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Banking Crises and Exchange Rate Regimes:

Is There a Link?*

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Abstract

This paper empirically investigates the linkages between banking crises and exchange rate regimes, using a comprehensive data set including developed and developing countries over the last two decades. In particular, the paper examines whether the choice of exchange rate regime affects the likelihood, cost, and duration of banking crises. Empirical results indicate that adopting a fixed exchange rate diminishes the likelihood of a banking crisis among developing countries. However, once the crisis occurs, the costs associated with it appear to be larger in countries with fixed exchange rates. The duration of crises, on the other hand, does not seem to be affected by the exchange rate policy.

Keywords: banking crises and exchange rate regimes.

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I. Introduction

The recent financial crises in Asia, Brazil, and Russia have rekindled the debate on the choice of exchange rate regimes. In other words, the debate over the appropriate exchange rate regime—a topic on which a consensus is hard to find—has once again taken center stage.

Since the work of Mundell (1961), an extensive literature has developed examining the links between the exchange rate regime and macroeconomic performance.[1] For example, Ghosh et al. (1997) as well as a recent IMF (1997) study demonstrate that inflation is lower under fixed exchange rate regimes, yet they fail to find robust evidence on the relationship between growth and currency regimes.

While the impact of exchange rate policies on macroeconomic performance has received a great deal of attention, until recently, the literature had largely ignored the implications of the exchange rate regime for financial stability.[2] Most studies on the determinants of banking crises have focused primarily on the role of macroeconomic, external, and regulatory environments. In particular, the following factors have been identified by the literature as the key determinants of banking crises: (i) credit risk, (ii) lack of adequate capital, (iii) sharp increases in short-term interest rates, (iv) currency mismatches, (v) presence of a deposit insurance scheme, (vi) financial liberalization, (vii) lending booms, and (viii) external economic conditions.[3]

Recently, studies by Eichengreen and Hausmann (1999), Eichengreen and Rose (1998), Hausmann et al. (1999), and Velasco and Cespedes (1999) have begun to discuss —primarily at the theoretical level—the potential links between the exchange rate regime and financial

[1] For a detailed review of the literature on exchange rate regimes and macroeconomic performance, see Edwards and Savastano (1999).

[2] McKinnon (1963) alluded to the importance of financial factors, stating that countries with deep financial markets will favor flexible exchange rates regime. Heller (1978), however, contended that countries with integrated and developed financial markets will prefer to peg.

[3] See Demirgüç-Kunt and Detragiache (1997) as well as Eichengreen and Rose (1998) for a thorough literature review.

stability. With the exception of Eichengreen and Arteta (2000) and Eichengreen and Rose (1998), this issue remains largely unexplored at the empirical level.[4] Furthermore, the existing empirical papers focus exclusively on developing countries and ignore indirect channels through which the exchange rate may affect the likelihood of banking crises, beyond the impact of external shocks. Also, these studies have been silent on the question of how, if at all, exchange rate regimes affect the cost and duration of crises.

This paper attempts to fill some of the gaps in the empirical literature on the links between exchange rate policies and banking crises. Using a comprehensive data set including developed and developing countries for the period 1980-1997, we examine whether the choice of exchange rate regime affects the likelihood, cost, and duration of banking crises.

Regarding the likelihood of banking crises, we test the validity of some of the indirect channels discussed in the recent literature linking the exchange rate regime to the probability of banking crises. In particular, we examine the following issues: (i) whether unhedged liabilities increase the likelihood of banking crises under fixed exchange rate regimes, (ii) whether the extent to which the broad monetary base is backed by reserves affects the likelihood of banking crises caused by runs under pegged regimes; (iii) whether the liquidity of a banking system reduces the negative repercussions of the lack of a lender of last resort under fixed exchange rate regimes; and finally (iv) whether the impact of capital flows on the probability of banking crises varies under different exchange rate regimes.[5]

[4] Using a panel of developing countries over the period 1975-1992, Eichengreen and Rose (1998) focus primarily on the role of external factors (foreign interest rates and OECD growth) in precipitating banking crises. Eichengreen and Arteta (2000) examine the impact of the exchange rate regime, financial liberalization, and deposit insurance on the likelihood of banking crises. Their estimations are based on a panel of developing countries over the period 1975-1997. Both of these studies conclude that the exchange rate regime does not have a robust impact on the likelihood of banking crises.

[5] Indeed, lending booms—one of the most widely acknowledged determinants of banking crises—are often deemed as the domestic counterpart of a surge in capital inflows (Gourinchas et. al (1999)).

We also extend the existing empirical work in a number of ways. First, we consider a larger number of banking crises that affected not only developing, but also developed countries. Second, aside from using the IMF's *de jure* exchange rate classification, we also investigate whether the results change when we use alternative measures of *de facto* exchange rate flexibility (or lack thereof). Finally, to test the robustness of the results, we allow and control for the potential endogeneity of the exchange rate regime and test the sensitivity of our results to changes in the criteria used to identify banking crises.

In the estimations of the cost and duration of crises, we analyze the impact of the exchange rate regime, while controlling for macroeconomic factors and for the crises management strategies used by governments to deal with these episodes. The investigation of the determinants of the cost of banking crises relies on two measures of the burden imposed by crises. First, we use estimates of the fiscal cost of crises.[6] These are related to the clean-up costs faced by the government as a result of the crises. Second, we measure the cost of the crises to the economy as the foregone output growth that resulted from the period of banking distress. Finally, we estimate hazard models to study the impact of the currency regime on the duration of crises.

The remainder of this paper is structured as follows. Section II discusses the literature and main arguments relating exchange rate policies to banking crises. Section III describes the empirical methodology and the data used in this study. Section IV presents the empirical results. Finally, Section V concludes.

II. The Choice of Exchange Rate Regime and Financial Stability

In the aftermath of the recent financial crises, the impact of the exchange rate regime on financial stability has become one of the central components of the debate on the appropriate

exchange rate policies for countries to adopt. Yet, to date, little consensus has emerged on this subject. Below, we provide a brief overview of the competing arguments and literature linking exchange rate regimes and financial stability.

II.a Arguments Favoring Pegged Exchange Rates

A popular argument in favor of fixed exchange rates is that a commitment to a currency peg may reduce the probability of banking crises, as it would discipline policy makers (Eichengreen and Rose (1998)). Put differently, the restrictions imposed by the objective of maintaining an exchange rate anchor would discourage the propensity towards erratic policies and, therefore, minimize the occurrence of domestic shocks that lead to banking crises.[7] Furthermore, as argued by Calvo (1999b) random shocks that affect economies may be a function of the exchange rate regime. Thus, the transparency and credibility associated with fixed exchange rates may insulate a country from contagion and rumors.

Proponents of fixed exchange rate regimes also consider the presence of dollar debt as an argument supporting the adoption of pegged exchange rates (Velasco and Cespedes (1999)). They argue that a nominal devaluation will drastically increase the burden faced by debtors and can generate a wave of corporate bankruptcies. This may, in turn, result in a banking crisis, as banks see their stock of non-performing loans rise. Calvo (1999a) also supports this conjecture and claims that "liability-dollarized economies are highly vulnerable to a devaluation".

Finally, a series of recent studies have provided strong support for the importance of exchange rate stability, particularly in the case of developing countries. More specifically, Calvo

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[6] These come from Honohan and Klingebiel (2000).

[7] A related argument put forward by Mishkin and Savastano (2000) is that countries lacking political and economic institutions to support an independent central bank may find hard pegs a sensible second best strategy for monetary policy

(1999b) and Calvo and Reinhart (2000a, 2000b) contend that the choice of exchange rate regime for developing countries is very different from that of developed countries. Developing countries are often plagued by lack of credibility and limited access to international markets, more pronounced adverse effects of exchange rate volatility on trade, high liability dollarization, and higher passthrough from exchange rate to inflation. As a result of these features, flexible exchange rate arrangements are not suitable for developing countries. They argue that this is why authorities in developing countries often resist large movements in the exchange rate [8]

II.b Arguments Favoring Flexible Exchange Rates

The traditional argument for supporting the adoption of flexible exchange rate systems is that they offer the possibility of a more stabilizing monetary policy. Accordingly, the exchange rate could be used to absorb some of the real shocks the economy faces and could reduce the burden on the interest rate. More precisely, confronted with an adverse external shock, floaters can let the exchange rate bear the brunt of the adjustment so that interest rates need not be raised. Thus, output is protected through increased competitiveness and more favorable financial conditions.[9]

This argument, however, is subject to a number of caveats. First, whereas the traditional ranking between fixed and floating regimes is based on a loss function that depends exclusively on output volatility, Calvo (1999b) shows that fixed exchange rates would always dominate flexible regimes if the function being optimized puts weight on real exchange rate volatility.[10] Second, empirical evidence for developing countries does not lend support to the notion that monetary policy is stabilizing under flexible regimes. For example, Calvo and Reinhart (2000a,

[8] See Hausmann et. al (1999) for the empirical support for this conjecture in the case of Latin American countries.
[9] This argument is, of course, not applicable to those countries with significant liability dollarization.

2000b) and Hausmann et al. (1999) demonstrate that monetary policy is more pro-cyclical in flexible than in fixed exchange rate regimes. They attribute this finding to the lack of credibility that plagues developing countries. Moreover, Calvo and Reinhart (2000a) show that developing countries refrain from using their exchange rate flexibility in the face of large external shocks. In particular, they find that the volatility of commodity prices expressed in the local currency of developing countries exceeds that for the exchange rate suggesting that the latter is not often allowed to perform as a shock absorber. Finally, shocks could contain both real and nominal components. This, in turn, would make the choice of exchange rate regime on the basis of the nature of shocks more difficult. Indeed, recent crises episodes in which shocks have come mainly through the capital account—affecting both aggregate demand as well as monetary aggregates—lend support to this conjecture and raise doubts about the usefulness of floating exchange rates as a shock absorber.

Defenders of floating exchange rate regimes also contend that pegged exchange rates provide implicit guarantees for those looking to borrow in foreign currency, giving rise to a moral hazard problem. To sustain the peg, authorities will insist that there is absolutely no prospect of it being changed. In this way, the government offers the private sector an insurance against the risk of exchange rate changes. This situation attracts capital inflows, but leaves the economy very vulnerable to external shocks.[11] Moreover, under pegged regimes, borrowers have little incentive to hedge their foreign exposures (Eichengreen and Hausmann (1999)). On the other hand, exchange rate risk under flexible regimes promotes hedging and helps to curb inflows.

