period. Thus, credit slows down, but less so than output. Moreover, in about half of the sample credit growth was still *positive* in  $t$  and  $t+1$ . On the other hand, in the second and third year following the crisis, when output growth returns to its pre-crisis levels, credit growth remains depressed. So the recovery does not seem to be driven by a resumption in bank lending.

This evidence casts doubts about the credit crunch hypothesis, according to which the lack of bank credit significantly contributes to output decline following a banking crisis, and the resumption of bank lending is a necessary condition for output recovery. What seems to be happening, instead, is that, once the macroeconomic outlook improves, firms are able to “economize” on bank credit by switching to other sources of funding, such as suppliers’ credit, internal financing, foreign credit lines, equity, or bonds. This interpretation is in line with what has been observed during the Mexican recovery following the 1995 crisis (Krueger and Tornell, 1999).

Unfortunately, this evidence, though suggestive, cannot be conclusive because the change in the stock of real credit is an imperfect measure of the aggregate amount of funds available to bank customers, particularly during a crisis. Some of the increase (or lack of decline) of credit may reflect the capitalization of interest payments to avoid open defaults in a situation in which interest rates have increased dramatically. Also, in countries with a sizable portion of foreign currency loans, there may be a revaluation effect due to a real exchange rate depreciation. In Section VI below we assess the relevance of this particular source of bias. Other factors may lead to overestimate the credit contraction following a crisis: restructuring operations following the crisis may result in an apparent reduction of aggregate bank credit to

the private sector if some loans are transferred to a special institution outside the banking system (for instance, an asset management company). Also, when loans are set in nominal terms, inflation reduces the value of real bank debt outstanding. Since inflation is high following a banking crisis, as documented below, this valuation effect may be substantial.

#### E. Interest rates

The first interest rate in Table 1 is a “policy” interest rate, i.e. the rate on short-term government securities where available, and a central bank rate otherwise. The real rate is obtained by subtracting inflation. This interest rate is higher in the year of the crisis and in the following year, and lower thereafter, but these differences are not significant due to large standard errors. Deposit interest rates also exhibit no significant difference from pre-crisis levels, so there is no evidence that banks have to pay higher real rates to attract depositors. This reinforces the view that depositor safety nets were strong. Interestingly, both the real lending interest rate and the spread rise significantly in the crisis year, possibly reflecting an increase in default risk premiums.

#### F. Inflation, the Exchange Rate, and the Government Balance

Banking crises are accompanied by a substantial increase in inflation that peaks in the year after the crisis at almost 28 percentage points above the pre-crisis level, and persists throughout the aftermath period. The increase in the rate of depreciation of the exchange rate is even more marked than that of inflation, even if only eight countries in the sample had a full

blown currency crisis in the year of the banking crisis.<sup>7</sup> This loss of monetary control, however, does not seem to be driven by central bank lending to the banking system, as central bank credit does not significantly increase as a share of bank assets in the sample countries. The latter finding is consistent with the evidence on deposits: if the banking system does not lose liquidity through depositor runs, then there should be little need for liquidity support from the monetary authorities.<sup>8</sup> Finally, there is no systematic decline in the government surplus in the aftermath period, despite the large fiscal costs of banking crises documented in the literature (Caprio and Kliengebiel, 1996). This may be because the fiscal impact of the rescues is spread over a long period of time, or because other expenses are cut or revenues raised to make room for bank bailout costs. Another plausible hypothesis is that bailout costs are kept off budget.<sup>9</sup>

### **III. Correcting for Exchange Rate Valuation Effects**

Since banking crises are often accompanied by a large exchange rate depreciation, valuation effects may play an important role in shaping the movements of bank credit or bank deposits in countries in which a sizable portion of these claims is denominated in foreign currency. Careful measurement of these valuation effects requires much country-specific information that is not available in cross-country data bases and it is beyond the scope of this

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<sup>7</sup> The exchange rate depreciation also results in a sharp and persistent increase in bank foreign liabilities as a share of assets, of the order of over 20 percentage points.

<sup>8</sup> The central bank may play an active role in providing liquidity to the system by injecting liquidity in some banks and withdrawing it from others.

<sup>9</sup> This is supported by the findings of Kharas and Mishra (2000), who find that, in recent years, the main component of the large off-budget liabilities of developing countries is attributable to realized contingent liabilities following financial crises.

paper. Nonetheless, to get a better sense of the magnitude of these phenomena for the sample crises, we have gathered information on the size of foreign currency deposits and credit for the episodes in our sample from central bank bulletins and other miscellaneous data sources. The search yielded foreign currency credit data for 20 episodes and foreign currency deposit data for 23 episodes.<sup>10</sup> Using this information, we computed measures of aggregate real credit and deposits “purged” of exchange rate valuation effects as follows: for the crisis year and the aftermath years, total “corrected” real credit (deposits) is the sum of two terms, the domestic currency component divided by the domestic price index, and the foreign currency component multiplied by the real exchange rate prevailing *in the year before the crisis*, where the real exchange rate is the nominal rate (vis-à-vis the US dollar) divided by the price index. For the years before the crisis the “corrected” measures are equal to the standard ones. Thus, the corrected variables measure the foreign currency component of total real credit and deposits as if the real exchange rate had remained at its pre-crisis level.

