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SHIFTS: EXTERNAL FACTORS AND
EMERGING-MARKET BANKING CRISES

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Staying Afloat When the Wind Shifts: External
Factors and Emerging-Market Banking Crises
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ABSTRACT

We analyze banking crises using a panel of macroeconomic and financial data for more than one hundred developing countries from 1975 through 1992. We find that banking crises in emerging markets are strongly associated with adverse external conditions. In particular, high Northern interest rates are strongly associated with the onset of banking crises in developing countries, even after taking into account a host of internal macroeconomic factors. A one percent increase in Northern interest rates is associated with an increase in the probability of Southern banking crises of around three percent. Our results also seem insensitive to the effects of differing exchange rate regimes, external debt burdens and domestic financial structures.

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1. Introduction

Banking systems have emerged in the 1990s as the principal menace to financial stability in emerging markets, or as James Wolfensohn has referred to them, the Achilles heel of developing economies. From Mexico and Argentina to Thailand and Korea, banking crises have threatened to derail policymakers' efforts to establish a stable macroeconomic and financial environment attractive to foreign capital and conducive to growth. Systemic banking problems are no new development, of course. They feature prominently in modern explanations for the Great Depression of the 1930s, for example.¹ The tight regulations placed on banks in response to this episode put a lid on the problem after World War II. But banking crises returned with a vengeance after 1970 as the pendulum swung back toward financial liberalization. Caprio and Klingebiel (1996) list 49 banking crises in the 1970s and 1980s. Even this number pales in comparison with that for the 1990s: the same authors count 33 banking crises over the first six years of the present decade.

These problems have been anything but selective in their geographical incidence. Nearly every transition economy in Central/Eastern Europe experienced severe banking problems in the 1990s, reflecting non-performing loans to state firms inherited from the pre-transition era, continued pressure to extend credit to state and former-state enterprises, and an unstable macroeconomic environment. Banking crises reflecting the operation of many of these same factors have struck some two dozen African countries in the last decade. The problem is of long standing in Latin America, where early examples include the exceptionally severe banking crisis that erupted in Chile starting in 1981-2, an event which followed significant steps toward financial liberalization and then the sudden curtailment of capital inflows. Most recently, the tradition was kept alive by the Mexican meltdown of 1994, where financial liberalization was

again followed by a rise in the level of world interest rates and slowing capital inflows. Recently, East Asia has joined the crowd with the development of systemic banking problems in Thailand, signs of insolvency among chaebol-linked financial institutions in Korea, and nascent banking problems in Malaysia and the Philippines.²

By every measure, the cost of these episodes has been enormous. Published estimates put the budgetary cost of resolving financial crises and recapitalizing banking systems at some 10 per cent of GDP in Malaysia (1985-88), 15 per cent of GDP in Mexico (1994-97), 20 per cent of GDP in Venezuela (1994-7), 30 per cent of GDP in Chile (1981-86), and 50 per cent of GDP in Kuwait (1990-91). The macroeconomic cost has been significant as well. Most of the banking crises enumerated above were accompanied by major recessions.³ The mechanisms are well illustrated by the recent Mexican episode, where banking problems boosted the level of interest rates, leading to disintermediation and causing problems of credit stringency for small firms; many of the latter blamed the interruption of their customary bank credit lines for forcing them to curtail production and lay off workers in Mexico's post-tequila-crisis recession.⁴

Experiences such as these have prompted officials and others to seek to better understand the causes of banking crises and to draw lessons about how future crises might be averted (perhaps the most prominent recent report is by the Group of Ten, 1997). A recent survey in *The Economist* is representative; it attributed banking crises in emerging markets to four factors: macroeconomic volatility, connected (or insider) lending, government involvement which distorts the incentives facing bank management, and the failure of prudential regulation to match the pace of financial liberalization.⁵

Still, it is fair to say the lessons drawn so far are based largely on intuition and informal observation. The role of these and other determinants of banking crises remains to be

systematically documented. In particular, there is little consensus on the weight that should be attached to structural versus macroeconomic determinants of the incidence of crises, on the relative importance of domestic and international factors, and on whether the macroeconomic correlates of banking crises are properly seen as causes or consequences of financial problems.⁶

Previous studies of these questions can be counted on the fingers of one hand.

Sundararajan and Balino (1991) conclude from the experience of seven (mainly) developing economies that banking crises occur after periods of rapid economic growth and mounting imbalances in the external accounts. The onset of crisis itself tends to be associated with a sharp deceleration in the growth rate or a decline in the level of output. This result is also found by Kaminsky and Reinhart (1996) in an analysis of 20 Asian, European, Latin American and the Middle Eastern countries which experienced serious banking problems. Gavin and Hausmann (1996), in an analysis informed by Latin American experience, emphasize the development of unsustainable credit booms in the period leading up to crises. On the other hand, Caprio and Klingebiel (1997), upon broadening the analysis to a larger sample of industrial and developing countries, find no stable relationship between credit growth and banking problems.⁷ These authors emphasize instead the dangers posed by the combination of shallow financial markets, which offer little insulation from shocks, and domestic macroeconomic volatility. Comparing economies experiencing banking crises with the OECD countries in the 1960s (where the latter serve as a crisis-free control group), they find that crisis countries experienced significant greater GDP and terms-of-trade volatility in the period leading up to their crises (although they do not attempt formal statistical tests).⁸ Kaminsky and Reinhart similarly report evidence of the importance of macroeconomic factors in banking crises: in their sample of 20 crisis countries, output, the stock market and the real exchange rate peak about a year before the onset of banking

crises, with growth rates up to that point suggesting a boom in activity greater than that observed in tranquil periods; all three variables turn down subsequently. Real interest rates and bank deposits rise in the period leading up to the crisis, as if financial liberalization helps to set the stage for banking problems. In this connection, Caprio and Klingebiel suggest a role for poor supervision and regulation and for deficient bank management, although the weight that should be attached to these factors remains difficult to analyze systematically.⁹

Finally, in the paper closest to our own, Demirgüç-Kunt and Detragiache (1997) consider the determinants of banking crises in a large sample of developed and developing countries between 1980 and 1994 using a multivariate logit model. They find that low growth and high inflation make crises more likely, that high real interest rates are associated with banking problems, and deteriorating terms of trade may help set the stage for financial-sector difficulties. They construct a dummy variable for the presence of an explicit deposit insurance scheme and an index of the quality of law enforcement and find that deposit insurance and lax law enforcement both heighten the probability of banking crises.¹⁰

In this paper we build on this literature, providing a statistical analysis of the causes and consequences of banking crises in emerging markets. Our analysis departs from the work of the aforementioned authors in a number of important respects. In contrast to the Kaminsky-Reinhart, Caprio-Klingebiel and Demirgüç-Kunt-Detragiache studies, we confine our attention to developing countries on the grounds that their problems are distinctive and that it is within this group that we are most likely to find enough data variation to identify systematic effects. But we do not limit the developing countries we consider to those experiencing banking problems. To avoid problems of sample selectivity we cast our net as widely as possible, including over one hundred developing countries for which the relevant data are available. As our control group of

non-crisis cases we use not the OECD economies in the 1960s as in Caprio and Klingebiel, but rather all the developing-country observations that do not qualify as crises.¹¹ We provide formal statistical tests for differences in the behavior of the relevant macroeconomic and structural variables at a variety of leads and lags and conduct multivariate as well as univariate tests of the significance of those variables. We utilize a considerably larger sample than previous authors. And finally, we draw our measures of banking crises from the work of other authors to protect against potential problems of selectivity.