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[10] He also shows that this dominance weakens, but does not vanish, with full indexation to the exchange rate.

[11] Indeed, many analysts considered this channel as one of the major contributing factors to the Asian crises and concluded that "the peg did it". However, as was pointed out by Calvo (1998) if the crises countries had floated their exchange rates prior to the crisis, their currencies would likely have appreciated, not depreciated.

Advocates of the flexible regime also argue that fixed exchange rates severely constrain lender of last resort operations, since domestic credit growth may undermine the confidence in the currency peg.[12] The lack of a lender of last resort under fixed exchange rates can, in turn, encourage bank runs and financial panics.[13] However, there is a caveat to this argument. The existence of lender of last resort facilities under flexible exchange rates may encourage bankers to take additional risks, since they know authorities will bail them out. Under this scenario, a rise in bank risk-taking will increase the odds of a banking crisis. Moreover, if the market anticipates the influx of last-resort lending to the banking system that would lead to a rapid expansion of the monetary base, the market will expect the currency to lose value. This, in turn, could produce a major destabilizing depreciation.[14]

Aside from the lender of last resort argument, Chang and Velasco (1998) and Velasco and Cespedes (1999) underscore that flexible exchange rates may be helpful in preventing self-fulfilling bank runs. Under a fixed exchange rate regime, if depositors are concerned about the viability of the peg, they will have incentives to run in order to exchange their deposits for reserves, before the government stock is depleted. On the other hand, in a flexible exchange rate this motivation to run disappears, because those who run first face a depreciation.[15]

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[12] It could be argued that the use of fiscal policy in lieu of monetary policy to help troubled banks might be a reasonable alternative. However, since developing countries are often rationed at times of crises, it is not feasible for the government simply to borrow against the present value of future tax receipts and then hand over the money to the bankers (Velasco, 1999).

[13] It should be noted that there is no unanimity over this argument. Some claim that the lender of last resort function can be rented—contingent credit lines (Dornbusch, 1998). Others contend that the policy of contracting a line of credit has the following shortcomings (Velasco, 1999). First, the risk of bank runs need not be easily diversifiable for lenders in the wake of regional or global contagion. Second, such contracts are difficult to write and enforce, owing to the obvious potential for moral hazard. Third, the issue size of the credit may not be sufficient to cover a reasonable portion of the banking sector liabilities at a reasonable premium.

[14] Indeed, as Hausmann et al. (1999) indicate, this is exactly what happened in Venezuela during the first half of 1994.

III. Empirical Methodology

We investigate the links between exchange rate regimes and financial stability by estimating three types of empirical models. In particular, we use logit analysis to estimate the probability of a banking crisis, ordinary least squares to analyze the cost of these episodes, and hazard functions (Cox and Weibull) to study the determinants of crisis duration. In the following subsections, we provide a more detailed description of our empirical methodology.

III.a The Likelihood of Banking Crises

In the logit analysis, the dependent variable is obviously a dichotomous one. This dummy equals zero in years and countries where there are no crises and it equals one during systemic crisis periods. Following Demirgüç-Kunt and Detragiache (1997), we define as systemic crises episodes that meet one of the following four criteria: (i) the non-performing loans ratio (to total loans) is above 10%; (ii) the cost of the banking crisis is at least 2% of GDP; (iii) the crisis led to the nationalization of banks; and/or (iv) emergency measures such as deposit freezes or prolonged bank holidays are adopted in response to the crisis. For the 88 countries in our sample, we identify periods of systemic crises according to the criteria described above, based on the information and chronology of episodes of banking distress provided by Caprio and Klingebiel (1999) and Lindgren, Garcia, and Saal (1996).

Given the logistic distribution, the probability of a banking crisis in period t can be expressed as follows:

$$(1)\ \Pr ob(Crisis_t = 1 / X_{t-1}) = \frac{e^{(\beta' X_{t-1})}}{1 + e^{(\beta' X_{t-1})}}$$

[15] One should recognize that such a mechanism protects banks against self-fulfilling pessimism on the part of domestic depositors if their claims are in local currency and not against panic by external or domestic creditors who hold short-term i.o.u's denominated in foreign currency.

Similarly, the probability of no crisis in period t is:

$$(2)\ \Pr ob(Crisis_t = 0 / X_{t-1}) = \frac{1}{1 + e^{(\beta' X_{t-1})}}$$

The ratio of (1) over (2) is the odds ratio in favor of a crisis. Taking natural logs of this ratio, it should be clear that the log of the odds ratio is not only linear in X_{t-1}, but also linear in the parameters β. Given (3), β measures the change in the log-odds ratio for a unit change in X_{t-1}.[16]

$$(3)\ \ln \frac{\Pr ob(Crisis_t = 1 / X_{t-1})}{\Pr ob(Crisis_t = 0 / X_{t-1})} = \beta' X_{t-1}$$

X is a matrix of determinants of banking crises. In our estimations, only the first year of a crisis is coded as a one and the crisis observations beyond the first year are excluded. We adopt this strategy to avoid the endogeneity problem that would result from the fact that once the crisis starts, it is likely to affect the evolution of the macro and financial variables on the right hand side. Similarly, to minimize simultaneity problems, all regressors in the logit models are lagged one period.

The variables included in X are dictated by the theory on the determinants of banking crises. We provide a detailed list of variables and sources in the data appendix. We include three types of variables in our estimations, namely: *domestic- macroeconomic*, *external*, and *financial*. In this regard, we closely follow the empirical specification on the likelihood of banking crises in Demirgüç-Kunt and Detragiache (1997). Among the domestic macroeconomic variables we

[16] However, the marginal effect of a regressor on the dependent variable, which is the usual interpretation for coefficients in the ordinary least squares setup, is different from β (although it still depends on it), namely:

$$\partial \frac{Prob(Crisis_t = 1 \mid X_{t-1})}{\partial X_{t-1}} = \beta * \frac{\exp(\beta' X_{t-1})}{1 + \exp(\beta' X_{t-1})} * \frac{1}{1 + \exp(\beta' X_{t-1})}$$

Note that (3) will vary with X_{t-1}. In practice, the marginal effects are calculated at the means of the regressors.

include: the real growth of GDP, the level of real GDP per capita, the inflation rate, and the real interest rate.[17]

Adverse macroeconomic conditions hurt banks by increasing the share of non-performing loans in the economy. Thus, we expect an increase in the real growth of GDP to reduce the probability of a banking crisis. On the other hand, we expect higher real interest rates to have a positive effect on the likelihood of crises. High inflation is associated with high nominal interest rates and may also be viewed as a proxy for poor macroeconomic management. Finally, real GDP per capita is included to control for the fact that poor countries typically have inefficient legal systems, as well as weak enforcement of loan contracts and deficient prudential regulations.

To capture the external conditions that countries face, we include two variables: the change in the terms of trade and the ratio of net capital flows to GDP. A deterioration in the terms of trade is expected to increase the likelihood of a banking crisis, since it would negatively affect the ability of borrowers (in particular those in the tradable sector) to repay loans. Both net outflows and inflows could play an important role in precipitating banking crises. A rise in capital flows intermediated by the domestic banking system is likely to increase the supply of loanable funds at banks' disposal, thereby allowing banks to engineer a lending boom. As is widely acknowledged, lending booms lead to financial vulnerability by contributing to an endogenous decline in the quality of banks' assets.[18] Outflows, on the other hand, can bring about crises by depriving banks of foreign financing and also by heightening the expectation of a

[17] We also conducted some estimations including the budget surplus/deficit as a percentage of GDP, but since this variable was never significant and it significantly reduces the number of observations, we report the results excluding this variable. The results including the budget surplus/deficit to GDP are available upon request.

[18] There are several reasons why this holds true. First, banks have limited capacity to evaluate projects. Second, regulatory agencies have limited monitoring capacity and resources. Finally, the supply of "good" projects with high expected returns relative to their variance is limited (see Gavin and Hausmann (1996)).

meltdown, leading to bank runs. Calvo and Reinhart (1999) argue that "sudden stops" or episodes of inflow reversals can trigger output collapses and severely damage financial sectors.

A number of financial variables are also included in the logit estimations. In particular, we include the ratio of M2 to reserves, the ratio of private domestic credit to GDP, the growth of credit, the ratio of foreign liabilities to foreign assets held by banks, and the ratio of cash held by banks to assets. The ratio of M2 to foreign exchange reserves is supposed to capture the exposure that banks face to runs associated with currency crises. Demirgüç-Kunt and Detragiache (1997) argue that financial liberalization may weaken the condition of the banking sector because this process may result in an increase in risk-taking opportunities, and when not appropriately regulated, in instances of fraud. Pill and Pradhan (1995) argue that the ratio of domestic credit to the private sector to GDP can be utilized to capture the extent of financial liberalization.[19] We include this variable in our estimations to control for this effect. Also, because a number of studies (Gavin and Hausmann (1996), Gourinchas et al. (1999)) have argued that banking crises are associated with lending booms, we also include the growth rate of domestic credit in the logit estimations.

The ratio of cash (to total bank assets) held by banks is introduced to capture the ability of banks to deal with potential runs on their deposits. We include the ratio of foreign liabilities to foreign assets held by banks to examine the extent to which banks' currency mismatches affect the likelihood of a banking crisis.[20]

[19] We also conducted some estimations using a dummy for financial liberalization periods (following Demirgüç-Kunt and Detragiache (1998)), but it reduces our sample of countries significantly and does not affect the empirical results .