The new variables were used to rerun the regressions for the rates of growth of real credit and deposits and for the ratios of each variable to GDP. The results are reported in Table 2. Perhaps surprisingly, the coefficient estimates and standard errors are not much different whether valuation effects are eliminated or not, although for some individual countries these

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<sup>10</sup> The episodes for which both foreign currency credit and deposit data are available are: Argentina (1995), Bolivia (1995), Chile (1980), Ecuador (1995), Finland (1991), Indonesia (1992), India (1991), Israel (1983), Italy (1990), Japan (1992), Panama (1988), Papua New Guinea (1989), Paraguay (1995), Peru (1993), Sweden (1990), United States (1981), Uruguay (1981), Venezuela (1993). In addition, information on deposits only is available for Thailand (1983), Nigeria (1991), Portugal (1986), El Salvador (1989), and Turkey (1991), and for credit only for Mexico (1982) and Norway (1987).

effects are not trivial. Both using the corrected and non-corrected measures, credit growth declines substantially in the crisis year, and remains depressed through the third year after the crisis; credit, however, increases as a share of GDP as compared to the pre-crisis period. This is exactly what was happening for the baseline sample. As for deposits, the ratio of total deposits to GDP increases in the aftermath years relative to the pre-crisis period even after correcting for valuation effects, further confirming that depositor runs had limited aggregate impact.

#### **IV. Differences among Groups of Countries**

To test whether the crisis response differs across countries with different characteristics, we add to the regressions an interaction term between each of the period dummies and the country characteristic of interest. A positive and significant sign for the interaction term indicates that the difference between the value of the variable in the period of interest and the pre-crisis period is larger for countries with a high value of the characteristic. Tables 2-5 summarize the results. For brevity, only the variables for which at least one of the interaction terms has a significant coefficient are reported. Thus, for the variables missing from the table the response to the crisis does not differ based on the country characteristic in question.

The first characteristic is the level of development measured by GDP-per-capita. From Table 3, it appears that in more developed countries the slowdown in growth and investment is more persistent, in contrast with the commonly voiced view that developing country financial crises are more severe.<sup>11</sup> Credit growth decelerates more markedly in countries with higher

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<sup>11</sup> Gupta, Mishra, and Sahay (2000) also find currency crises to be more recessionary in more developed countries.

GDP per capita, but not quite as fast as GDP growth, so bank credit as a share of GDP tends to be higher relative to the pre-crisis period in those countries. Bank deposits tend to fall at the lower levels of development but not at the higher, suggesting that the depositor safety net is not as extensive or effective in poorer developing countries. Interestingly, a worse safety net does not lead to worse output performance. Government finances seem to deteriorate more the higher is the level of development, perhaps because of the higher costs of the safety net.

A second issue is whether the presence of explicit deposit insurance makes any difference in the response to crises, given that depositors are often bailed out in systemic crises even if they have no explicit protection.<sup>12</sup> Table 4 shows that demand deposits fall significantly in countries without deposit insurance, suggesting that deposit insurance does matter. However, total deposits exhibit the opposite pattern, indicating that, when they are not insured, depositors shift to time deposits or to foreign currency deposits. This result, however, may be driven by the revaluation of foreign currency deposits due to exchange rate depreciation, if this effect is stronger in countries without deposit insurance. Perhaps because total deposits do not fall, bank credit-to-GDP remains above its pre-crisis level also in countries without deposit insurance. Another interesting question is whether deposit insurance makes crises less costly, perhaps because it makes the resolution more orderly. If the cost of a crisis is measured in terms of output growth, then the answer is negative, as output growth remains below its pre-crisis level also in T+3 in deposit insurance countries.<sup>13</sup>

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<sup>12</sup> Demirgüç-Kunt and Detragiache (1999) find that explicit deposit insurance makes banking crisis more likely, suggesting that a formal guarantee does play an important role.

<sup>13</sup> Of course, we are not controlling for the severity of the shocks that cause the initial output decline. In countries without deposit insurance output may recover faster because the initial  
(continued...)



Next, we differentiate among crisis episodes based on whether banking sector problems were accompanied by a currency crisis.<sup>14</sup> There are eight episodes in which a currency crisis occurred in the same year as the banking crisis. Interestingly, while it is these eight cases that cause the increase in the average rate of exchange rate depreciation reported in Table 1, the output response does not significantly differ between the two groups of countries (Table 5). This suggests – among other things -- that output recovery following a banking crisis is not just the effect of an expansionary real exchange rate depreciation, but is a more general phenomenon. There is no indication that the real interest rate behaved any different in the two groups of countries, but the bank lending rate was lower in currency crisis countries in T and T+1, and so was the spread in T and T+3.

Finally, the issue of what interest rate policy should be followed during a financial crisis has attracted much debate in the wake of the Asian crises (Furman and Stiglitz, 1999). While a thorough empirical investigation of this controversy is beyond the scope of this paper, we examine whether the pattern of response to the banking crisis differed in countries that increased the real interest rate in the year of the crisis. In Table 6, a positive sign for the interaction term means that the response to the crisis of the particular variable was larger in countries that increased interest rates. The first observation is that where interest rates declined central banks stepped up lending to the banking system relative to the pre-crisis period. Thus,

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shock was small, as without deposit insurance even small shocks could give rise to depositor panics. However, Demirgüç-Kunt and Detragiache (1999) find that, for given level of macroeconomic shocks, countries without deposit insurance are *less* likely to experience crises.