The results paint a rather different picture from that suggested by other recent quantitative studies. We find that the stage is set for banking crises by the interaction of fragilities in domestic financial structure and unpropitious global economic conditions. Our central finding is a large, highly-significant correlation between changes in industrial-country interest rates and banking crises in emerging markets. We show that Northern interest rates rise sharply and significantly (relative to their level in non-crisis control-group cases) in the year preceding the onset of banking crises, before peaking in the crisis year and the year following. This result comes through strongly in univariate and multivariate analyses and is robust to changes in specification. It points strongly to the role played by external financial conditions — and in particular to the effect of rising interest rates in worsening the access of developing-country banking systems to offshore funds, as well as in aggravating moral hazard problems -- in heightening the vulnerability of emerging economies to banking problems. The “Argentine syndrome,” in which that country experienced severe banking problems in 1995 as a result of events in world capital markets largely beyond its control, appears on the basis of our results to be quite general. There is also some evidence that the global business cycle, and OECD growth in particular, play a role in the

incidence of banking crises, with slowing growth in the advanced industrial countries being associated with the onset of crisis.

This evidence is inconsistent with the notion that domestic macroeconomic problems provide the entire explanation for banking crises. While there are signs that real overvaluation and slow output growth at home help to set the stage for banking crises, domestic developments are not the entire story.

In contrast, evidence for the view that domestic macroeconomic policies are the main source of banking-system risk is weaker. While there are some signs that real overvaluation, tight fiscal policy and slow economic growth help to set the stage for banking crises, this evidence is less robust.

Our finding of an important role for world interest rates in the onset of banking crises reinforces the conclusions of Calvo (1994), among others, who stress the potential for capital inflows (whose availability is strongly correlated with the level of industrial-country interest rates) to reduce portfolio discipline in developing-country banking systems and for increases in world interest rates to precipitate banking problems.¹² It is consistent with the emphasis of Mishkin (1996) on changes in the level of interest rates in prompting banking crises. For developing countries, where the level of interest rates is heavily influenced by the state of international financial markets, this points to the need for special measures to protect domestic financial markets and institutions and the real economy from destabilization by external variables largely beyond their control.

2. Analytical Issues

A large literature has grown up around the causes and consequences of banking crises. In this section we review that work with an eye toward issues of relevance to emerging markets. We start with a discussion of what distinguishes banking from other sectors of the economy and motivates our concern with banking crises. We then turn to an enumeration of factors popularly identified as contributing to banking crises in emerging markets.

A. What is Special About Banks?¹³

The financial-services industry, and banking in particular, is different from other industries. The business of banks is providing liquidity-transformation services. Because they exploit economies of scale, they have a comparative advantage in the provision of such services -- in other words, they are better able to make illiquid investments than the typical household or firm. Scale allows them to accept deposits from diverse households, all of which are unlikely to experience exceptional demands for liquidity simultaneously and force the bank's investments to be liquidated at a loss.¹⁴ In addition, banks can exploit economies of scale and scope in assessing repayment capacity and monitoring the behavior of borrowers. Recent models demonstrate how savers may wish to delegate to banks responsibility for screening and monitoring.

From our perspective, that banks provide liquidity-transformation services in an environment of asymmetric information has three important implications.

First, banking crises have macroeconomic effects. If banks are relatively efficient at overcoming information asymmetries through monitoring or can reduce lending risks through portfolio diversification, disruptions to their operation will show up in the wedge between the return to lenders and the cost to borrowers. In turn, increases in that wedge will have an impact

on the level of economic activity through what is known as the credit channel of monetary policy.¹⁵

Empirical studies of banking crises have documented that these events can have a significant impact on the real economy even after controlling for changes in the money multiplier and other sources of macroeconomic variability. Grossman (1993) and Eichengreen and Grossman (1997) document that bank failures contributed significantly to the American business cycle before 1913 even after controlling for their impact on money and interest rates. Bernanke (1983) and Bernanke and James (1991) provide evidence for the U.S. and international economies that the nonmonetary consequences of bank failures played a major role in the Great Depression.

The second implication of our framework is that banks are fragile. The fact that banks' assets are less liquid than their liabilities renders their financial condition delicate and confidence essential to their stability. If confidence wanes for any reason, the withdrawal of deposits can render banks unable to meet their obligations. And the sequential-service constraint under which banks operate (demands for funds are met on a first-come, first-served basis) gives creditors an incentive to liquidate their deposits at the first sign of trouble.¹⁶ Insofar as bank portfolios are linked together by the interbank market, withdrawals from one bank can undermine the liquidity of others and lead to a generalized crisis.

Because banks operate in an environment of asymmetric information, their fragility is likely to be heightened by the operation of adverse selection. Under asymmetric information, borrowers with low-risk projects will be rationed out of the market by the price mechanism (since only those with high risk projects will be prepared to pay high interest rates). By making it more likely that loans will be made to poor credit risks and to lenders whose own solvency is vulnerable to changing economic conditions, adverse selection can heighten banks' vulnerability

to problems (Mishkin 1991). A further implication of asymmetric information is the scope it provides for moral hazard. One illustration, with obvious implications for banking crises, is gambling-for-redemption behavior, in which borrowers who see their financial condition worsening “double up their bets” -- that is, engage in even riskier behavior in a desperate effort to generate cash.

The third implication is that owing to the opacity of their loan portfolios, banks will find it more difficult than non-financial firms to raise the liquidity needed to restructure (Simons and Cross 1991), increasing the likelihood that adverse shocks will result in failure.

Each of these characteristics of banks is likely to be particularly prevalent in emerging markets. In particular, the information and liquidity structure that makes banks distinctive is likely to be pronounced. Households on the margin of subsistence will attach particular value to the liquidity of their savings. Reluctant to fund long-term investments themselves, they will rely on the liquidity-transformation services of banks and other financial institutions. Financial disclosure and reporting standards being relatively primitive in developing economies, the information asymmetries that create a role for banks as delegated monitors and assemblers of information are likely to be particularly acute. Banks account for a larger share of the total assets of financial institutions in developing than advanced-industrial countries. Correspondingly, a banking crisis which disrupts the supply of intermediation services can have a particularly devastating impact on economic activity.

B. Causes of Banking Crises in Emerging Markets¹⁷

The factors emphasized in earlier discussions of banking crises in emerging markets can be grouped under five headings: domestic macroeconomic policies, external macroeconomic

conditions, the exchange rate regime, domestic financial structure, and problems of supervision and regulation.¹⁸

Domestic macroeconomic policies

Many accounts stress the role of macroeconomic policies in promoting rapid increases in bank lending which create trouble when they come to an end. The typical sequence runs as follows.¹⁹ Expansionary monetary and fiscal policies fuel a lending boom which drives up equity and real-estate prices as banks increase their commitments to securities brokers and the property market. Eventually it becomes necessary to tighten monetary policy to contain inflation, pricking the bubble. Individuals who borrowed from the banks to purchase and develop real estate or to speculate in securities find themselves unable to repay, saddling the banks with nonperforming loans that threaten their solvency.²⁰ Banks curtail their lending in response to the decline in the value of collateral caused by the collapse of equity and real estate prices, which further aggravates the problem of credit stringency depressing property and securities markets.