[20] The ratio of foreign liabilities to foreign assets used here (see appendix for definition and sources) is only a proxy for the true currency mismatch since it only considers the liabilities held by banks with foreigners (i.e., non-residents) and the banks' claims on foreigners, irrespective of the currency of denomination. There are a number of obvious deficiencies with this measure. First, for some developed countries bank assets and liabilities with foreigners may in fact be denominated in the domestic currency, in which case, this ratio does not really capture the currency mismatch of banks. However, because our sample is primarily comprised of developing countries, we do

We investigate the link between the exchange rate regime and banking crises, controlling for other relevant macroeconomic, external, and financial factors, in a number of ways. First, to explore whether the exchange rate regime has a direct impact on the likelihood of a banking crisis, we introduce dummies capturing the declared exchange rate regime in each country. For this purpose, we use data on exchange rate regimes available from the IMF's *Annual Report on Exchange Rate Arrangements and Exchange Rate Restrictions*. In some estimations, we distinguish between fixed exchange rate regimes vis-à-vis all other regimes. In other cases, we allow for three exchange rate categories: fixed, intermediate, and floating.[21]

Given that countries' declared exchange rate regimes might be quite different from the one pursued in practice, we conduct alternative estimations with two measures of *de facto* exchange rate regimes. First, we use a data set on *frequent* and *infrequent parity-adjusters* put together by Ghosh et al. (1997) to distinguish between countries that truly peg from those that constantly modify their exchange rate parity or even regime. Second, we define a dummy that takes the value of one whenever a country's relevant exchange rate changes by less than 5%.[22]

Since the exchange rate may also have an indirect impact on the probability of a banking crisis, we explore certain interactions between the explanatory variables discussed above and the exchange rate regime. First, by interacting the pegged exchange rate dummy with the capital flows and terms of trade variables, we analyze the standard prescription that floating exchange

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not expect this to be a significant bias. Another potential problem with this ratio is that it excludes the foreign assets and liabilities held by banks with domestic residents. In many developing countries, banks take dollar deposits and make dollar loans. In those cases, our measure will underestimate the currency mismatch since it only includes obligations towards and claims on non-residents. We made attempts to collect data on foreign currency deposits and loans held by residents, but we were only able to collect a very limited data set.

[21] Fixed exchange rate regimes include pegs to individual currencies or to a basket. The intermediate regimes includes crawling pegs, managed floating, and regimes that allow limited flexibility with respect to a set of indicators.

[22] Dummies constructed to capture exchange rate changes smaller than 2.5%, 10%, or 25% yielded similar results. In addition, we also employed another alternative *de facto* classification of exchange rate regimes constructed by Levy

rates are more suitable in the face of external shocks. Second, we examine the interaction between the exchange rate regime and the ratio of foreign liabilities to assets, the share of cash to bank assets, and the ratio of M2 to reserves to test the validity of the arguments put forth by Eichengreen and Hausmann (1999) and Velasco and Cespedes (1999), among others.

Fixed exchange rate rates are often perceived as government guarantees against exchange rate fluctuations. In this sense, pegged regimes may create moral hazard incentives for banks not to hedge their foreign liabilities or to make riskier investments, for a given ratio of foreign liabilities to assets. Thus, if the argument above is true, we expect to find a positive sign on the interaction term between the peg dummy and the ratio of foreign liabilities to assets.

A common argument explaining why fixed exchange rate regimes may be associated with financial instability is the fact that under this regime the ability of the central bank to act as a lender of last resort is severely curtailed by its commitment to the exchange rate. We interact the fixed exchange rate dummy with the ratio of bank assets held as cash to investigate whether bank liquidity matters more (in terms of reducing the probability of a banking crisis) in countries that have exchange rate commitments and, therefore, have a limited capacity to inject liquidity if needed (i.e., situations where the government cannot act as a lender of last resort).

The ratio of M2 to foreign exchange reserves captures banks' vulnerability to runs associated with currency crises. The incentives to run could be higher under fixed exchange rates. This is due to the fact that under exchange rate pegs, agents may fear that the central bank will not have enough reserves to convert their deposits to foreign currency. On the other hand, under floating rates, panicking will lead only to a depreciation (Velasco and Cespedes (1999)). Thus, we expect the interaction of the ratio of M2 to reserves with the peg dummy to be positive.

Yeyati and Sturzenegger (1999) on the basis of clustering analysis. Because this classification is only available for the 1990s and it significantly reduces our sample, we do not report these results here.

In other words, under fixed rates, the larger the ratio of M2 to reserves the greater the likelihood of a bank run.

III.b. The Cost of Banking Crises

To study whether the exchange rate regime affects the cost of banking crises, we estimate the following equation using ordinary least squares:

$$Cost_i = \alpha + \mu' Z_i + \delta Flex_i + \eta' \operatorname{Re} s_i + \varepsilon_i \qquad (4)$$

where i denotes a banking crisis episode.

Cost refers, alternatively, to the fiscal or real output cost (i.e., the cost in terms of foregone output growth) of a crisis. Data on the fiscal cost of crises (relative to GDP) come from Honohan and Klingebiel (2000). The real output cost was calculated as the differences between the average growth rate of real GDP during each crisis episode relative to the average growth during tranquil times. Allowing for a two-year window around banking crises (to accommodate for the possibility that crises may have started earlier and ended later than identified in the literature), we define output growth during tranquil periods as the average growth of output in the two years surrounding the window described above.[23] Z is a matrix of macro and financial variables measured as the two-year average before each crisis. In particular, the following macro variables are included in the specifications: inflation, real interest rates, lending growth, bank credit to the private sector to GDP, and the ratio of bank liquidity to total bank assets.[24] *Flex* is the average of an index of exchange rate flexibility, where higher values for this variable indicate a greater degree of flexibility. In some estimations, we replace *Flex* with the lag of the peg

[23] We tried other definitions of the output losses associated with banking crises, but results did not change significantly.

[24] Other specifications with a larger number of macro variables were run, but given the limited number of observations and because the remaining variables were not significant, we only report those described above.

dummy. Finally, *Res* is a matrix containing dummies for the different resolution mechanisms implemented by governments to overcome crises. In particular, using data collected by Honohan and Klingebiel (2000), we identify episodes when the government provided liquidity support to banks, when forbearance was extended to multiple institutions, and, finally, crises episodes where the government extended blanket guarantees to depositors.

III.c. The Duration of Banking Crises

To investigate the potential link between the duration of crises and the exchange rate regime, we estimate Weibull and Cox hazard functions. In this paper, the hazard function represents the rate at which countries exit a banking crises at period t, given that they were in a crisis up until t. The hazard functions for the Cox and Weibull models can be written as:

$$\lambda(t) = \lambda(t)_0 e^{\phi' Z + \gamma Flex + \rho' Res} \qquad (5)$$

$\lambda_0(t)$ is the so-called "baseline" hazard function. In the Weibull distribution, the baseline hazard is a parametric function such that $\lambda_0(t) = pt^{p-1}$ where p is the shape parameter to be determined by the data. If p=1, the hazard rate is flat; if p<1, the hazard is decreasing, and if p>1, the hazard is increasing. On the other hand, in the Cox model estimates of ϕ, γ, and ρ can be obtained without imposing a particular structure on $\lambda_0(t)$. *Z*, *Flex,* and *Res* are defined as above. A positive coefficient in both models indicates that the given covariate (or right hand side variable) increases the likelihood of exiting a crisis. Since we are interested in the determinants of the duration of crises, to evaluate the impact of a given variable on the length of a crisis, we need to invert the signs on the coefficients.

IV. Empirical Findings

IV.a. The Exchange Rate Regime and the Likelihood of Crises

Table 1 presents logit estimations for systemic crises over the full sample 1980-1997. All estimates are corrected for heteroscedasticity and for within-country autocorrelation[25]. Aside from the macro, external, and financial variables discussed earlier, the first specification in Table 1 (column (1.1)) includes only the peg dummy. In the second and third specifications (columns (1.2) and .(1.3)), we try to disentangle the effect of capital flows on banking crises by replacing net flows with two different variables that isolate periods of net inflows and net outflows. In specification (1.2), the variable *outflows* equals net flows when these are negative and it is zero otherwise. Similarly, the regressor labeled *inflows* equals net flows when these are positive and takes the value of zero otherwise. The fourth specification in Table 1 includes both the peg and intermediate regime dummies. Finally, the last three estimations include interaction terms of the peg dummy with the following variables: terms of trade change, the ratio of capital flows to GDP (and separately the ratio of net inflows and net outflows), the ratio of foreign liabilities to assets, the ratio of M2 to reserves, and the ratio of cash to bank assets.

Across all specifications for the systemic crises, the results indicate that countries with higher GDP per capita—most likely endowed with better contract enforcement mechanisms and

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[25] Given a regression model $y_i = x_i\beta + \varepsilon_i$, following Huber (1967) and White (1980, 1982) the formula for the robust estimator of variance is $\hat{v} = \hat{V}(\sum_{j=1}^{N} u_j' u_j)\hat{V}$ where $\hat{V}$ is the conventional variance estimator and u_j is the contribution from the jth observation to the scores $\frac{\partial LnL}{\partial \beta}$. Assuming the observations denoted by j are not independent but that they can be divided into M groups G1, G2, ...GM that are independent, then the robust estimator of the variance is $\hat{v} = \hat{V}(\sum_{k=1}^{M} u_k^{(G)'} u_k^{(G)})\hat{V}$ where $u_k^{(G)}$ is the contribution of the kth group to the scores $\frac{\partial LnL}{\partial \beta}$ and $u_k^{(G)} = \sum_{j \in G_k} u_j$ (see Rogers (1993)).

institutions—have a lower probability of facing a banking crisis. High credit growth raises the likelihood of a banking crisis and so do capital inflows. This is consistent with the notion that lending booms precede banking crises.

Regarding the impact of the exchange rate regime on the likelihood of banking crises, we find that the peg dummy is negative, though not significant. Nonetheless, the interaction between the peg and episodes of net inflows is negative and significant, implying that inflows are less damaging under fixed than floating regimes. This could be attributed to several factors. First, evidence suggests that countries with fixed exchange rate regimes have larger (and possibly more sophisticated) financial systems, which would allow them to intermediate inflows more efficiently.[26] Second, it is possible that the real exchange rate appreciations that accompany inflow episodes are initially larger under floating regimes than under fixed, since under the former, both the nominal exchange rate appreciates and the price of non-tradable increases. Because under fixed exchange rate regimes appreciations take place only through usually sluggish price adjustments, exporters in countries under pegged regimes will be in a better position to adjust to the adverse consequence of appreciations relative to their counterpart under floating regimes. Finally, it has been argued that the volatility of capital flows is larger under flexible exchange rates than under fixed exchange rates. Thus, for a given level of inflows, it is possible that the higher volatility of inflows under flexible rates and its negative impact on banks' balance sheet may explain why inflows appear to be particularly damaging to financial stability under flexible regimes.