<sup>14</sup> The definition of a currency crisis follows Milesi-Ferretti and Razin (1998). The occurrence of “twin crises” has received much attention in the recent literature (Kaminsky and Reinhart, 1999, Goldfajn and Valdes, 1998).

the more lax monetary stance served to support the banking system. Not surprisingly, the higher policy interest rate was mirrored by higher bank lending rates and higher spreads, and the decline in credit growth was more marked in T+2 and T+3. Interestingly, however, output growth and investment did not differ significantly in the two group of countries. Finally, countries that increased interest rates experienced larger exchange rate depreciation, while inflation was not any different. Of course, it is not clear on which direction causality goes, because countries where there was more pressure on the exchange rate may have been forced to increase interest rates to keep inflation in check.

## **V. Evidence from Bank-Level Data**

### **A. Data sources and sample selection**

To build a panel of bank-level data, we use the 1999 and 2000 releases of the Bankscope data base compiled by Fitch IBCA. Countries include all OECD countries and several developing and transition economies, but the time series extends back only to 1991, so all of the crisis episodes of the eighties have to be excluded from the sample. To preserve sample size, we restrict attention to a five-year period centered around the crisis year rather than the seven-year period used in the macro analysis.<sup>15</sup> The resulting sample includes 16 banking crises (listed in Appendix I) all occurring in developing countries or transition economies. Four of the crises

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<sup>15</sup> We include banks from Malaysia though we have data only through the first aftermath year (1998), because coverage for this country is quite good and the Asian episodes are of particular interest. Excluding Malaysia does not significantly alter the picture.

included here (Croatia, Latvia, Paraguay, and Costa Rica) are not in the macro sample because of lack of data.

The Bankscope database is designed to cover the world's largest banks and coverage is supposed to reach 80-90 percent of bank assets in each country. For the countries in our sample, Bankscope covers 595 banks, but this number includes banks that were created, closed, or merged during the sample period, or that simply did not report information for one or more years. Thus, the sample of usable banks is much smaller, consisting of 257 banks. Coverage in terms of total bank assets, though uneven across countries, remains quite good (see Table 3 in Appendix I for detailed coverage information).

A problem with the Bankscope data is that mergers and acquisitions that do not lead to a name change for the bank are not explicitly identified in the data base. We were able to find specific history information for 35 percent of the banks in the sample, either from Bankscope or from other sources.<sup>16</sup> When a merger or acquisition was identified, if we had information for both banks involved we treated them as one bank from the beginning of the sample period. Otherwise, the bank was dropped. This reduced the sample size to 247. The data set contains a number of outliers, some of which were obvious data mistakes. Rather than eliminating extreme observation in an arbitrary way, observations outside a four standard deviation interval around the mean were excluded from each regression. We will point out when the exclusion of outliers significantly changes the results. The exclusion of outliers should also alleviate the impact of unidentified mergers or acquisitions on variables such as credit and deposits growth.

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<sup>16</sup> For a large number of banks Bankscope history information only includes the year of establishment, but it is not clear whether this means that the bank was not involved in any merger or acquisition.

Finally, in interpreting the results is important to keep in mind that the sample is affected by survivorship bias: banks that fail during the sample period drop out, so the sample is biased towards the healthier institutions. To assess the potential extent of this source of bias, we have looked at what percentage of banks in the Bankscope database stopped reporting data in the year of the crisis or in the two subsequent years. This figure, which provides an upper bound to the fraction of banks that closed because of the crisis, is 10.7 percent.

#### B. The variables of interest

The information from Bankscope allows us to examine several bank characteristics in the aftermath of a banking crisis. The first aspects is performance, measured by gross and net return on average assets (see Appendix II for details on variable definitions). If the banking crisis is driven by a deterioration in the quality of the bank loan portfolio, we expect to find a decline in profitability as well as an increase in loan loss provisions as the crisis unfolds, so we also examine the evolution of loan loss provisions and loan loss reserves. Another aspect of interest is bank efficiency, which is measured here by the interest margin (the difference between interest earned and interest paid) and by overhead costs. The state of bank liquidity is captured by cash (including currency and due from banks) as a ratio of assets. To examine whether depositor panics were an important element of the crises, we look at the ratio of deposits to assets as well as the rate of growth of real deposits. Another important issue is whether bank distress led to a fall in bank lending, so we examine the growth rate of total assets and of credit, and the breakdown of bank assets between loans and other earning assets. Finally, we look at the evolution of equity over assets to determine whether crises were accompanied by an erosion of bank capital.

### C. Estimation results

To characterize bank behavior in the aftermath of a crisis we employ the same methodology used for the macro variables, except that, as explained in the preceding section, the period covered is limited to five years. Thus, for each variable of interest we run a regression on a panel consisting of five observations for each bank in the sample; the independent variables are country dummies and three period dummies, one for the crisis year and one for each of the two years following the crisis. The coefficient of each time dummy is the mean difference between the value of the variable in the year and the country-specific average of the value of the variable in the two pre-crisis years.