Thus, this school of thought points to the stance of monetary and fiscal policies (which typically swing from sharply expansionary to sharply contractionary) as the underlying determinant of financial booms and busts, to the expansion of bank credit as fuel for the flames, and to recession, credit stringency, and falling asset prices as the proximate factors precipitating the crisis. Insofar as banks provide a disproportionate share of intermediation services in developing countries and, historically, their monetary and fiscal policies have been relatively volatile, one would expect this constellation of factors to be particularly prominent in emerging markets.

External economic conditions

A distinct but related set of explanations emphasizes the role of external conditions. Shocks to the terms of trade can be of major importance to the profitability of domestic enterprise; a deterioration in export prices can render commodity exporters incapable of discharging their debts.²¹ Small countries with low levels of export diversification are particularly susceptible to terms-of-trade shocks capable of destabilizing the banking system. Unanticipated changes in the real exchange rate (the relative price of traded and nontraded goods), whether caused by shifts in domestic or foreign economic policies, can similarly leave banks' customers unable to service their obligations.

A large literature (viz. Calvo, Leiderman and Reinhart, 1993) documents the sensitivity of capital flows to changes in the level of world interest rates. Not only does a decline in industrial-country interest rates prod investors in money centers to search for higher yields abroad, but it increases the creditworthiness of indebted countries by reducing the cost of servicing short-term and variable-rate debts (Eichengreen and Fishlow 1996). Thus, a sudden rise in the level of interest rates can curtail the inflow of foreign funds and make trouble for the banks. Banks in developing countries have a disproportionate tendency to fund themselves offshore, offering relatively high returns to attract foreign deposits. For them a rise in foreign interest rates means a sudden fall in the level or growth of their funding. As the rise in rates is passed through to domestic borrowers, the latter develop problems repaying. Moreover, higher rates can aggravate agency problems by reducing franchise value (the present value of future profits). They can reduce the average quality of bank liabilities by aggravating adverse selection, thereby heightening failure risk.²²

The Exchange Rate Regime

The exchange rate, being the relative price of different national currencies, does not fit neatly into either the domestic or external category.²³ One strand of thought highlights the association between pegged rates and surges in capital inflows. An increasingly prevalent view is that pegged rates are positively associated with banking crises since the problems associated with dependence on foreign capital emphasized in the preceding paragraph will be most pronounced in countries operating a pegged-rate regime. Allowing the exchange rate to fluctuate and thereby introducing an element of exchange risk will tend to moderate capital inflows and minimize problems for the banking system.

The opposing view is that pegged exchange rates are negatively associated with banking crises because they discipline erratic policymakers. If erratic aggregate demand policies at home are at the root of problems in the banking system, then an exchange rate commitment can constrain policymakers' erratic tendencies and share domestic demand shocks with the rest of the world. The danger that the country's international reserves will be depleted and the currency peg will be jeopardized prevents policies conducive to the development of a domestic credit boom with the capacity to bring down the banking system from getting out of hand. The lending booms that are the ultimate source of banking problems should thereby be attenuated. And constraints on lender-of-last-resort activities ameliorate otherwise worrisome problems of moral hazard.

It will be evident that this debate is a particular instance of the general textbook point that flexible exchange rates are preferable when disturbances are foreign, while pegged rates are preferred when shocks are domestic. Thus, when threats to the stability of the banking system take the form of changes in world interest rates that make it more difficult for banks to fund themselves offshore, there will be a case for exchange rate flexibility to discourage the banks

from relying excessively on external sources of finance. Conversely, when the main threats to the stability of the banking system emanate from monetary and fiscal policies at home, there will be an argument for pegging the exchange rate to discipline domestic policies and vent domestic shocks via the external sector.

The other potential source of association between pegged exchange rates and banking crises derives from limits on the authorities' capacity to engage in lender-of-last-resort operations. Central banks can support troubled banks by injecting liquidity into the economy, making it easier for depository institutions to borrow on the interbank market or to discount with the central bank itself.

But supporting an exchange rate peg requires limiting the provision of liquidity to the economy. There may be one level of central bank credit consistent with exchange rate stability but another needed to prevent the collapse of distressed financial institutions. Injecting credit into the financial system may therefore undermine confidence in the currency peg and provoke a balance-of-payments crisis, deterring the central bank from aiding the banks.

Diamond and Dybvig (1984) show how the knowledge that the authorities stand ready to support distressed banks effectively removes the incentive for depositors to run on weak institutions. It follows that an exchange rate peg that prevents lender-of-last-resort operations can encourage bank runs and financial panics. Again, there is an opposing point of view, that the existence of a lender-of-last resort encourages bankers to take additional risks since they know that the authorities stand ready to bail them out, a fact which only increases the likelihood that a crisis will eventuate.

Domestic Financial Structure

The structure of their balance sheets can influence the susceptibility of banks to both internal and external shocks. The implications of foreign funding for sensitivity to world interest rate shocks has already been noted.²⁴ In addition, devoting a disproportionate share of the loan portfolio to firms in the export sector can heighten vulnerability to terms-of-trade fluctuations, while carrying a disproportionate share of real-estate loans can magnify real exchange rate risk. Currency mismatch, when banks borrow in foreign currency but denominate their loans in domestic currency, can create problems when the exchange rate depreciates, since a given stream of domestic-currency-denominated interest earnings will finance less foreign-currency-denominated debt service. Passing exchange risk through to the ultimate borrower may not help; insofar as the revenues of the latter still depend on the exchange rate, devaluation can precipitate loan default.

Maturity mismatch (when banks' assets are longer term than their liabilities) can pose problems when shocks precipitate a loss of confidence. Maturity transformation, as noted above, is the banking system's *raison d'être*. But the larger are shocks to the economy, the less the maturity mismatch that will be consistent with financial stability. This suggests that banks in developing countries, where the economy is volatile, should match the maturity of their assets and liabilities relatively closely; in practice, however, the opposite tends to be true. Banks in emerging markets typically have poor access to long-term funding; compared to the advanced industrial countries, the average length of their liabilities is much shorter to maturity.²⁵

Finally, a number of authors (*viz.* Calvo 1996; Sachs, Tornell and Velasco 1995) have emphasized, with Mexican experience in mind, the connection between the structure of a country's external obligations and the stability of its banks. The crisis in Mexico, according to these authors, was aggravated by the fact that the authorities had issued large quantities of short-

term, foreign-currency-indexed debt. The stock of such obligations greatly exceeded the central bank's reserves of foreign exchange. When investors refused to roll over these assets in 1994 and 1995, the government was forced to jack up interest rates to lure them back and defend its international reserves. The high interest rates, credit stringency and recession that followed had predictably devastating effects on the banks. The implication is that countries with large amounts of short-term debt, variable-rate debt, foreign-currency-denominated debt, and foreign debt flowing through depository institutions are likely to be particularly prone to banking crises.