The empirical results also indicate that the interaction of the peg with the ratio of foreign liabilities to foreign assets is positive and statistically significant. This finding suggests that in countries with pegged exchange rates, unhedged foreign liabilities are more likely to have a

larger positive impact on the likelihood of a crisis. A possible explanation for this finding is that for a given level of unhedged liabilities, banks and individuals under pegged regimes have a larger incentive to take greater risks, because fixed exchange rates act as implicit guarantees against losses associated with exchange rate volatility.

The choice of exchange rate regime is probably more important for developing countries, given their inability to borrow in their own currency and the fact that most of the trade they conduct with other nations takes place in a currency other than their own. Table 2 presents the estimates on the determinants of systemic crises in developing countries only. As before, we find that capital inflows increase the likelihood of banking crises. Also, an increase in the ratio of M2 to reserves raises countries' vulnerability to banking crises. On the other hand, we find that GDP per capita has a negative and significant impact on the likelihood of a banking crisis. Similarly, the results indicate that the peg dummy is negative and significant, suggesting that the adoption of fixed exchange rates lowers the probability of banking crises in developing countries.

The estimations discussed above use the IMF's *de jure* classification of exchange rate regimes (i.e., a classification based on the declared commitment of the central bank) to investigate the link between this variable and the likelihood of a banking crisis. Given that in many instances the declared regime might be a poor proxy for the actual exchange rate behavior, we consider two alternative measures of the *de facto* regimes. First, we use a data set collected by Ghosh et al. (1997) that separates countries with pegged or intermediate regimes into *infrequent* or *frequent parity-adjusters*. Frequent parity adjusters are those countries that constantly change their exchange rate, even though they are under a declared fixed or semi-fixed regime. Second, we construct a dummy to capture those cases when the actual exchange rate changed by less than 5 per cent over the previous year. For each country, the exchange rate used

[26] See Hausmann et. al (1999).

to construct this measure varies according to the declared intentions of each country to peg their currency vis-à-vis a particular currency or basket of currencies.[27]

Table 3 presents logit estimates for systemic crises using both *de facto* exchange rate regime measures for all countries and, separately, for developing countries. In these estimations, we ignore the interaction terms because we found that these are mostly insignificant. For the sample including all countries, we find that the exchange rate regime is significant when the dummy that captures exchange rate changes smaller than 5 per cent is included. On the other hand, when only developing countries are included, we find that both measures of *de facto* pegs have a negative and significant impact on the likelihood of banking crises. Thus, these estimations confirm that pegged regimes reduce the probability of banking crises, whether we focus on *de jure* or *de facto* measures of the regimes.

An important test to verify the robustness of our results is to study whether the significance of the exchange rate disappears, if we modify the criteria we used to select episodes of banking crises. Thus, in Table 4 we present logit specifications where we use alternative definitions of crises. In the first case (columns (4.1) through (4.4)) , we add to the systemic crises included in our estimations up to now, any other periods of banking distress identified by Caprio and Klingebiel (1999) and Lindgren et. al (1996). These episodes had been excluded so far because they did not qualify as systemic crises according to the Demirgüç-Kunt and Detragiache (1997) criteria. In the second set of estimations (columns (4.5) through (4.8)), we restrict our definition of crises and sample to match that analyzed by Glick and Hutchison (1999) in a recent study of

[27] For example, for CFA countries we would construct the 5 percent dummy based on the behavior of the African countries' exchange rate vis-à-vis the French franc. By contrast, previous studies (like Eichengreen and Rose (1998) and Eichengreen and Arteta (2000) have focused only on the exchange rate volatility vis-à-vis the U.S. dollar.

the determinants of banking and currency crises.[28] Table A.1. in the appendix compares the episodes we identify as systemic and non-systemic according to the Demirgüç-Kunt and Detragiache (1997) criteria, with the banking crises episodes identified by Glick and Hutchison (1999).[29]

Table 4 presents the logit estimations using alternative measures of banking crises. In both cases, we find that having a fixed exchange rate lowers the likelihood of banking crises, whether we focus on *de jure* or *de facto* measures of the regime . Also, Table 4 confirms our previous findings that an increase in the ratio of M2 over reserves, faster credit growth, and higher ratios of unhedged foreign liabilities increase the likelihood of banking crises. On the other hand, GDP per capita has a negative impact on the likelihood of banking crises.

Another potential criticism to the regression results presented thus far is that the decision to adopt a fixed exchange rate may be influenced by the fragility of the banking sector, causing both variables to be jointly determined. Under such a circumstance, the results would be tainted by a simultaneity bias. To examine whether such a bias drives our results, we estimate a bivariate two-stage logit model. In the first stage, we estimate a logit model of the determinants of the choice of exchange rate regime, while in the second stage, we estimate the likelihood of a banking crisis using the predicted values from the first stage instead of the exchange rate regime dummy. This two-stage procedure is equivalent to an instrumental variables regression where, in the first stage, we purge the endogenous component of the exchange rate regime. The two-stage logit is only identified if there is at least one variable that is correlated with the probability of adopting a fixed exchange rate, but is uncorrelated with the probability of a banking crisis.

[28] Glick and Hutchison (1999) use the banking crises dates in Caprio and Klingebiel (1999) and Demirgüç-Kunt (1998) to identify banking crises in 90 industrial and developing countries over the period 1975-1997. Their study is an empirical examination of the value of banking crises in helping to predict currency crises and vice-versa.
[29] See Caprio and Klingebiel (1999) for a list and classification of the episodes they identify.

Following, Ghosh et al. (1997), we use the country's size- proxied by its population as an instrument for the exchange rate regime.[30] On the other hand, we treat the macro variables as exogenous.

As indicated by Maddala (1983), the computation of the variance-covariance matrix for bivariate limited dependent models is quite cumbersome. However, Angrist (1991) has shown that standard (linear) instrumental variable estimation can be used instead. More precisely, ignoring that both the peg and banking crisis are binary variables, the estimates obtained from a two-stage least squares model have all the desired properties when the sample size is large.

Table 5 reports the results from the instrumental variables estimation for all countries and, separately, for developing countries. The results confirm the findings discussed before. High capital inflows and domestic credit growth increase the likelihood of banking crises. On the other hand, GDP per capita has a negative impact on the occurrence of banking crises. While the exchange rate regime does not appear to have a significant effect on the probability of banking crises in the overall sample (including both developed and developing countries), fixed exchange rate regimes seem to reduce the chances that developing countries will endure banking crises.

IV.b. Exchange Rate Regimes and the Cost Crises

Table 6 presents the OLS estimates for the determinants of the real and fiscal cost of crises. In this case, because we are conducting cross-section regressions, we include systemic and non-systemic crises, in order to have an adequate number of observations.[31] For each measure of the cost of crises, we conduct two sets of estimates. In the first case, we regress the cost of crises against the pre-crisis two-year average values of a number of macro variables,

[30] We also tried with the degree of openness as a potential instrument, and the results do not change significantly. These results are available upon request.

together with the exchange rate policy measure. In the second set of estimates, we also include a group of dummies that capture the crises management strategies used by the government. In particular, following the work of Honohan and Klingebiel (2000), we include dummies to control for episodes where unlimited deposit guarantees were granted, open-ended liquidity support was extended, or where a policy of forbearance was adopted.[32]

The purpose of this section is to study whether the exchange rate regime affects the cost of crises, once we control for the behavior of macro variables prior to the crises and for the resolution mechanisms adopted to deal with them. We investigate the role of the exchange rate regime in affecting the cost of crises using two different measures of the currency arrangement in place. First, we include the average over the two years prior to each crisis of an index of exchange rate flexibility (see columns (6.1), (6.2), (6.5), and (6.6). This index can take values between one (for fixed exchange rate regimes) and four (for flexible regimes). Second, we include a dummy that is equal to one if the exchange rate regime in the year before the crisis was a peg (see columns (6.3),(6.4), (6.7), and (6.8)).

The real cost of crises—measured as the foregone output growth as a result of banking crises—appears to be higher in countries that exhibited high inflation and low bank liquidity in the years prior to the start of the crises. Also, foregone output growth appears to be higher in countries with high ratios of bank credit to GDP. Fixed exchange rates seem to increase the cost of crises in terms of foregone output, even once we control for the resolution mechanisms used to deal with crises. Among these, crises where the government allowed for regulatory forbearance seem to be costlier in the end.

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[31] In other words, in this section we include all banking crises episodes identified by Caprio and Klingebiel (1999).
[32] See data appendix for exact definition of these crises management dummies.

The fiscal cost of crises appears to be higher in countries where real interest rates were high before the crises. Also, in countries with a high dependence on bank credit (i.e., countries with a high ratio of bank credit to GDP), governments seem to face costlier crisis. The exchange rate policy does not seem to affect the fiscal cost of crises. Regulatory forbearance appears to increase the fiscal cost of crises.

IV.c. Exchange Rate Regimes and the Duration of Crises

To study the duration of banking crises, we estimate Cox and Weibull hazard functions. In the first case, parameter estimates can be obtained without imposing a specific structure on the baseline hazard function. The length of crises is determined on the basis of the work by Caprio and Klingebiel (1999) and Lindgren et. al (1996). Like in the cost of crises estimations, we examine the role of macro variables, crises resolution mechanisms, and the pre-crisis exchange rate policies in affecting the length of crises. Table 7 presents the empirical results from the estimation of the hazard functions. In interpreting the signs on the coefficients from the hazard models, it is important to note that these functions measure the likelihood of exiting a crisis at time t, given that the crisis lasted until then. Thus, variables that have a positive impact on the hazard functions, have a negative effect on the duration of crises.