Table 7 contains the regression results. Returns on average assets and profits are below the pre-crisis level in the year of the crisis, and more markedly so in the first post-crisis year, while in T+2 the difference is no longer significant. Non-performing loans and loan loss reserves rise substantially beginning in the crisis year, while by T+2 they are back to their pre-crisis level, probably because at that stage banks begin getting bad assets off their books. Thus, the banking crises were accompanied by a decline in bank profitability and asset quality.<sup>17</sup> The crisis is also followed by a significant decline in liquidity and by a reduction in both operating costs and the interest margin. Thus, financial difficulties seem to provide a stimulus for banks to improve efficiency.

Turning now to bank deposits, the rate of growth of real deposits is significantly below that of the pre-crisis period in the first year after the crisis. However, because growth rates were

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<sup>17</sup> If outliers are included in the sample the loan loss variables lose significance.

high before the crisis, deposits were still increasing in absolute terms in 57 percent of the sample banks.<sup>18</sup> In fact, the sample banks lost other sources of funding (such as interbank credit, foreign loans, commercial paper, or equity) more rapidly than deposits, as witnessed by the significant increase in the ratio of deposits to assets. These results are probably affected by survivorship bias, since healthier banks may have attracted deposits from weaker banks or from weak non-bank institutions. Nonetheless, because the banks in the sample represent a sizable portion of the banking system, this evidence supports the view that extensive runs did not take place despite signs of deteriorating bank profitability and asset quality. The shift towards deposit financing may be a consequence of the introduction or extension of depositor guarantees by the government in the midst of a crisis, since such guarantees make deposits a cheaper and more stable source of funding.

On the asset side, the rate of growth of total assets (in real terms) is not significantly different from its pre-crisis level in T and T+1, while in T+2 it is above that level. In contrast, real credit slows down substantially beginning in the crisis year, with the growth rate declining by nine percentage points in both T and T+1. As in the case of deposits, because of the high rates of growth before the crisis, in both periods real credit was still growing in absolute terms in a majority of the sample banks. Also, by T+2 credit growth recovered strongly, so, in contrast with the evidence from the macro data, the credit contraction here seems to be short-lived. Differences in sample or survivorship bias may account for this differences; also, if credit growth reflects mostly growth in interbank market, it would not be captured in the macro data,

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<sup>18</sup> If outliers are included deposit growth is not significantly different from the pre-crisis period.

where interbank flows are netted out. Finally, the averages examined here are not weighted by the size of the bank, so they do not tell much about aggregate behavior.

Another interesting regularity is that banks reallocated funds away from lending, as witnessed by the significant decline in the loan-to-asset ratio in T and T+1 and by the increase in the ratio of other earning assets to total assets in T+1, a phenomenon also identified by case studies.<sup>19</sup> There are a number of explanations for this behavior: the portfolio shift may be due to a contraction in loan demand which, in turn, may be caused by higher lending interest rates or by the adverse shocks that accompany the crisis. Another possibility is that banks are forced to cut collateral-based lending because lower asset prices reduce the value of collateral (Kiyotaki and Moore 1997). In times of stress banks may also shift to safer assets to economize on regulatory capital (the “capital crunch”). A fourth possibility is that the shift reflects rescue operations in which banks exchange non-performing loans for government securities, as in Mexico in 1995. Notice that the shift to other earning assets occurs even though our sample is potentially biased towards the less distressed banks, which should be those with a healthier customer base and fewer non-performing assets. Whatever the explanation, this evidence suggests that preserving banks’ access to deposits and other sources of funding during a crisis may not be sufficient to preserve the flow of credit, as banks tend to redirect funds away from

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<sup>19</sup> Luzio-Antezana (1999) finds that the positive net inflows of deposits into Mexican banks beginning in the second quarter of 1996 were used to purchase of government securities (as well as to increase provisioning). Catao (1997) documents that Argentine banks increased their investment in government securities after the 1995 crisis over and above what was mandated by increased liquidity requirements. Domaç and Ferri (1999) present evidence suggesting a similar phenomenon in Korea, Malaysia, and the Philippines in 1998. In Thailand, large banks benefiting from deposit flight from small banks in the immediate aftermath of the crisis increased their liquidity instead of expanding their loan portfolio (Ito and Pereira da Silva, 1999).

lending. The reduction in bank lending activity may also help explain the reduction in overhead costs.<sup>20</sup>

#### D. Differences among banks

The results described so far reflect the average behavior of banks, and it is natural to ask at this stage whether the effects of the crisis were rather uniform across the banking sector, or significant differences existed. To answer this question, we have re-estimated the regressions of the preceding section dividing the sample banks in five subsamples based on their profitability in the year of the crisis. Accordingly, the first subsample includes banks that, in each country, belonged to the lowest quintile of the distribution of the return on assets, and similarly for the other subsamples. The results are summarized in Table 8. For brevity, the table reports only the signs and significance levels of the coefficients.

The first observation is that the negative effects of the crisis on profitability is concentrated in the bottom two quintiles of banks, which also experience a marked increase in loan loss reserves and provisions in T and T+1 and a decline in equity over assets. Interestingly, deposits become a more important source of funding for these institutions, while there is some evidence that loans tend to decline relative to assets while other earning assets become more important. Most strikingly, in the lowest quintile of banks both credit and deposits decelerate substantially both in T and T+1. The decline in the rate of growth of these variables are of the order of 15-20 percentage points, so they are quite substantial. Thus, while on average there is

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<sup>20</sup> The portfolio shift away from lending is more marked in countries with deposit insurance, and so is the decline in overhead costs.



no evidence of a strong decline in deposit growth, the weakest banks in each country do experience a severe decline, which is also accompanied by a drastic slowdown in credit growth.