Problems of Supervision and Regulation

A final group of factors contributing to banking crises falls under the heading "problems of supervision and regulation." Often these problems arise in the aftermath of financial liberalization when banks are freed to enter new lines of business and make new, unfamiliar investments.²⁶ The removal of controls on lending and offshore borrowing may prompt a sudden expansion of business. If banks have inadequate trained personnel to evaluate the risks of the increase in their lending, the quality of their asset portfolios will decline. If they engage in connected lending (loans go mainly to influential insiders), more resources for the banks only adds risk and worsens the allocation of funds. Financial liberalization thus places a premium on sound supervision and regulation while at the same time straining the capacity of regulators to carry out their tasks.

Flaws in the regulatory structure will be especially damaging where market discipline is weak. And market discipline will be least effective where there are defects in the accounting, disclosure and legal frameworks for banking. Banks will be able to disguise loan losses, announcement of which typically requires management to take corrective action. They will

overstate income and disguise the extent of their financial difficulties until it is too late. Thus, where accounting and disclosure are inadequate, neither regulators nor shareholders will be able to effectively discipline management.²⁷

Finally, there is the possibility that government supervision and regulation are themselves a source of perverse incentives. Managers of state banks are unusually susceptible to political pressures to engage in directed lending; if supervisors see the allocation of loans as a device for furthering certain political objectives rather than maximizing the return on bank capital, problems of bank insolvency and illiquidity can result.²⁸ A deposit insurance scheme in conjunction with a regulator who subscribes to the “too-big-to-fail” principle will encourage bank management to assume excessive risk and relieve customers and shareholders of all incentive to monitor its behavior.

Clearly, there is no shortage of potential explanations for banking crises in emerging markets. The issue is the generality and predictive power of these explanations. It is to this question that we now turn.

3. Data and Methodology

The most important methodological decision for any study of banking crises is dating the crises themselves. It is revealing of the difficulty of this task that a number of otherwise admirable studies avoid explicitly addressing this problem, analyzing banking crises without defining them. But a few previous studies have tackled the issue head on. Examples include Bordo (1985, 1986), who defines a banking crisis as a situation where actual or incipient bank runs or failures lead banks to suspend the internal convertibility of their liabilities. Caprio and

Klingebiel (1996) define a systemic banking crisis as an instance in which bank failures or suspensions lead to the exhaustion of much or all of bank capital.²⁹

Inevitably there is an element of judgement in any attempt to identify banking crises. To protect our analysis from the danger of picking crises consistent with our own priors of how they are correlated with macroeconomic and structural variables, we employ the list developed by Caprio and Klingebiel, which is the most comprehensive attempt to date to identify and date the incidence of banking problems. These authors identify crises of various degrees of intensity in 69 countries, forming their judgement of the extent of the problem and the impact on net bank capital on the basis of both official published data and the opinion of country experts. We use only one observation for each banking crisis identified by Caprio and Klingebiel, namely the year that the crisis began.³⁰

While Caprio and Klingebiel provide data on banking crises for both developing and advanced industrial countries, we limit our analysis to their developing-country subsample. There may be good grounds for thinking that banking problems in developing and advanced industrial countries respond to some of the same determinants, but there are also reasons to anticipate differences between the two subsamples.³¹ Banks account for a larger share of the total assets of financial institutions in developing than advanced-industrial countries; developing countries also have systematically smaller financial structures than developed countries. The length of bank liabilities is typically shorter to maturity. Supervisory and regulatory structures are less articulated in developing countries. The susceptibility of banking systems to shocks to the terms of trade is likely to be greater in developing countries, where opportunities to hedge terms-of-trade risk are fewer. Developing countries, moreover, are exceptionally susceptible to changing international financial conditions.

We supplement this indicator of banking problems with the macroeconomic and financial data set employed by Frankel and Rose (1996). This is extracted from the 1994 World Data CD-ROM, and consists of annual observations from 1975 through 1992 for one hundred and five countries.³²

Our analysis focuses on nine key variables of interest. These are intended to capture the macroeconomic environment of the country in as comprehensive and succinct a fashion as possible.

Four of our variables are “international” in nature and measure the size of international reserves, external debt, the current account, and the degree of exchange rate over-valuation. Reserves are expressed as a percentage of monthly imports; external debt and the current account surplus (+) or deficit (-) are both expressed as percentages of GDP. We measure the real exchange rate by adjusting the nominal exchange rate for domestic and foreign GDP price levels, and then normalizing the level of the resulting ratio over time on a country by country basis.

We also examine key “domestic” macroeconomic indicators, including broad measures of fiscal and monetary policy and the state of the business cycle. We measure these variables using the government budget surplus (+) or deficit (-) (again expressed as a percentage of GDP), domestic credit growth; and the growth rate of GDP per capita.

Finally, we include two “external” variables, the growth rate of real GDP in the OECD, and “Northern” interest rates. We construct the latter as the weighted average of short-term rates for the United States, Germany, Japan, France, the United Kingdom and Switzerland; the weights are proportional to the fractions of debt denominated in the relevant currencies.

Throughout, we rely on the “event study” methodology of Eichengreen, Rose and Wyplosz (1996). We start by dividing the sample into country-year observations with banking

crises, as identified by Caprio and Klingebiel (using only the first year of a banking crisis if it is more than one year in length). We then construct two-sided, three-year “exclusion windows” around each crisis observation to avoid double-counting. This is important given the observed persistence of banking crises. These procedures yield a total of 39 banking crises. In addition, there are 1600 observations which are not crises and do not fall into our exclusion window; we use these as our control sample of tranquil observations.

4. Results

We begin our analysis with a graphical examination of macroeconomic conditions in the periods surrounding the onset of banking crises. We then proceed to a multivariate analysis of these variables, before focusing to the roles of the exchange rate regime, external indebtedness and the structure of the financial sector’s balance sheet.

In the panels of Figure 1, we plot the behavior of our nine macroeconomic and financial variables at the onset of 39 developing country banking crises, as well as in the three years preceding and three years following these crises.³³ Consider the foreign interest rate, portrayed in the top-left panel. The vertical center bar marks the year when the banking crises began. The circled observation indicates that the average Northern interest rate for countries experiencing a banking crisis was around twelve percent; the lines above and below this indicate that the +/- two standard deviation confidence interval is approximately (11%,13%). The average interest rate during periods of tranquility (i.e., for countries which did not suffer a banking crisis within a window of plus/minus three years) is marked with a horizontal line and lies below this confidence interval at the crisis onset. The behavior of foreign interest rates in the three years preceding the crisis is portrayed to the left of the vertical bar; the period after to the right. The other panels

portray the eight other variables of interest to us. Note that the precise number of observations may differ across panels as a function of the availability of data.

By far the most striking variable is foreign interest rates. From essentially the same level as in tranquil periods three years before the onset of a banking crisis, foreign interest rates rise to significantly higher levels as the crisis approaches; the differential peaks in the year of the crisis and the year following, although it remains significantly higher for a second subsequent year before returning to non-crisis levels. There is a clear presumption, then, that global financial conditions play a role in developing-country banking crises. Our other measure of external conditions, the OECD growth rate, also indicates adverse external conditions, but less dramatically so: northern growth decelerates in the periods leading up to banking crises but from a slightly above-average level; it falls significantly below “normal” levels only in the periods after the onset of banking crises.