The duration of crises seems positively affected by the size of the credit boom prior to the crises. The larger the credit boom before a crisis, the smaller the hazard rate, or the probability of exiting a crisis. In the specifications where the only macro variables included is the growth of credit, crises last longer in episodes when the government grants regulatory forbearance and, in some cases, when liquidity support is provided. The degree of exchange rate flexibility or the exchange rate regime in the year prior to the crises, on other hand, do not seem to have a

statistically significant impact on the duration of crises. Since these results are consistent across the Weibull and Cox functions, we can conclude that the finding that the exchange rate regime does not seem to affect the length of crises is robust to the duration model specified.[33]

V. Conclusions

The choice of exchange rate regime is probably one of the most important macro-economic policy decisions, especially for developing countries. It can strongly affect their freedom of action, the effectiveness of macro-economic policies, the stability of their financial system, and even the evolution of their economies. A number of studies have tried to ferret out the influence of exchange rate arrangements on economic performance.[34] This strand of the literature, however, has paid little attention to the link between the exchange rate regime and financial stability, including the issue of whether the exchange rate regime has an impact on the cost and duration of crises.

This study attempted to fill this void in the literature by empirically investigating the impact of the exchange rate regime on the likelihood, cost, and duration of banking crises, in a large sample of developed and developing countries over the period 1980-1997. The main conclusion that emerges from our study is that fixed exchange rate regimes, after controlling for a host of macroeconomic, financial, and external fundamentals, reduce the probability of a banking crisis, particularly in developing countries. This finding is robust to various specifications, different criteria for identifying banking crisis periods, using measures of *de facto* flexibility, and even controlling for the possible endogeneity of the exchange rate regime. The

[33] We also obtained almost identical results assuming a logistic, exponential, or normal hazard function. Results are available upon request.

[34] See, for instance, Baxter and Stockman (1989), Ghosh et al (1997), and Edwards and Savastano (1999) for a review of this literature.

empirical results also underscore the fact that higher per capita income (associated with better institutions and enforcement of contracts) reduces the likelihood of a banking crisis. Also, our estimations confirmed the detrimental effects of excessive credit growth, high M2 to reserve ratios, and net capital flows on financial stability.

Regarding the cost of crises, the empirical results indicate that the real cost of banking crises—measured in terms of forgone output growth—is higher for those countries with more stringent exchange rate arrangements. Moreover, the findings suggest that countries that experience high inflation rates and large bank credit to GDP ratios prior to crises, are likely to endure significant output losses during these episodes. The fiscal costs of crises, on the other hand, appear to be higher in countries where crises are preceded by episodes of high interest rates, high bank credit to GDP, and where authorities extend regulatory forbearance. However, the exchange rate regime does not seem to affect the fiscal cost of crises.

The duration of crises turns out be influenced primarily by the size of the credit boom prior to the crises. In general, the results suggest that the degree of exchange rate flexibility does not affect the duration of crises.

A number of policy implications can be inferred from the empirical results. First, in the context of the modern literature on exchange rate regimes, which underscores the existence of important trade-offs between *credibility* and *flexibility*, our findings suggest that the credibility associated with fixed exchange rates may also help to promote financial stability. Since the fixed exchange regime reduces both erratic and discretionary policy making, it would also decrease the occurrence of domestic shocks that, in turn, produce banking crises. Indeed, this finding lends support to the argument that countries lacking political and economic institutions to assure an

independent central bank may find the adoption of a fixed exchange rate regime a reasonable strategy for monetary policy.

Second, the findings also agree with those who argue that flexible exchange rates are no longer a useful shock absorber for real shocks. By contrast, they are now primarily a distributing transmitter of financial shocks, thereby adversely affecting productive economic activities.[35] More precisely, countries with flexible exchange rates, except those with well-developed and sophisticated markets, are likely to experience a surge in the volatility of the real value of domestic assets due to the increased capital mobility. Excessive fluctuations in the real value of domestic assets may, in turn, thwart financial stability.

Third, it may also be possible that countries with fixed exchange rate regimes have additional incentives for more stringent regulations and supervision of their banking system. In particular, the lack of a lender of last resort and the knowledge that domestic credit expansions may cause the peg to collapse, may force bank managers and supervisors to improve their prudential standards (Eichengreen 2000).

Finally, the fact that the real cost of crises tends to be higher in countries with more rigid exchange rate regimes may be attributed to: (i) lending-based consumption booms, which usually take place under fixed exchange rate regimes and bring sharp contraction in economic activity, when they evaporate and (ii) inconsistency between injecting the much needed liquidity to the banking system—particularly in the absence of close substitutes for bank loans—and the exchange rate regime in place. [36]

Based on the empirical findings in this paper, can we conclude that the fixed exchange rate regime is superior to other exchange rate arrangements in buttressing financial stability? As

[35] See, for instance, Cooper (1999)

is widely recognized, the optimal exchange rate regime hinges on the circumstances of the particular country and time. It is thus hard to make a general statement applicable to all cases. Nevertheless, the empirical results suggest that the fixed exchange rate regime can indeed play an important role by minimizing discretion and enhancing credibility in policy making, thereby contributing to financial stability. This conclusion is indeed consistent with recent studies that underscore the importance of exchange rate stability owing to particular characteristics of developing countries such as lack of credibility and market access, high liability dollarization, as well as high passthrough from the exchange rate swings to inflation— all of which prevent them from benefiting from more flexible exchange rate arrangements in the first place.[37]

[36] Evidence suggests that the higher the share of consumption financed by capital inflows, the stronger the negative impact of a cut in capital inflows.
[37] See, for instance, Calvo and Reinhart (2000a, 2000b)

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TABLE 1: Logit Estimations for Systemic Banking Crises in Developed and Developing countries

This table presents the coefficients and z-statistics (in parentheses) for the logit estimations of the probability of a systemic banking crisis. Systemic crises are identified as in Demirguc-Kunt and Detragiache (1997). *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Variable	(1.1)	(1.2)	(1.3)	(1.4)	(1.5)	(1.6)	(1.7)
Lag of (Inflation)	-0.0020	-0.0025	-0.0020	-0.0021	-0.0017	-0.0029	-0.0014
	-(0.56)	-(0.63)	-(0.55)	-(0.57)	-(0.47)	-(0.67)	-(0.41)
Lag of (Terms of trade change)	0.0064	0.0082	0.0060	0.0065	0.0049	0.0043	0.0046
	(0.44)	(0.56)	(0.42)	(0.45)	(0.21)	(0.20)	(0.20)
Lag of (Real interest rate)	-0.0028	-0.0036	-0.0027	-0.0029	-0.0025	-0.0037	-0.0021
	-(0.67)	-(0.57)	-(0.71)	-(0.68)	-(0.63)	-(0.78)	-(0.58)
Lag of (M2 / Reserves)	0.0042	0.0047*	0.0039	0.0042	0.0095	0.0068	0.0097
	(1.53)	(1.73)	(1.47)	(1.52)	(1.25)	(0.94)	(1.29)
Lag of (GDP per capita)	-0.0001*	-0.0001*	-0.0001*	-0.0001*	-0.0001*	-0.0001**	-0.0001**
	-(1.72)	-(1.86)	-(1.77)	-(1.68)	-(1.90)	-(2.03)	-(2.02)
Lag of (Real GDP growth)	0.0068	0.0114	0.0077	0.0055	0.0117	0.0152	0.0138
	(0.20)	(0.33)	(0.23)	(0.16)	(0.34)	(0.43)	(0.41)
Lag of (Domestic credit growth)	0.0129*	0.0115	0.0137*	0.0133*	0.0126*	0.0112	0.0139*
	(1.75)	(1.50)	(1.92)	(1.83)	(1.64)	(1.42)	(1.85)
Lag of (Private credit / GDP)	-0.0009	-0.0001	-0.0006	-0.0010	-0.0019	-0.0007	-0.0020
	-(0.31)	-(0.05)	-(0.19)	-(0.30)	-(0.52)	-(0.17)	-(0.55)
Lag of (Cash held by banks / Bank assets)	-0.0013	-0.0008	-0.0019	-0.0009	0.0006	0.0003	0.0002
	-(0.20)	-(0.12)	-(0.29)	-(0.14)	(0.06)	(0.04)	(0.03)
Lag of (Foreign liabilities / Foreign assets)	-0.0001	-0.0001	-0.0001	-0.0001	-0.0007	-0.0007	-0.0006
	-(1.20)	-(1.13)	-(1.22)	-(1.15)	-(1.15)	-(1.28)	-(1.12)
Lag of (Net capital flows / GDP)	0.0389**			0.0393**	0.0689**		
	(2.14)			(2.14)	(2.02)		
Lag of (Capital outflows/GDP)		0.1626				0.0791	
		(1.30)				(0.73)	
Lag of (Capital inflows/GDP)			0.0333				0.0855**
			(1.41)				(2.51)
Lag of (De jure peg dummy)	-0.4781	-0.4233	-0.4614	-0.3431	-0.6076	-0.8547	-0.3305
	-(1.45)	-(1.27)	-(1.42)	-(0.91)	-(1.08)	-(1.63)	-(0.59)
Lag of (De jure intermediate regime dummy)				0.2208			
				(0.55)			
*Lag of (De jure peg * Terms of trade change)*					0.0014	0.0065	0.0018
					(0.05)	(0.25)	(0.07)
*Lag of (De jure peg * M2/ Reserves)*					-0.0058	-0.0011	-0.0063
					-(0.74)	-(0.14)	-(0.80)
*Lag of (De jure peg * Foreign liab. / Foreign assets)*					0.0015*	0.0015*	0.0015**
					(1.90)	(1.93)	(2.00)
*Lag of (De jure peg * Cash / Assets)*					0.0009	0.0049	0.0003
					(0.06)	(0.32)	(0.02)
*Lag of (De jure peg * Net capital flows)*					-0.0589		
					-(1.56)		
*Lag of (De jure peg * Capital outflows)*						0.2622	
						(1.04)	
*Lag of (De jure peg * Capital inflows)*							-0.1046**
							-(2.13)
Number of observations	903	903	903	903	903	903	903
Pseudo R2	0.0786	0.0820	0.0751	0.0793	0.0984	0.1037	0.0991

TABLE 2: Logit Estimations for Systemic Banking Crises in Developing Countries

This table presents the coefficients and z-statistics (in parentheses) for the logit estimations of the probability of a systemic banking crisis. Systemic crises are identified as in Demirguc-Kunt and Detragiache (1997). *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