Other trends do not appear to be concentrated among the weakest banks: for instance, the decline in overhead costs is shared by all the banks, suggesting that financial difficulties lead to improvements in cost efficiency across the board. Also, the shift from loans to other earning assets takes place also on the top and middle quintile of banks, suggesting that it is not just the effect of recapitalization operations in rescued banks. Finally, the decline in cash appears to be more marked among the stronger institutions.

## **V. Concluding Remarks**

Perhaps the most interesting empirical regularity uncovered in this study is that contemporary banking crises are not accompanied by substantial declines in bank deposits. Thus, while depositor runs have played a central role in the theoretical literature on banking crises, in practice they seem to be a sideshow at best. Furthermore, while bank lending interest rates and spreads rise in the wake of a crisis, we find no evidence of increased deposit interest rates. A plausible interpretation of these findings is that bank safety nets have succeeded in keeping depositors from fleeing despite widespread insolvency in the banking system. Of course, to the extent that depositor runs also help maintaining appropriate incentives for bankers, the lack of runs may be seen as a lack of discipline.

Sharp declines in liquidity due to depositor runs, forcing banks to cut lending even to creditworthy borrowers, have been often viewed as an important mechanism through which

bank distress affects the real economy and helps propagating adverse shocks.<sup>21</sup> Contemporary banking crises do not seem to be followed by prolonged recessions: the slowdown in output growth is usually sharp but short-lived, with growth rates back to their pre-crisis levels in the second year after the crisis. This evidence raises the question of whether the quick rebound in output is the result of the lack of widespread depositor panics. Our analysis cannot give a definite answer to this complex question. Nonetheless, some of the evidence discussed in the paper points in a different direction: in our sample, credit growth remains below its pre-crisis level even after output growth has rebounded, suggesting that the recovery may not result from a resumption in bank lending. At the same time, even banks in the best financial position, who do not see significant declines in profitability or capital, decrease their loan-to-asset ratio following a crisis.

These two findings suggest that during a banking crisis protecting deposits may not be sufficient to protect bank credit, as lack of usable collateral and poor borrower creditworthiness discourage banks from lending. However, protecting bank credit may not be a priority in the immediate aftermath of a crisis, as the real economy can rebound without it, at least while there is substantial unutilized capacity.<sup>22</sup>

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<sup>21</sup> Mishkin (1996) views panics as an important mechanism through which banking crises propagate to the real sector.

<sup>22</sup> For a discussion of policies followed to support credit in the recent Asian crisis, see Lindgren et al. (1999).

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**Table 1. Crisis Aftermath –Evidence from Aggregate Data**

	T	T+1	T+2	T+3
GDP Growth	-3.913*** (1.004)	-3.519*** (.896)	-.950 (.662)	.398 (.829)
Credit Growth	-6.761*** (2.261)	-7.390*** (2.311)	-7.178*** (2.199)	-5.687** (2.334)
Credit/GDP	6.046*** (1.705)	7.849*** (2.675)	6.748*** (2.062)	5.646** (2.180)
Investment/GDP	-.428 (.551)	-1.067** (.564)	-.724 (.621)	-.854 (.698)
Demand deposit growth	-5.798*** (2.0192)	-2.397 (1.7612)	-3.676 (2.814)	-4.280 (2.608)
Demand deposits/GDP	.286 (.336)	.333 (.398)	.734 (.466)	.878* (.509)
Total deposits/GDP	2.920** (1.382)	5.554*** (1.881)	5.177*** (1.292)	4.233*** (1.451)
Real interest rate	5.501 (6.768)	6.918 (11.525)	-7.239 (8.279)	-3.078 (4.548)
Real lending rate	10.504** (4.685)	21.312 (17.007)	16.249 (10.043)	3.827 (5.685)
Real deposit rate	1.806 (2.036)	.827 (3.359)	-3.291 (3.686)	-4.903 (4.023)
Spread	10.079** (4.899)	22.332 (15.696)	21.016 (13.483)	10.906** (4.899)
Inflation	19.166** (6.816)	27.785** (13.408)	23.820** (10.449)	18.177*** (5.830)
Depreciation	28.714*** (8.274)	36.968** (14.415)	30.384*** (11.121)	23.232*** (6.707)
Fiscal surplus/GDP	-.494 (.594)	-.803 (.512)	-.041 (.713)	.974 (1.015)
Central bank funds/bank assets	.844 (1.565)	1.233 (.999)	1.410 (1.610)	2.071 (2.368)

\*, \*\* and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parenthesis.

**Table 2. Real Credit and Deposit Corrected for Exchange Rate Effects**

	T	T+1	T+2	T+3
Real Credit Growth	-7.971** (3.961)	-9.430** (3.872)	-13.532*** (3.961)	-14.931*** (3.960)
Corrected Real Credit Growth	-8.031** (3.759)	-12.887*** (3.675)	-14.075*** (3.675)	-14.753*** (3.759)
Credit/GDP	4.117*** (1.651)	4.677*** (1.588)	3.791** (1.589)	1.584 (1.824)
Corrected Credit/GDP	4.122** (1.725)	4.780*** (1.659)	4.093** (1.659)	2.109 (1.907)
Real deposit growth	-8.930 (8.071)	-4.885 (8.030)	-12.121 (8.030)	-12.201 (8.356)
Corrected real deposits growth	-11.076 (7.977)	-7.700 (7.937)	-11.488 (7.937)	-12.305 (8.260)
Deposits/GDP	4.117*** (1.651)	4.677*** (1.588)	3.791** (1.588)	1.584 (1.824)
Corrected deposits/GDP	4.123** (1.725)	4.780*** (1.659)	4.093** (1.659)	2.109 (1.907)

\*, \*\*and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parenthesis.