A second striking finding is the slight or perverse importance of our four “international” factors. While external debt rises throughout the periods surrounding banking crises, levels remain broadly similar to those in tranquil periods. The level of international reserves is also insignificantly different across crisis and non-crisis periods. Even more surprisingly, exchange rates appear to be under-rather than over-valued, and (consistent with the former observation) current accounts deficits are actually smaller than in periods of tranquility. Thus, it is striking that a variety of high-profile indicators of the stance of international economic policies do not appear to matter in the expected way for the incidence of banking crises.

Nor do most standard measures of domestic macroeconomic conditions differ significantly (at the 95 per cent confidence level) between crisis and non-crisis observations. Domestic output growth, while also decelerating over the period surrounding banking crises, does not differ

significantly in the period leading up to the crisis relative to the control cases. There is, however, clear evidence of a recession one year following the event. More surprisingly, the typical post-banking-crisis recession appears to be relatively short lived; by the second post-crisis year, there is no longer evidence of a statistically-significant recessionary effect. Finally, our measures of fiscal and monetary policy behave no differently in crisis and non-crisis cases. While the means of the variables are consistent with the hypotheses of relatively rapid domestic credit growth in the period leading up to banking crises, we cannot reject the hypothesis, at standard levels of statistical significance, that these variables behave the same as in non-crisis cases. Fiscal policy is, if anything, unusually tight at the time of banking crises.

All in all, our graphical analysis indicates that external factors are adverse during periods of Southern banking crises and significantly so. Northern interest rates tend to be high when banking crises break out in developing countries; the North tends also to be in recession. There is much less evidence that macroeconomic conditions in the South vary systematically between periods of tranquility and banking crises. Neither “international” factors (external debt, the current account, reserves and the exchange rate level) nor “domestic” conditions (domestic growth, monetary and fiscal policy) appear to differ in easily identifiable ways between crisis and non-crisis periods.

These comparisons contrast the behavior of variables in crisis and non-crisis periods one at a time. A more demanding test involves estimating a multivariate model. We therefore turn to probit analysis, considering groups of variables and asking whether their joint behavior differs between crises and periods of tranquility. We estimate our models with maximum likelihood.

Various statistical measures suggest that goodness of fit is best when observations are weighted by GNP per capita; such weighting will also tend to minimize the influence of lower-

quality data from poorer countries.³⁴ We refer to these GDP-weighted regressions as our baseline results, although we also report the unweighted regressions for completeness.³⁵

Our benchmark regression is in the first column of Table 1. As independent variables we include the nine variables portrayed in Figure 1: the foreign interest rate, the change in OECD output, the change in domestic output, the change in domestic credit, the budget as a share of GDP, exchange rate overvaluation, the current account as a share of GDP, the ratio of reserves to imports, and the debt/GDP ratio. Since probit coefficients are not easily interpretable, we report the effects of changes in regressors on the probability of crisis (expressed in percentage points), evaluated at the mean of the variables. We also tabulate the associated z-statistics which test the null hypothesis of no effect. Diagnostics follow at the bottom of the table, including joint hypothesis tests for the significance of our four “international,” three “domestic,” and two “external” effects.

The majority of our variables enter with plausible signs and coefficients that differ from zero at standard levels of confidence. In particular, industrial-country interest rates enter positively (confirming that higher world interest rates are associated with a higher probability of emerging-market banking crises). OECD growth enters negatively, as recession in the industrial world is also associated with banking problems in emerging-markets. The two coefficients are jointly significant. Thus, the importance of global financial and economic conditions evident in the univariate results is affirmed and if anything strengthened by this multivariate analysis.

The negative coefficient on output growth indicates that slowing growth at home tends to be associated with banking crises, presumably reflecting the lesser ability of bank borrowers to service their loans. These results are thus consistent with the emphasis of Gavin and Hausmann, Gorton and others on slowing growth as a causal factor in banking crises, although as we shall see

below this effect is not as robust as some other findings. Real overvaluation is significantly associated with the incidence of banking crises, perhaps reflecting a profitability squeeze on domestic borrowers or anticipating a subsequent step devaluation. Surprisingly, there is some evidence that, in this sample, larger government budget surpluses are associated with the probability of banking crises.³⁶

The coefficients on the other variables are less robust or less plausible. Countries with higher ratios of external debt to output may be more prone to banking crises, since their banks are more dependent on foreign funding, but the coefficient on this variable falls short of significance at the ten per cent confidence level. The coefficients on the current account and domestic credit growth are insignificantly different from zero; this result for credit growth is striking given the emphasis placed by Gavin and Hausmann (1996) and Kaminsky and Reinhart (1996) on this variable. The ratio of international reserves to imports enters with a counterintuitive positive sign; one would anticipate a negative coefficient if additional reserves allow the authorities to engage in more extensive lender-of-last-resort operations.³⁷

The remaining columns of Table 1 report various exercises in sensitivity analysis. In the unweighted regression in the second column, the only effects that are statistically significant at standard confidence levels are the foreign interest rate, the domestic budget deficit, and the debt/GNP ratio. The third column is predictive in that the dependent variable is led by a year; the fourth column drops the observations for the 1970s. Neither of the last two perturbations substantially change the impression from our baseline regressions. Throughout, the role of external factors – particularly Northern interest rates – remains economically important and statistically significant.

A. The Role of the Exchange Rate Regime

As noted above, considerable controversy surrounds the question of how the exchange rate regime affects the incidence of banking crises. To analyze this question we utilize data from *International Financial Statistics* on countries' choice of exchange rate regime. Ghosh et al. (1996) have aggregated IFS's more detailed tabulation into three categories: "fixed" rate regimes (countries pegging to a single foreign currency, to a basket, or to the SDR), floating rate regimes, and "intermediate" exchange rate regimes (typically managed floaters). To check the robustness of our results, we also add a composite fourth category of "managed" exchange rate flexibility when a country is either "fixed" or "intermediate."

We first examine the simple correlation -- the unconditional probability of a banking crisis under fixed and flexible exchange rates. The results are far from promising. When we split the banking crises and periods of tranquility into our three exchange rate regimes (fixed/intermediate/floating), there is only very weak evidence against the hypothesis that banking crises are randomly distributed across regimes. A formal chi-squared test of independence only rejects at the 4% significance level, as shown in the contingency table below.

	Fixed	Intermediate	Floating	Total
Tranquil	528	62	69	659
Banking Crisis	15	4	6	25
Total	543	66	75	684

A careful test should account for other macroeconomic factors. We examined whether there is a partial correlation between pegged exchange rates and banking crises after controlling

for macroeconomic variables included in our baseline regression -- either the positive correlation predicted by those who associate pegged rates with constraints on the lender of last resort, or the negative correlation predicted by those who associate pegged rates with discipline and hence with a more stable expected future path for macroeconomic fundamentals. The results, in Table 2, provide little ammunition for either view. The dummy variables for countries with pegged and intermediate exchange rate regimes enters with coefficients indistinguishable from zero whether they are entered separately or together. This negative result is insensitive to minor changes in the way that we estimate the equation. For instance, the second column reports results when we exclude the intermediate regime observations from the sample; and the third column is an analog with the managed regime composite in place of both fixed and intermediate dummies.³⁸

To test the hypothesis (anticipated in Section 2 above) that pegged rates are preferable when disturbances are domestic, flexible rates when disturbances are external, we interacted our dummy variables for pegged and intermediate exchange rate regimes with our measures of external shocks (alternatively, foreign interest rates and the OECD growth rate).³⁹ In no case did any of the individual coefficients approach significance at standard confidence levels. And in no case did the group of regime dummies and interaction terms achieve joint significance at even the 90 per cent confidence level.