Variable	(2.1)	(2.2)	(2.3)	(2.4)	(2.5)	(2.6)	(2.7)
Lag of (Inflation)	-0.0032	-0.0043	-0.0032	-0.0032	-0.0024	-0.0042	-0.0020
	-(0.61)	-(0.76)	-(0.62)	-(0.62)	-(0.47)	-(0.74)	-(0.42)
Lag of (Terms of trade change)	0.0091	0.0111	0.0086	0.0096	0.0067	0.0063	0.0061
	(0.69)	(0.85)	(0.66)	(0.74)	(0.32)	(0.32)	(0.30)
Lag of (Real interest rate)	-0.0039	-0.0050	-0.0039	-0.0040	-0.0031	-0.0050	-0.0026
	-(0.74)	-(0.88)	-(0.74)	-(0.74)	-(0.60)	-(0.86)	-(0.55)
Lag of (M2 / Reserves)	0.0046*	0.0051**	0.0042*	0.0047*	0.0108	0.0068	0.0108
	(1.81)	(2.01)	(1.75)	(1.83)	(1.53)	(0.96)	(1.50)
Lag of (GDP per capita)	-0.0002**	-0.0002**	-0.0002**	-0.0002**	-0.0002**	-0.0002**	-0.0002**
	-(2.25)	-(2.35)	-(2.29)	-(2.30)	-(1.98)	-(2.14)	-(1.99)
Lag of (Real GDP growth)	0.0157	0.0213	0.0163	0.0141	0.0164	0.0227	0.0173
	(0.44)	(0.58)	(0.47)	(0.39)	(0.46)	(0.60)	(0.50)
Lag of (Domestic credit growth)	0.0082	0.0062	0.0095	0.0091	0.0082	0.0062	0.0099
	(1.08)	(0.81)	(1.30)	(1.22)	(1.06)	(0.79)	(1.31)
Lag of (Private credit / GDP)	0.0002	0.0011	0.0006	0.0006	-0.0011	0.0010	-0.0013
	(0.08)	(0.43)	(0.21)	(0.23)	-(0.32)	(0.33)	-(0.38)
Lag of (Cash held by banks/ Bank assets)	-0.0032	-0.0018	-0.0036	-0.0026	-0.0017	-0.0016	-0.0020
	-(0.45)	-(0.25)	-(0.51)	-(0.38)	-(0.16)	-(0.16)	-(0.20)
Lag of (Foreign liabilities / Foreign assets)	-0.0001	0.0000	0.0000	-0.0001	0.0001	0.0000	0.0001
	-(0.18)	(0.08)	-(0.08)	-(0.28)	(0.05)	-(0.02)	(0.10)
Lag of (Net capital flows / GDP)	0.0434**			0.0451**	0.0793**		
	(2.38)			(2.34)	(2.24)		
Lag of (Capital outflows/GDP)		0.1806				0.1177	
		(1.40)				(0.97)	
Lag of (Capital inflows/GDP)			0.0365				0.0957**
			(1.48)				(2.50)
Lag of (De jure peg dummy)	-1.0211***	-0.9834***	-0.9928***	-0.7246**	-0.6474	-0.9147*	-0.3975
	-(3.33)	-(3.24)	-(3.30)	-(2.00)	-(1.12)	-(1.84)	-(0.67)
Lag of (De jure peg intermediate regime dummy)				0.4949			
				(1.12)			
*Lag of (De jure peg * Terms of trade change)*					0.0045	0.0103	0.0048
					(0.18)	(0.43)	(0.19)
*Lag of (De jure peg * M2/ Reserves)*					-0.0067	-0.0006	-0.0069
					-(0.91)	-(0.08)	-(0.93)
*Lag of (De jure peg * Foreign liab. / Foreign assets)*					-0.0000	0.0000	-0.000
					-(0.04)	(0.01)	(0.00)
*Lag of (De jure peg * Cash / Assets)*					-0.0025	0.0010	-0.0029
					-(0.14)	(0.06)	-(0.17)
*Lag of (De jure peg * Net capital flows)*					-0.0584		
					-(1.48)		
*Lag of (De jure peg * Capital outflows)*						0.2380	
						(0.91)	
*Lag of (De jure peg * Capital inflows)*							-0.0972*
							-(1.89)
Number of observations	633	633	633	633	633	633	633
Pseudo R2	0.0841	0.0892	0.0790	0.0878	0.0885	0.0925	0.0863

TABLE 3: Logit Estimations for Systemic Banking Crises Using *De Facto* Classifications of Exchange Rate Regimes

This table presents coefficients and z-statistics (in parentheses) for the logit estimations of the probability of a systemic banking crisis, including two measures of de facto exchange rate regimes. The first measure is a dummy that equals one when exchange rate parities are rarely adjusted. The second measure captures those episodes when the exchange rate changed by less than 5 percent. Systemic crises are identified as in Demirguc-Kunt and Detragiache (1997). *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Including Dummy for Infrequent Parity Adjusters		Including Dummy for Exchange Rate Changes < 5%	
	All countries	Developing Countries	All countries	Developing countries
Variable	(3.1)	(3.2)	(3.3)	(3.4)
Lag of (Inflation)	-0.0025	-0.0031	-0.0021	-0.0014
	-(0.62)	-(0.52)	-(0.59)	-(0.38)
Lag of (Terms of trade change)	0.0027	0.0076	0.0072	0.0105
	(0.17)	(0.53)	(0.50)	(0.82)
Lag of (Real interest rate)	-0.0030	-0.0036	-0.0028	-0.0021
	-(0.75)	-(0.60)	-(0.73)	-(0.53)
Lag of (M2 / Reserves)	0.0039	0.0046*	0.0101***	0.0107***
	(1.45)	(1.78)	(4.31)	(4.04)
Lag of (GDP per capita)	0.0000	-0.0002	0.0000	-0.0001*
	-(1.05)	-(1.36)	-(1.50)	-(1.90)
Lag of (Real GDP growth)	0.0369	0.0468	0.0263	0.0317
	(1.08)	(1.30)	(0.74)	(0.92)
Lag of (Domestic credit growth)	0.0057	-0.0001	0.0138**	0.0117*
	(0.84)	-(0.02)	(2.08)	(1.79)
Lag of (Private credit / GDP)	-0.0065	-0.0030	-0.0018	0.0000
	-(0.83)	-(0.71)	-(0.49)	(0.01)
Lag of (Cash held by banks/ Bank assets)	-0.0038	-0.0083	0.0017	0.0008
	-(0.48)	-(0.98)	(0.29)	(0.14)
Lag of (Foreign liabilities / Foreign assets)	-0.0001	-0.0004	-0.0001	-0.0002
	-(1.36)	-(0.74)	-(1.02)	-(0.37)
Lag of (Net capital flows / GDP)	0.0563**	0.0631**	0.0522***	0.0517***
	(2.23)	(2.44)	(2.64)	(2.64)
Lag of (Dummy denoting infrequent parity adjusters)	-0.2484	-0.9146**		
	-(0.75)	-(2.53)		
Lag of (Dummy denoting exchange rate changes < 5 percent)			-0.6192**	-0.6891**
			-(2.16)	-(2.23)
Number of observations	708	456	874	614
Pseudo R2	0.0883	0.0929	0.1043	0.0945

TABLE 4: Logit Estimations Using Alternative Definitions of Banking Crises

This table presents coefficients and z-statistics (in parentheses) for the logit estimations of the probability of a banking crisis. Two measures of banking crises episodes are used. Estimations (4.1) though (4.4) examine the likelihood of systemic and non-systemic crises. Estimations (4.5) through (4.8) use the crises episodes and sample included in Glick and Hutchison (1999). *De facto* and *de jure fixed* exchange rate measures are used. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Including Systemic and Non-systemic Crises				**Including Banking Crises Episodes in Glick and Hutchison (1999)**			
	De jure peg dummy		***De facto peg dummy***		***De jure peg dummy***		***De facto peg dummy***	
	All countries	**Developing Countries**	**All countries**	**Developing Countries**	**All countries**	**Developing Countries**	**All countries**	**Developing Countries**
Variable	**(4.1)**	**(4.2)**	**(4.3)**	**(4.4)**	**(4.5)**	**(4.6)**	**(4.7)**	**(4.8)**
Lag of (Inflation)	-0.0033	-0.0038	-0.0037	-0.0042	-0.0021	-0.0039	-0.0025	-0.0038
	-(0.85)	-(0.74)	-(0.96)	-(0.72)	-(0.93)	-(0.89)	-(0.68)	-(0.68)
Lag of (Terms of trade change)	0.0102	0.0105	0.0116	0.0076	0.0070	0.0075	0.0066	0.0076
	(0.74)	(0.79)	(0.84)	(0.61)	(0.42)	(0.45)	(0.38)	(0.46)
Lag of (Real interest rate)	-0.0046	-0.0046	-0.0046	-0.0048	-0.0069	-0.0092	-0.0040	-0.0050
	-(0.80)	-(0.80)	-(0.86)	-(0.80)	-(1.24)	-(1.54)	-(0.64)	-(0.72)
Lag of (M2 / Reserves)	0.0032	0.0034	0.0091 ***	0.0038	0.0119 ***	0.0109 ***	0.0160 **	0.0136 ***
	(1.34)	(1.58)	(4.47)	(1.46)	(2.92)	(3.30)	(2.55)	(2.69)
Lag of (GDP per capita)	0.0000 **	-0.0002 ***	0.0000	-0.0002 *	0.0000	0.0000	0.0000	-0.0001
	-(2.07)	-(2.82)	-(1.53)	-(1.67)	-(1.35)	-(0.82)	(0.47)	-(0.75)
Lag of (Real GDP growth)	0.0111	0.0323	0.0250	0.0631 **	-0.0015	0.0024	0.0324	0.0627
	(0.40)	(1.11)	(0.86)	(2.08)	-(0.05)	(0.06)	(0.77)	(1.33)
Lag of (Domestic credit growth)	0.0081	0.0049	0.0083	-0.0009	0.0156 *	0.0153	0.0076	0.0035
	(1.23)	(0.75)	(1.34)	-(0.13)	(1.89)	(1.55)	(0.79)	(0.33)
Lag of (Private credit / GDP)	-0.0034	0.0008	-0.0048	-0.0024	-0.0040	-0.0008	-0.0153 **	-0.0065
	-(0.71)	(0.29)	-(0.84)	-(0.57)	-(0.87)	-(0.31)	-(1.98)	-(0.62)
Lag of (Cash held by banks / Bank assets)	0.0026	-0.0009	0.0042	0.0014	0.0068	0.0067	0.0103	0.0086
	(0.52)	-(0.15)	(0.86)	(0.21)	(1.24)	(1.16)	(1.32)	(0.98)
Lag of (Foreign liabilities / Foreign assets)	0.0001 **	-0.0004	0.0001 ***	-0.0004	0.0000	0.0000	0.0000	-0.0002
	(2.06)	-(0.85)	(2.89)	-(0.78)	(0.41)	(0.10)	(0.84)	-(0.27)
Lag of (Net capital flows / GDP)	0.0053	0.0029	0.0159	0.0278	0.0362	0.0380	0.0324	0.0316
	(0.27)	(0.14)	(0.77)	(1.00)	(1.43)	(1.42)	(0.93)	(0.89)
Lag of (De jure peg dummy)	-0.3872	-0.6551 **			-0.5242 *	-0.8250 ***		
	-(1.54)	-(2.40)			-(1.88)	-(2.65)		
Lag of (De facto peg dummy)			-0.5053 **	-0.6122 *			-0.5858	-1.1438 **
			-(2.06)	-(1.95)			-(1.57)	-(2.15)
Number of observations	903	633	874	456	700	451	551	318
Pseudo R2	0.0435	0.0594	0.0608	0.0697	0.0656	0.0711	0.0792	0.1007