**TABLE 3**  
**DIFFERENCE AMONG COUNTRIES BASED ON LEVEL OF DEVELOPMENT**

	T	T*DEV	T+1	T+1xDEV	T+2	T+2xDEV	T+3	T+3xDEV
Growth	-3.913** (1.225)	0.000 (0.083)	-2.461** (1.171)	-0.191 (0.108)	0.285 (0.829)	-0.229*** (0.055)	2.065* (1.149)	-0.220** (0.085)
Investment	-0.389 (0.713)	-0.048 (0.079)	-0.792 (0.739)	-0.131 (0.085)	-0.027 (0.767)	-0.279*** (0.089)	-0.044 (0.881)	-0.362*** (0.073)
Growth of real bank credit	-4.583 (2.908)	-0.358 (0.218)	-3.939 (2.883)	-0.802*** (0.204)	-4.100** (2.907)	-0.876*** (0.243)	1.233 (2.760)	-1.376*** (0.255)
Bank credit/GDP	0.893 (1.079)	0.338** (0.127)	2.890 (1.951)	0.276* (0.145)	1.325 (1.217)	0.288** (0.134)	-1.178 (1.564)	0.285 (0.177)
Demand deposits/GDP	-0.935*** (0.245)	0.369** (0.103)	-1.111*** (0.275)	0.455*** (0.109)	-0.777** (0.346)	0.476*** (0.124)	-0.951*** (0.325)	0.549*** (0.112)
Fiscal surplus/GDP	0.162 (0.712)	-0.113 (0.077)	0.366 (0.592)	-0.218** (0.088)	1.419 (0.810)	-0.288** (0.103)	3.181*** (0.978)	-0.454*** (0.169)

\*, \*\*, and \*\*\* indicate significant levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parenthesis.

**Table 4. Differences between Countries with and without Deposit Insurance**

	T	TxDI	T+1	T+1xDI	T+2	T+2xDI	T+3	T+3xDI
Growth	-3.533** (1.498)	-1.031 (1.760)	-2.988** (1.239)	-1.459 (1.693)	-.567 (.910)	-1.061 (1.213)	1.771 (1.043)	-3.872** (1.552)
Bank credit/GDP	7.039** (2.514)	-2.745 (2.887)	9.773** (4.022)	-5.206 (4.283)	8.479** (3.091)	-4.619 (3.306)	7.791** (3.105)	-5.989* (3.525)
Demand deposits/ GDP	-.526** (.214)	2.152** (.764)	-.887*** (.218)	3.284*** (.912)	-.262 (.333)	2.683** (1.090)	-.526** (.269)	3.293*** (1.263)
Total deposits/GDP	4.286** (1.818)	-3.634** (1.806)	7.885** (2.891)	-6.275** (2.936)	7.059*** (1.911)	-5.066** (2.091)	5.741** (2.066)	-4.134** (2.502)

\*, \*\*and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parentheses.



**Table 5**  
**DIFFERENCES BETWEEN COUNTRIES WITH AND WITHOUT A CURRENCY CRISIS**

	T	TxCC	T+1	T+1xCC	T+2	T+2xCC	T+3	T+3xCC
Depreciation	-7.362**	49.017***	11.457	15.382	10.874	-7.953	2.262	-2.138
	(3.718)	(14.221)	(9.923)	(15.116)	(7.070)	(8.858)	(9.134)	(11.095)
Investment/GDP	-0.329	-0.329	-1.659**	3.057**	-1.089	1.883	-1.293	2.540
	(0.636)	(1.174)	(0.620)	(1.264)	(0.733)	(1.141)	(0.727)	(2.112)
Real lending rates	13.161**	-14.632**	28.642	-34.272***	19.771	-18.559	3.592	-2.419
	(5.421)	(6.607)	(21.368)	(7.026)	(12.490)	(12.853)	(6.706)	(7.253)
Spread	11.813**	-12.734*	25.881	-22.863	24.883	-22.453	11.913**	-9.641*
	(5.547)	(5.750)	(18.727)	(18.853)	(16.453)	(16.495)	(5.405)	(5.544)
Total deposit/GDP	3.180**	-1.028	6.964**	-5.481**	5.431***	-0.986	4.507**	-1.050
	(1.523)	(1.734)	(2.464)	(2.713)	(1.517)	(2.876)	(1.875)	(2.183)

\*, \*\*, and \*\*\* indicate \*, \*\*, and \*\*\* significant levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parentheses.