It could be that a country's declared exchange rate arrangement is a poor proxy for the actual stability of its exchange rate. Therefore, we also considered three measures of the actual stability or variability of the nominal rate. Results are reported in Table 3. In the first column we include the measure of an exchange rate crash utilized in Frankel and Rose (1996): an exchange rate crash is a nominal depreciation of at least 25 per cent that is also at least a ten per cent increase in the rate of depreciation over the previous period. Like the IFS measure of regime, the

currency crash dummy has a statistically insignificant impact on the probability of a banking crisis.⁴⁰

In addition, we constructed two alternative measures of the variability of the actual rate, one a dummy variable for cases where the exchange rate changed by less than 5 per cent in the last year, the other an otherwise comparable dummy with a 10 per cent variability cutoff. Both of these variables entered negatively and significantly, as if countries whose currencies were relatively stable were least prone to banking crises. These coefficients cannot reflect the effect of, say, faster domestic credit growth or larger budget deficits in such countries, since we are already controlling for these effects; rather, they presumably reflect the tendency for expectations about future policy to work in stabilizing directions where the authorities commit to stabilizing the exchange rate.

Thus, while the results are largely negative, they lend more support to the discipline than the lender-of-last-resort view.

B. The Role of External Debt

Sachs, Tornell and Velasco (1996) posit an association between the structure of the external debt and the stability of the financial system. Countries with large amounts of short-term, variable-rate, foreign-currency-denominated debt, are, in their view, especially prone to exchange rate crises. The fact or anticipation of a currency crisis can lead to an investor run as depositors scramble to get their money out of domestic banks and can force the government to jack up interest rates in order to lure back skittish investors, creating a problem of nonperforming loans.

To test this hypothesis we extended our graphical analysis of macroeconomic conditions in the periods surrounding the onset of banking crises. The nine panels of Figure 2 show the evolution, in the periods surrounding banking crises (and the comparable control group cases), of the following measures of the structure of the external debt: the share of commercial bank debt in the total, the share of concessional debt in the total, the share of variable rate debt in the total, the share of public debt in the total, the share of short-term debt in the total, the share of multilateral rate debt in the total, the share of FDI in the total, the overall debt/GDP ratio, and the interest payment/GDP ratio.

A number of these measures of debt structure behave differently in the periods surrounding banking crises. These include the debt flowing through the banking system, variable-rate debt, and short-term debt. All are significantly higher in periods leading up to banking crises than in control group cases, consistent with the motivating hypothesis.

When we add all of the aforementioned measures of debt structure to our baseline specification, as in the first column of Table 4, they are highly significant as a group. The relevant χ^2 test rejects the null of zero coefficients for the group at better than the 95 per cent confidence level. But only three of the individual debt structure variables enter with individual coefficients that differ from zero at the 95 per cent confidence level: the share of multilateral debt, the share of concessional debt, and the share of short-term debt. Only the last of this trio is central to the debt-runs-cause-bank-runs hypothesis, and it enters with a negative coefficient inconsistent with that tale. The other variables central to the hypothesis -- the share of debt flowing through the banks, which should render the banking system more fragile, *ceteris paribus*, or the share of DFI, which should be less volatile than other forms of external debt and hence less

conducive to banking crises -- enter with their anticipated signs but do not approach significance at standard confidence levels.

To be sure, the various measures of the structure of the external debt considered in this analysis are highly collinear, rendering individual point estimates and confidence intervals unreliable. Perhaps the best conclusion is a cautious one: there is evidence that the structure of the external debt matters for banking crises, even after controlling for a country's other macroeconomic fundamentals, but whether the channels are those posited in the Sachs-Tornell-Velasco debt run story is less clear.

C. The Role of Domestic Financial Structure

A final possibility to be explored is that a fragile domestic financial structure is conducive to banking crises. While this hypothesis has intuitive appeal, there are difficulties in measuring financial fragility in ways that are internationally comparable. Countries do not report loan losses or loan-loss provisioning systematically. The difficulty of obtaining data on such variables was an issue when the IMF sought to assemble a rescue package for Thailand in 1997, which led to U.S. government proposals that countries commit to releasing such information in a timely fashion.

We follow Demirgüç-Kunt and Detragiache in attempting to measure domestic financial fragility or vulnerability indirectly. We construct three measures: the ratio of M2 to reserves (an increase in which tends to follow financial liberalization, heightening financial fragility if bank supervision and regulation does not keep up with the growth of bank lending), a measure of the liquidity of the banking system (bank reserves as a share of bank assets), and the proportion of

bank lending directed to the public sector (which may proxy for the extent of connected lending). All three variables are constructed from data in IFS.

When added to our default regression, none of the three variables enters with a coefficient significantly different from zero at standard confidence levels. M2 relative to reserves comes closest: it enters with a positive coefficient, as predicted, but differs from zero only at the 80 per cent confidence level.

We interacted these three measures of domestic financial structure with the foreign interest rate in an effort to test more directly whether increases in world interest rates precipitate crises mainly when they are superimposed on a fragile financial structure. The interaction terms turned out to be insignificant individually and as a group.

Thus, we find little evidence that accessible measures of domestic financial fragility are useful for predicting banking crises. Admittedly, this may tell us more about the limitations of the data than about the validity of the underlying economic hypothesis.

5. Conclusions and Implications

The results of this paper confirm that banking crises in emerging markets tend to occur in response to a conjuncture of unfavorable developments in domestic and international markets. Domestic imbalances play a role in crises; specifically, our results point to the importance of overvalued real exchange rates and slowing output growth. On the other hand, there is little evidence of an independent role for domestic credit booms of the sort emphasized by Gavin and Hausmann (1996) and Kaminsky and Reinhart (1996). But by far our strongest finding is of the role of changes in global financial conditions, and specifically of rising industrial-country interest rates in precipitating banking crises. Insofar as our regressions have predictive implications, they

suggest the following. Look first for countries with overvalued exchange rates and disappointing output growth, for their banks are most likely to be saddled with nonperforming loans. Look then for rise in interest rates in the principal financial centers, for this will disrupt the availability of offshore funding for the banks and cause the smoldering crisis to finally burst into flames.

The ultimate test of any such model is its out-of-sample predictive power. For this purpose we can make use of the wave of banking crises that hit East Asia in the second half of 1997. In our estimation, this episode is consistent with our results, although the fit is not exceptionally good. Thailand, the first country to be so affected, did in fact develop a problem of significant real overvaluation in the period leading up to its crisis. The rate of growth of real GDP decelerated sharply after 1995. And in the first part of 1997, there was a significant tightening in global financial conditions resulting from a sudden rise in Japanese bond yields and the sharp rebound in the yen, which reduced the attractiveness of borrowing in Japan to finance investments in high-yielding markets elsewhere and signaled the possibility of more difficult financing conditions for emerging market borrowers.⁴¹ But compared to the earlier experience we analyze, one would say that in Thailand the domestic imbalances were more pronounced, the tightening in global financial conditions somewhat less so.