Table 5: Instrumental Variable Estimations of the Likelihood of Systemic Banking Crises

This table presents the coefficients and t-statistics (in parentheses) for the instrumental variables estimations of the probability of a systemic banking crisis. Systemic crises are identified as in Demirguc-Kunt and Detragiache (1997). Country size (population) is used as an instrument for the choice of an exchange rate regime. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Including *De Jure* Peg Dummy		Including Infrequent Parity Adjusters Dummy		Including Exchange Rate Changes < 5 % Dummy	
	All countries	Developing Countries	All countries	Developing Countries	All countries	Developing Countries
Variable	**(5.1)**	**(5.2)**	**(5.3)**	**(5.4)**	**(5.5)**	**(5.6)**
Lag of (Inflation)	-0.0003	-0.0005	-0.0005	-0.0007	-0.0008	-0.0020
	-(0.64)	-(0.90)	-(1.16)	-(1.01)	-(0.96)	-(1.23)
Lag of (Terms of trade change)	0.0004	0.0006	0.0004	0.0008	0.0007	0.0014
	(0.38)	(0.55)	(0.41)	(0.69)	(0.63)	(1.16)
Lag of (Real interest rate)	-0.0005	-0.0007	0.0001	0.0001	-0.0003	-0.0004
	-(1.30)	-(1.50)	(0.20)	(0.10)	-(0.63)	-(0.63)
Lag of (M2 / Reserves)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
	(1.46)	(1.46)	(1.38)	(1.38)	(1.51)	(1.62)
Lag of (GDP per capita)	0.0000 *	0.0000 ***	0.0000	0.0000 ***	0.0000	0.0000 **
	-(1.82)	-(2.81)	-(1.35)	-(2.85)	-(1.43)	-(2.21)
Lag of (Real GDP growth)	0.0007	0.0012	0.0020	0.0026	0.0012	0.0018
	(0.32)	(0.51)	(0.86)	(0.97)	(0.56)	(0.68)
Lag of (Domestic credit growth)	0.0007	0.0005	0.0000	-0.0005	0.0009 *	0.0011
	(1.27)	(0.71)	(0.03)	-(0.68)	(1.65)	(1.48)
Lag of (Private credit / GDP)	-0.0003	-0.0002	-0.0005 *	-0.0005 **	-0.0002	-0.0001
	-(0.99)	-(0.69)	-(1.90)	-(2.28)	-(0.59)	-(0.20)
Lag of (Cash held by banks / Bank assets)	-0.0001	-0.0001	-0.0004	-0.0004	0.0001	0.0004
	-(0.36)	-(0.23)	-(0.75)	-(0.88)	(0.16)	(0.53)
Lag of (Foreign liabilities / Foreign assets)	0.0000 *	0.0000	0.0000 *	0.0000	0.0000	0.0001
	-(1.80)	(0.65)	-(1.94)	(0.43)	(0.08)	(1.34)
Lag of (Net capital flows / GDP)	0.0026 **	0.0036 **	0.0032 *	0.0042 *	0.0035 **	0.0049 **
	(2.11)	(2.36)	(1.76)	(1.87)	(2.24)	(2.16)
Lag of (Peg dummy)	-0.1087	-0.1682 **				
	-(1.63)	-(2.11)				
Lag of (Dummy denoting infrequent parity adjusters)			-0.1011	-0.1648 *		
			-(1.53)	-(1.92)		
Lag of (Dummy denoting exchange rate changes < 5 %)					-0.1499	-0.3512 *
					-(1.41)	-(1.95)
Number of observations	868	598	676	424	840	580

Table 6: OLS Estimations of the Cost of Banking Crises

This table presents the coefficients and t-statistics (in parentheses) of the OLS estimations of the cost of crises. Both systemic and non-systemic crises are included. Two measures of the cost of crises are used. The cost based on foregone output growth is calculated as the difference between the growth of ouput during crises minus output growth during tranquil periods. All macro variables are averaged over the two years prior to each crisis. *Average exchange rate flexibility* is the pre-crisis two-year average of an index that takes values between 1 (fixed) to 4 (flexible).

Variable	**Cost Based on Foregone Output Growth**				**Cost Based on Fiscal Expenses as % of GDP**			
	(6.1)	**(6.2)**	**(6.3)**	**(6.4)**	**(6.5)**	**(6.6)**	**(6.7)**	**(6.8)**
Constant	1.317	3.533 ***	-1.391	0.656	1.546	-5.825	-1.057	-11.743 **
	(0.94)	(3.07)	(1.01)	(0.36)	(0.23)	-(0.92)	-(0.18)	-(1.96)
Average inflation	0.033	0.155 ***	0.025	0.149 ***	0.046	0.036	0.046	0.007
	(1.49)	(3.66)	(1.37)	(3.50)	(0.71)	(0.21)	(0.80)	(0.04)
Average real interest rates	-0.008	-0.025	-0.018	-0.044	0.283 **	0.324	0.286 **	0.273
	-(0.25)	-(0.67)	-(0.62)	-(1.26)	(2.25)	(1.49)	(2.44)	(1.32)
Average growth of credit	0.080 *	0.069	0.064	0.065	0.156	0.439	0.147	0.405
	(1.84)	(1.05)	(1.54)	(1.14)	(0.54)	(0.88)	(0.50)	(0.83)
Average bank credit to GDP	0.040 *	0.032	0.037 *	0.029	0.152 **	0.107	0.151 **	0.098
	(1.69)	(1.12)	(1.75)	(1.27)	(2.05)	(1.13)	(2.21)	(1.13)
Average cash held by banks to bank assets	0.022	-0.136 ***	0.016	-0.140 ***	0.242 *	0.298	0.236 *	0.286
	(1.00)	-(3.18)	(0.75)	-(2.97)	(1.63)	(0.96)	(1.68)	(0.91)
Average exchange rate flexibility	-0.981 **	-1.073 **			-0.778	-2.535		
	-(2.08)	-(2.03)			-(0.45)	-(1.09)		
Forbearance		-2.562 ***		-2.453 **		10.038 *		10.321 **
		-(2.98)		-(2.48)		(1.80)		(1.95)
Liquidity support		1.070		0.914		5.130		4.798
		(1.05)		(0.86)		(0.77)		(0.76)
Government guarantee		0.240		-0.385		-2.367		-3.455
		(0.27)		-(0.35)		-(0.28)		-(0.43)
Lag of peg dummy			1.966 **	2.394 **			2.200	4.228
			(2.25)	(2.27)			(0.52)	(0.94)
Number of observations	54	24	54	24	32	25	32	25
R-squared	0.1925	0.6126	0.1937	0.6549	0.2039	0.3494	0.2079	0.3448

Table 7: Hazard Model Estimations of the Duration of Banking Crises

This table presents the coefficients and t-statistics (in parentheses) of the hazard estimations of the duration of crises. Both systemic and non-systemic crises are included. All macro variables are averaged over the two years prior to each crisis. *Average exchange rate flexibility* is the pre-crisis two-year average of an index that takes values between 1 (fixed) to 4 (flexible).

Variable	Cox Hazard Function						Weibull Hazard Function					
	(7.1)	(7.2)	(7.3)	(7.4)	(7.5)	(7.6)	(7.7)	(7.8)	(7.9)	(7.10)	(7.11)	(7.12)
Average inflation	0.017		0.017	0.001		0.017	0.053		0.032	-0.002		0.032
	(0.85)		(0.39)	(0.06)		(0.39)	(0.76)		(0.29)	-(0.02)		(0.29)
Average real interest rate	0.017		-0.010	0.001		-0.010	0.053		0.001	-0.002		-0.001
	(0.84)		-(0.22)	(0.05)		-(0.22)	(0.71)		(0.01)	-(0.03)		-(0.01)
Average credit growth	-0.029 **	-0.028	-0.034	-0.029 **	-0.028	-0.034	-0.142 ***	-0.043	-0.056	-0.128 ***	-0.041	-0.048
	-(2.25)	-(0.91)	-(0.58)	-(2.20)	-(0.96)	-(0.59)	-(3.93)	-(1.00)	-(0.17)	-(3.59)	-(1.00)	-(0.15)
Average bank credit to GDP	0.005		-0.029	0.000		-0.029	0.031		-0.048	0.013		-0.052
	(0.55)		-(0.64)	(0.02)		-(0.64)	(1.07)		-(0.11)	(0.52)		-(0.12)
Average cash to bank assets ratio	-0.011		-0.061	-0.011		-0.060	-0.022		-0.086	-0.017		-0.088
	-(1.03)		-(1.63)	-(0.98)		-(1.63)	-(0.55)		-(0.65)	-(0.46)		-(0.65)
Average exchange rate flexibility	0.025	0.045	0.021				0.573	0.148	0.215			
	(0.13)	(0.11)	(0.05)				(0.76)	(0.23)	(0.23)			
Lag of peg dummy				-0.728	-0.134	-0.079		-2.413 *		-3.488 **	-0.269	-0.363
				-(1.63)	-(0.15)	-(0.08)		-(1.61)		-(2.15)	-(0.22)	-(0.19)
Forbearance		-1.449 *	-1.205		-1.439 *	-1.204		-2.119 *	-1.896		-2.420 *	-1.894
		-(1.83)	-(1.02)		-(1.80)	-(1.03)		-(1.84)	-(0.23)		-(1.62)	-(0.22)
Liquidity support		-1.220	-0.978		-1.194	-0.963		-1.475	-2.037		-2.058 *	-1.919
		-(1.36)	-(0.88)		-(1.33)	-(0.86)		-(1.29)	-(0.35)		-(1.86)	-(0.34)
Guarantee		-0.800	-0.491		-0.798	-0.487			-0.652		-1.494	-0.686
		-(0.99)	-(0.58)		-(0.99)	-(0.58)			-(0.21)		-(1.38)	-(0.22)
Number of observations	62	22	22	62	22	22	62	22	22	62	22	22

Data Appendix

Below we list the variables and sources used for this study. The data is annual and it covers the period 1980-97.