**TABLE 6**  
**COUNTRIES THAT INCREASED THEIR INTEREST RATES DURING CRISES VS. THOSE THAT DID NOT**

	T	TxINT	T+1	T+1xINT	T+2	T+2xINT	T+3	T+3xINT
Growth of real bank credit	-8.070** (3.340)	1.264 (4.589)	-2.620 (2.167)	1.264 (4.047)	-5.027** (2.625)	-3.757 (4.191)	.081 (3.105)	-9.164** (4.390)
Bank credit/GDP	1.562 (1.365)	2.234 (1.738)	.995 (1.557)	3.684 (2.039)	.848 (1.867)	3.439 (2.167)	-2.326 (2.110)	6.969** (2.771)
Total deposits/GDP	5.098*** (1.047)	10.824*** (2.213)	-1.101 (1.221)	10.824** (3.444)	2.124 (1.809)	5.007* (2.652)	.674 (1.602)	5.371* (2.869)
Real interest rate	-9.163** (4.125)	27.487** (11.411)	-11.487** (4.605)	33.244 (20.310)	-11.303 (9.998)	6.819 (16.186)	-8.898** (4.605)	9.500 (8.606)
Real lending rates	-.868 (1.579)	18.072** (7.985)	-4.366 (2.976)	42.384 (29.778)	1.573 (1.789)	24.680 (17.416)	-3.789 (3.710)	11.972 (10.656)
Spread	.995 (.848)	16.568** (8.125)	1.152 (.810)	38.307 (26.942)	1.620** (.719)	34.468 (23.160)	1.534 (.887)	16.780** (7.907)
Depreciation	-2.890 (6.720)	17.378* (10.666)	-3.102 (5.771)	33.231** (14.673)	-5.389 (5.339)	17.550** (9.366)	-4.810 (6.493)	8.918 (14.816)
Fiscal surplus/GDP	.856 (.660)	-2.406** (1.165)	1.411** (.628)	-3.431*** (.952)	1.781 (1.026)	-2.710* (1.469)	3.901*** (1.062)	5.371* (2.869)
Central bank funds /bank assets	.579 (1.106)	1.319 (2.259)	2.866** (1.274)	-4.398** (1.824)	2.469** (.946)	-7.018*** (1.703)	2.822** (1.222)	-9.227*** (1.956)

\*, \*\*and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parentheses.

**TABLE 7**  
**Crisis Aftermath –Evidence from Bank Level Data**

	T	T+1	T+2
Return on average asset	-0.0054** (0.0025)	-0.0072*** (0.0022)	-0.0019 (0.0025)
Profitability	-0.0062** (0.0027)	-0.0077*** (0.0025)	-0.0013 (0.0024)
Interest margin	0.0006 (0.0034)	-0.0076*** (0.0030)	-0.0102*** (0.0031)
Overhead	-0.0010 (0.0020)	-0.0052*** (0.0017)	-0.0105*** (0.0019)
Loan loss provisions	0.0157*** (0.0050)	0.0115*** (0.0041)	-0.0036 (0.0039)
Loan loss reserves	0.02117*** (0.0085)	0.0259*** (0.0093)	0.0049 0.0100
Cash/assets	-0.0026 (0.0028)	-0.0076*** (0.0026)	-0.0075*** (0.0027)
Deposits/assets	0.0144* (0.0081)	0.0161* (0.0086)	0.0228*** (0.0082)
Equity/assets	-0.0047 (0.0050)	-0.0062 (0.0054)	-0.0112** (0.0050)
Loan/assets	-0.0247** (0.0103)	-0.0390*** (0.0106)	-0.0121 (0.0113)
Other earning assets/assets	0.0167 (0.0108)	0.0359*** (0.0111)	0.0196* (0.0119)
Growth of real assets	0.0273 (0.0258)	-0.0054 (0.0255)	0.0859*** (0.0255)
Growth of real loans	-0.1061*** (0.0311)	-0.0759** (0.0331)	0.1107*** (0.0352)
Growth of real deposits	-0.0404 (0.0320)	-0.0651** (0.0335)	0.0090 (0.0319)

\*, \*\*and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively. White's heteroskedasticity-consistent standard errors are given in parenthesis.

**TABLE 7**  
**Crisis Aftermath –Differences Among Banks Based on Return on Assets in the Crisis Year**

	First quintile			Second quintile			Third quintile			Fourth quintile			Fifth quintile		
	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2	T	T+1	T+2
ROAA	-.***	-.***	-.*				-	-	+				+.***	-	-
Profitability	-.***	-.***	-				-	-	+				+.*	-	-
Interest Margin	-.**	-.***	-.***				-	-	-				+.*	-	-.*
Overhead/ Assets	+	-.*	-.*				-.**	-.*	-.***				+	-.**	-.***
Loan Loss Provisions	+.***	+.***	+				+.*	+.*	-				+	+	-.*
Loan Loss Reserves	+.***	+.***	+				+	-	-				+	+	-
Cash/Assets	-	-	-				-	-.***	-.***				-	-.*	-
Deposits/ Assets	+.***	+.***	+				+.*	+.***	+.*				-	+	+
Equity/ Assets	-	-.*	-				-	-	-				-	-	-.*
Loan/ Assets	-	-.**	-				-	-.*	-				-.**	-.**	-
OEA/ Assets	-	+.*	+				+	+.*	+				+.*	+	+
Asset Growth	-	-	+				+.***	+	+.*				-	+	+.***
Credit Growth	-.***	-.***	+				+	-	+				-.*	-	+.***
Deposit Growth	-.**	-.***	-				+.***	-	+				-	+	+

\*, \*\* and \*\*\* indicate significance levels of 10, 5, and 1 percent respectively.