Other cases like Indonesia and South Korea are more difficult to still to reconcile with our results. The evidence of real overvaluation and slower output growth is less impressive than in Thailand. And the evidence of an external funding shock is no greater. To be sure, there were a variety of subtler but nonetheless profound problems in the banking and corporate sectors of both countries, of a sort not easily captured by macroeconomic variables like those analyzed here. We suspect that there was a role in addition for the contagious spread of crises across countries. In previous work on foreign exchange crises (Eichengreen, Rose and Wyplosz 1996), we established

that a currency crisis in another country increased the probability that a neighboring country would experience a currency crisis of its own by fully 8 per cent. We conjecture that similar spillovers operate in banking markets.

The policy implications are clear. Insofar as banking systems in emerging markets are unusually dependent on offshore funds and susceptible to destabilization by sudden changes in global credit conditions, standard levels of regulatory and macroeconomic prudence may not be enough to insulate them from banking crises. The prudential requirements used by high-income countries use to protect their banking systems from domestic sources of instability may have to be supplemented in developing countries by an extra layer of insulation to protect their banking systems against externally-generated or amplified disturbances. Examples of the kind of measures we have in mind include limiting the short-term, foreign-currency-denominated liabilities of banks, adjusting domestic reserve and liquidity requirements to prevent an elastic supply of foreign funds from encouraging an excessive expansion of cyclically-sensitive loans, and requiring developing-country banks to meet even more demanding capital standards than their industrial-country counterparts.

More work will be needed to extend the sample to the advanced industrial countries and to determine whether the effects we have identified, notably the impact of global financial and economic conditions, have their largest impact on financial stability in emerging markets, independent of the domestic financial structures. But the evidence we have presented is at least consistent with this presumption. If borne out, this conclusion provides support for the increasingly widespread view that banking systems in emerging markets, owing to their special susceptibility to crisis, for reasons beyond those of their own making, need to be protected by prudential regulations and capital and liquidity requirements even more demanding than those of

the advanced industrial countries.

References

- Bernanke, Ben (1983), "Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression," *American Economic Review* 73, pp.257-276.
- Bernanke, Ben and Alan Blinder (1988), "Credit, Money and Aggregate Demand," *American Economic Review* 78, pp.435-439.
- Bernanke, Ben and Alan Blinder (1992), "The Federal Funds rate and the Channels of Monetary Transmission," *American Economic Review* 82, pp.902-921.
- Bernanke, Ben and Harold James (1991), "The Gold Standard, Deflation, and Financial Crisis in the Great Depression: An International Comparison," in R. Glenn Hubbard (ed.), *Financial Markets and Financial Crises*, Chicago: University of Chicago Press, pp.33-68.
- Bordo, Michael D. (1985), "The Impact and International Transmission of Financial Crises: Some Historical Evidence, 1870-1933," *Rivista di Storia Economica* 2, International issue, pp.41-78.
- Bordo, Michael D. (1986), "Financial Crises, Banking Crises, Stock Market Crashes and the Money Supply: Some International Evidence, 1870-1913," in Forrest Capie and Geoffrey Wood (eds), *Financial Crises and the World Banking System*, London: Macmillan, pp.190-248.
- Calomiris, Charles and Gary Gorton (1991), "The Origins of Banking Panics: Models, Facts and Bank Regulation," in R. Glenn Hubbard (ed.), *Financial Markets and Financial Crises*, Chicago: University of Chicago Press, pp.109-174.
- Calvo, Guillermo (1994), "Financial Vulnerability and Capital Flows," unpublished manuscript, University of Maryland.
- Calvo, Guillermo (1996), "Capital Flows and Macroeconomic Management: Tequila Lessons," unpublished manuscript, University of Maryland.
- Caprio, Gerald, Jr. And Daniela Klingebiel (1996), "Bank Insolvencies: Cross-Country Experience," Policy Research Working Paper 1620, Washington, D.C.: The World Bank.
- Caprio, Gerald, Jr. And Daniela Klingebiel (1997), "Bank Insolvency: Bad Luck, Bad Policy, or Bad Banking?" *Annual World Bank Conference on Development Economics*, 1996, Washington, D.C.: The World Bank, pp.79-104.
- Calvo, Guillermo, Leo Leiderman and Carmen Reinhart (1993), "Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors," *IMF Staff Papers* 40, pp.108-150.

De Juan, A. (1995), "The Roots of Banking Crises: Microeconomic Issues and Issues of Supervision and Regulation," paper presented to the IADB/G-30 Conference on Banking Crises in Latin America.

Demirgüç-Kunt, Ash and Enrica Detragiache (1997) "The Determinants of Banking Crises: Evidence from Developing and Developed Countries" IMF manuscript.

Diamond, Douglas and Phillip Dybvig (1983), "Bank runs, Liquidity and Deposit Insurance," *Journal of Political Economy* 91, pp.401-419.

Economist (1997), "A Survey of Banking in Emerging Markets," supplement, 12 April.

Edwards, Sebastian and Carlos A. Vegh (1997), "Banks and Macroeconomic Disturbances Under Predetermined Exchange Rates," NBER Working paper no. 5977 (March).

Eichengreen, Barry (1997), "Exchange Rate Stability and Financial Stability," unpublished manuscript, University of California, Berkeley.

Eichengreen, Barry and Albert Fishlow (1996), "Contending with Capital Flows: What is Different About the 1990s?" Council on Foreign Relations Paper, New York: Council on Foreign Relations.

Eichengreen, Barry and Richard S. Grossman (1997), "Debt Deflation and Financial Instability: Two Historical Explorations," in Forrest Capie and Geoffrey Wood (eds), *Asset Prices and the Real Economy*, London: Macmillan, pp.65-96.

Eichengreen, Barry, Andrew K. Rose and Charles Wyplosz (1996), "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks," *Economic Policy* 21, pp.249-312.

Frankel, Jeffrey A. And Andrew K. Rose (1996), "Currency Crashes in Emerging Markets," *Journal of International Economics* 41-3/4, 351-366.

Friedman, Milton and Anna J. Schwartz (1963), *A Monetary History of the United States, 1863-1960*, Princeton: Princeton University Press.

Gavin, Michael and Ricardo Hausmann (1995), "The Roots of Banking Crises: The Macroeconomic Context," in Ricardo Hausmann and Liliana Rojas-Suarez (eds), *Banking Crises in Latin America*, Baltimore: Johns Hopkins University Press, pp.27-63.

Ghosh, Atish, Anne-Marie Gulde, Jonathan D. Ostry and Holger C. Wolf (1995), "Does the Nominal Exchange Rate Regime Matter?" IMF Working Paper WP/95/121 (November).

Goldstein, Morris (1997), *The Case for an International Banking Standard*, Washington, D.C.: Institute for International Economics.

Goldstein, Morris and Philip Turner (1996), "Banking Crises in Emerging Economies: Origins and Policy Options," BIS Economic Papers no. 46, Basle: Bank for International Settlements (October).