* *Systemic banking crises dummy*: equals one during episodes identified as systemic following the criteria in Demirgüç-Kunt and Detragiache (1997)
  Source: like Demirgüç-Kunt and Detragiache (1997) we construct this variable based on Caprio and Klingebiel (1999) and Lindgren et. al (1996)
* *Inflation*: percentage change in the GDP deflator
  Source: International Monetary Fund, International Financial Statistics, line 99bir
* *Terms of Trade Change*: change in the price of exports over imports
  Source: World Bank, World Tables
* *Real Interest Rate*: Nominal interest rate minus inflation (calculated as the percentage change in the GDP deflator)
  Source: International Monetary Fund, International Financial Statistics, line 60B
* *M2:*
  Source: International Monetary Fund, International Financial Statistics, lines (34+35)
* *International Reserves*
  Source: International Monetary Fund, International Financial Statistics, line 1ld
* *GDP per capita*
  Source: World Bank, World Tables
* *Real GDP growth*:
  Source: World Bank, World Tables
* *Domestic Credit growth:*
  Source: International Monetary Fund, International Financial Statistics, line 32d
* *Private Credit/GDP:*
  Source: International Monetary Fund, International Financial Statistics, line 32d divided by line 99b
* *Cash/Assets*: Reserves of Deposit Money Banks / Assets of Deposit Money Banks
  Source: International Monetary Fund, International Financial Statistics, line 20 divided by lines (22a + 22b + 22c +22d +22f)
* *Foreign Liabilities / Foreign Assets:* deposit money banks foreign liabilities to foreign assets
  Source: International Monetary Fund, International Financial Statistics, lines (26c+26cl) divided by line 21
* *Capital Flows to GDP*: Capital Account plus Financial Account + Net Errors and Omissions
  Source: International Monetary Fund, International Financial Statistics, lines (78bcd + 78bjd + 78cad)
* *Fiscal cost of crises* (% of GDP)
  Source: Honohan and Klingebiel (2000)
* *Peg and Intermediate Regime Dummies:*
  Source: IMF classification comes from "Annual Report on Exchange Arrangements and Exchange Restrictions" (AREAER). The Intermediate Category includes the "managed" and "limited flexibility" categories.
* *Infrequet parity adjusters dummy:*
  Source: Ghosh et al. (1997).

* *Forbearance dummy*: equals one if the government extended forbearance in any of the following ways: (i)banks were left open in distress (i.e., unable to pay depositors, no access to inter-bank market,or widely believed to be insolvent for at least three months); (ii) banks were permitted to function under existing management though known to be severely undercapitalized; and (iii) regulations were relaxed or the current regulatory framework was not enforced for at least twelve months.
  Source: Honohan and Klingebiel (2000)
* *Liquidity support dummy*: equals one if the government provided substantial liquidity support to insolvent institutions.
  Source: Honohan and Klingebiel (2000)
* *Guarantee dummy*: equals one if the government offered explicit or implicit guarantees during the crisis.
  Source: Honohan and Klingebiel (2000)

Table A.1. Countries and Crises Included, 1980-97

Country Name	Crises Based on Demirgüc-Kunt and Detratgiache (1997)	Crises Based on Glick and Hutchison (1999)
Algeria	1990-1992 (systemic)	not in sample
Argentina	1980-1982 (systemic)	1980-1982
	1989-1990 (systemic)	1989-1990
	1995 (systemic)	1995-1997
Australia	1989-1992 (non-systemic)	not in sample
Austria	no crises	no crises
Bahrain	no crises	not in sample
Bangladesh	1987-1997 (systemic)	1987-1996
Belgium	no crises	no crises
Belize	no crises	not in sample
Benin	1988-1990 (systemic)	not in sample
Bhutan	no crises	not in sample
Bolivia	1986-1987 (systemic)	1986-1987
	1994-1997 (systemic)	1994-1997
Botswana	1994-1995 (non-systemic)	1994-1995
Brazil	not in sample	1990
	1994-1996 (systemic)	1994-1997
Burkina Faso	1988-1994 (systemic)	not in sample
Burundi	1994-1997 (systemic)	1994-1997
Cameroon	1987-1993 (systemic)	1987-1993
	1995-1997 (systemic)	1995-1997
Canada	1983-1985 (non-systemic)	1983-1985
Central African Republic	ongoing, entire period	not in sample
Chad	1992 (systemic)	not in sample
Chile	1981-1987 (systemic)	1981-1983
Colombia	1982-1987 (systemic)	1982-1987
Congo	1992-1997 (systemic)	not in sample
Costa Rica	1987 (systemic)	1987
	1994-1997 (non-systemic)	1994-1997
Cote d'Ivoire	1988-1991 (systemic)	not in sample
Denmark	1987-1992 (non-systemic)	1987-1992
Dominican Republic	no crises	no crises
Ecuador	not in sample	1980-1982
	1996-1997 (systemic)	1996-1997
Egypt	not in sample	1980-1985
	1991-1995 (non-systemic)	1991-1995
Finland	1991-1994 (systemic)	1991-1994
France	1994-1995 (non-systemic)	1994-1995
Gabon	1995-1997 (non-systemic)	not in sample
Gambia	1985-1992 (non-systemic)	not in sample
Germany	no crises	1978-79
Ghana	1982-1989 (systemic)	1982-1989
	1997 (systemic)	1997
Greece	1991-1995 (non-systemic)	1991-1995
Guatemala	not in sample	1991-1992
	1993-95 (systemic)	1993-95
Guinea	1985 (systemic)	not in sample
	1993-1994 (systemic)	
Guyana	1993-1995 (systemic)	not in sample
Haiti	1991-1997 (twin)	not in sample
Honduras	no crises	no crises
India	1991-1997 (systemic)	1993-1997
Indonesia	1992-1997 (systemic)	1994
		1997
Ireland	no crises	no crises
Israel	1970s-1983 (systemic)	not in sample
Italy	1990-1995 (non-systemic)	1990-1995
Jamaica	1994-1997 (systemic)	1994-1997
Japan	1992-1997 (systemic)	1992-1997
Kenya	1985-1989 (systemic)	1985-1989
	1993-1995 (systemic)	1992-1997
Korea	1997 (systemic)	1997
Lebanon	1988-1990 (systemic)	not in sample
Lesotho	1988-97 (non-systemic)	not in sample

Table A.1. Countries and Crises Included, 1980-97 (cont.)

Country Name	Crises Based on Demirgüc-Kunt and Detratgiache	Crises Based on Glick and Hutchison (1999)
Madagascar	1988 (systemic)	1988
	1991-1995 (non-systemic)	
Malaysia	1985-1988 (systemic)	1985-1988
	1997 (systemic)	1997
Mali	1987-1989 (systemic)	1987-1989
Mauritania	1984-1993	not in sample
Mexico	1981-1982 (systemic)	1981-1991
	1994-1997 (systemic)	1995-1997
Morocco	no crises	no crises
Nepal	1988-1997 (systemic)	1988-1994
Netherlands	no crises	no crises
New Zealand	1987-1990 (non-systemic)	1987-1990
Niger	1983-1997 (systemic)	not in sample
Nigeria	1991-1995 (systemic)	
	1997 (non-systemic)	1993-1997
Norway	1987-1993 (systemic)	1987-1993
Panama	1988-1989 (systemic)	1988-1989
Paraguay	1995-1997 (systemic)	1995-1997
Peru	1983-1990 (systemic)	1983-1990
Philippines	1981-1987 (systemic)	1981-1987
		1997
Portugal	no crises	1986-1989
Saudi Arabia	no crises	not in sample
Senegal	1983-1991 (systemic)	not in sample
Seychelles	no crises	not in sample
Sierra Leone	1990-1997 (systemic)	1990-1997
Singapore	no crises	1982
South Africa	1985 (systemic)	1985
		1989
Spain	70s-1985 (systemic)	70s-1985
Sri Lanka	1989-1993	not in sample
Swaziland	1995 (non-systemic)	1995
Sweden	1990-1994 (no crises)	1990-1993
Switzerland	no crises	no crises
Tanzania	1988-1997 (systemic)	1988-1994
Thailand	1983-1987 (systemic)	1983-1987
	1997 (systemic)	1997
Togo	1989-1991 (non-systemic)	not in sample
Tunisia	1991-1995 (systemic)	1991-1995
Turkey	1982-1985 (systemic)	1982-1985
	1991 (non-systemic)	1991
	1994 (non-systemic)	1994-1995
United Kingdom	1984 (non-systemic)	1984
	1991 (non-systemic)	
	1995 (non-systemic)	
United States	1980-1992 (systemic)	1981-1992
Uruguay	1981-1985 (systemic)	1981-1985
Venezuela	1994-1997 (systemic)	1993-1994