## Appendix I Data Sources and Definitions

**Table A1. Definitions and Data Sources for Macro Variables<sup>23</sup>**

Variable Name	Definition	Source
Growth	Rate of growth of real GDP	IFS where available. Otherwise, WEO.
Investment/GDP	Ratio of investment to GDP	IFS
Real credit growth	Rate of growth of credit by deposit money banks deflated by the GDP deflator	Credit: IFS. GDP deflator: IFS or WEO.
Demand deposit growth	Rate of growth of demand deposits in deposit money banks, deflated by GDP deflator	Demand deposits: IFS. GDP deflator: IFS or WEO.
Total deposits/GDP	Ratio of total deposit in deposit money banks to GDP	Total deposits: IFS. GDP: IFS or WEO.
Real interest rate	Nominal interest rate minus the contemporaneous rate of inflation	IFS. Where available, nominal rate on short-term government securities. Otherwise, a rate charged by the Central Bank to domestic banks such as the discount rate.
Real lending rate	Bank average lending interest rate minus rate of change of GDP deflator	Lending rate: IFS. GDP deflator: IFS or WEO.
Real deposit rate	Bank average deposit interest rate minus rate of change of GDP deflator	Deposit rate: IFS. GDP deflator: IFS or WEO.
Spread	Lending rate minus deposit rate	
Inflation	Rate of change of the GDP deflator	IFS or WEO.
Depreciation	Rate of change of the nominal exchange rate (period average)	IFS
Fiscal surplus/GDP	Government surplus divided by GDP	Deficit: IFS. GDP: IFS or WEO.
Central bank funds/bank assets	Loans from the monetary authorities to deposit money banks divided by total assets of deposit money banks.	IFS

The macroeconomic variables are available for the following sample of banking crises: Argentina (1995), Bolivia (1995), Colombia (1982), Chile (1980), Ecuador (1995), El Salvador (1989), Finland (1991), Guyana (1993), Indonesia (1992), India (1991), Israel (1983), Italy (1990), Jordan (1989), Japan (1992), Kenya (1993), Mali (1987), Malaysia (1985), Mexico

<sup>23</sup> IFS stands for International Financial Statistics, published by the IMF. WEO stands for the World Economic Outlook database of the IMF.

(1982, 1994), Nigeria (1991), Norway (1987), Nepal (1988), Panama (1988), Papua New Guinea (1989), Paraguay (1995), Peru (1993), Philippines (1981), Portugal (1986), Sri Lanka (1989), South Africa (1985), Sweden (1990), Thailand (1983), Turkey (1991), United States (1981), Uruguay (1981), Venezuela (1993).

**B. Bank Level Data**

All bank level data come from the 1999 release of the Bankscope database, compiled by Fitch IBCA.

**Table A2. Variable Definitions**

<b>Variable Name</b>	<b>Definition</b>
ROAA	Ratio of after tax profits to total assets.
Profitability	Ratio of gross profit to total assets.
Interest Margin	Ratio of net interest income (interest income – interest expenditure) to total assets.
Overhead/Assets	Ratio of overhead expenses (personnel expenses and other non interest expenses) to total assets
Loan Loss Provisions	Ratio of loan loss provisions to total assets.
Loan Loss Reserves	Ratio of loan loss reserves to total assets.
Cash/Assets	Ratio of cash and dues from banks to total assets
Deposits/Assets	Ratio of total deposits (demand deposits, saving deposits, time deposits, interbank deposits and other deposits) to assets
Equity/Assets	Ratio of equity to assets
Loan/Assets	Ratio of loans (commercial loans, public sector loans, consumer loans, secured loans and other loans, net of LLR) to total assets
OEA/Assets	Ratio of other earning assets (deposit with banks, Government securities, other investments and equity investments) to total assets.
Asset Growth	Growth rate of real total assets, real assets Calculated using CPI data from the IFS.
Credit Growth	Growth rate of total real credit, real credit Calculated using CPI data from the IFS.
Deposit Growth	Growth rate of total real deposits, real deposits Calculated using the data from the IFS.

The sample contains the following crisis episodes: Argentina (1995), Bolivia (1995), Costa Rica (1994), Croatia (1995), Ecuador (1995), Kenya (1995), Korea (1997), Latvia (1995), Malaysia (1985), Mexico (1994), Paraguay (1995), Swaziland (1995), Thailand (1997), Turkey (1994), Venezuela (1993) Zambia (1994).

**Table A3. Sample Coverage**

Country	Total number of banks	Number of banks included In the sample	Fraction of banks covered (in percentage)	Fraction of assets (or loans or deposits) covered (in percentage)*
Argentina	130	43	33	66
Bolivia	16	13	81	NA
Costa Rica	28	11	39	72
Croatia	60	19	32	71
Ecuador	41	21	51	80
Kenya	53	7	13	46
Korea	18	18	100	100
Latvia	33	8	32	53
Malaysia	35	25	71	73
Mexico	27	10	37	57
Paraguay	32	8	25	NA
Swaziland	4	2	50	56
Thailand	15	13	87	NA
Turkey	55	34	62	85
Venezuela	30	10	33	60
Zambia	18	5	28	64

\*The denominator is total unconsolidated assets (or loans or deposits) of the banking system in the last year in the sample (which varies depending on the year of the crisis). Because these figures are from miscellaneous country sources, the definition of the banking system may change from country to country.





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