Gorton, Gary (1988), "Banking Panics and Business Cycles," *Oxford Economic Papers* 40, pp.221-255.

Greenwald, Bruce and Joseph Stiglitz (1988), "Information, Finance Constraints, and Business Fluctuations," in Meir Kahn and S.C. Tsiang (eds), *Expectations and Macroeconomics*, Oxford: Oxford University Press.

Grossman, Richard S. (1993), "The Macroeconomic Consequences of Bank Failures Under the National Banking System," *Explorations in Economic History* 3-. [1/294-330.

Group of Ten Working Party on Financial Stability in Emerging Market Economies (1997) "Financial Stability in Emerging Market Economies" unpublished report.

Honohan, Patrick (1997), "Banking System Failures in Developing and Transition Countries: Diagnosis and Prediction," unpublished manuscript, University College, Dublin.

International Monetary Fund (1997), *Interim Assessment of the World Economic Outlook-- Regional and Global Implications of the Financial Crisis in Southeast and East Asia*, Washington, D.C.: IMF.

Kaminsky, Graciela and Carmen Reinhart (1996), "The Twin Crises: The Causes of Banking and Balance-of-Payments Problems," unpublished manuscript, Federal Reserve Board and International Monetary Fund.

Kapur, Ajay (1997), "And Here's How Not to Gamble with Banks," *Asian Wall Street Journal* (14 July).

Kindleberger, Charles P (1978), *Manias, Panics and Crashes*, New York: Basic Books.

McKinnon, Ronald and Huw Pill (1995), "Credible Liberalization and International Capital Flows: The Overborrowing Syndrome," unpublished manuscript, Stanford University.

Mishkin, Frederic S. (1991), "Anatomy of a Financial Crisis," NBER Working Paper no. 3934.

Mishkin, Frederic S. (1996), "Understanding Financial Crises: A Developing Country Perspective," NBER Working Paper no. 5600 (May).

Mishkin, Frederic (1997), "Asymmetric Information and Financial Crises: A Developing Country Perspective," World Bank Annual Conference on Development Economics, supplement to *World Bank Economic Review*.

Rojas-Suarez, Liliana and Steven R. Weisbrod (1994), "Financial Market Fragilities in Latin America: From Banking Crisis Resolution to Current Policy Challenges," IMF Working Paper WP/94/117.

Sachs, Jeffrey (1995), "Do We Need an International Lender of Last Resort?" unpublished manuscript, Harvard University.

Sachs, Jeffrey A., Aaron Tornell and Andres Velasco (1995), "The Collapse of the Mexican Peso: What Have We Learned?" *Economic Policy* 22, pp.15-56.

Schwartz, Anna J. (1996), "Comment on Jeffrey Sachs: 'Do We Need an International Lender of Last Resort?'" unpublished manuscript, National Bureau of Economic Research.

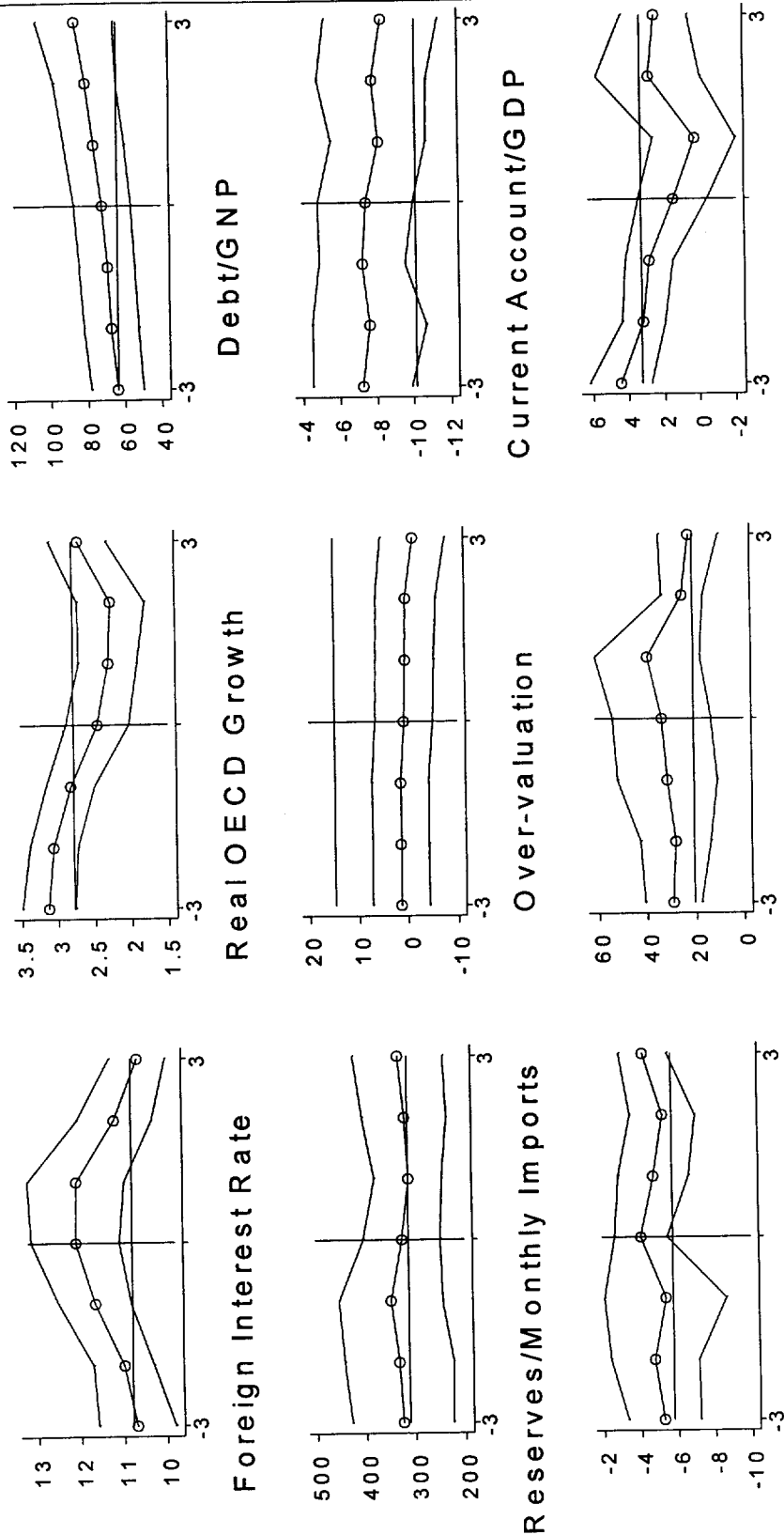
Simons, Katerina and Stephen Cross (1991), "Do Capital Markets Predict problems in Large commercial Banks?" *New England Economic Review* (May/June), pp.51-56.

Smallhout, James (1997), "How to Contain Banking Crises," *Euromoney* (July), pp.10-12.

Sundararajan, V. And Tomas J.T. Balino (1991), "Issues in Recent Banking Crises," in V. Sundararajan and Tomas J.T. Balino (eds), *Banking Crises: Cases and Issues*, Washington, D.C.: International Monetary Fund, pp.1-57.

Figure 1: Macroeconomic Characteristics of Banking Crises

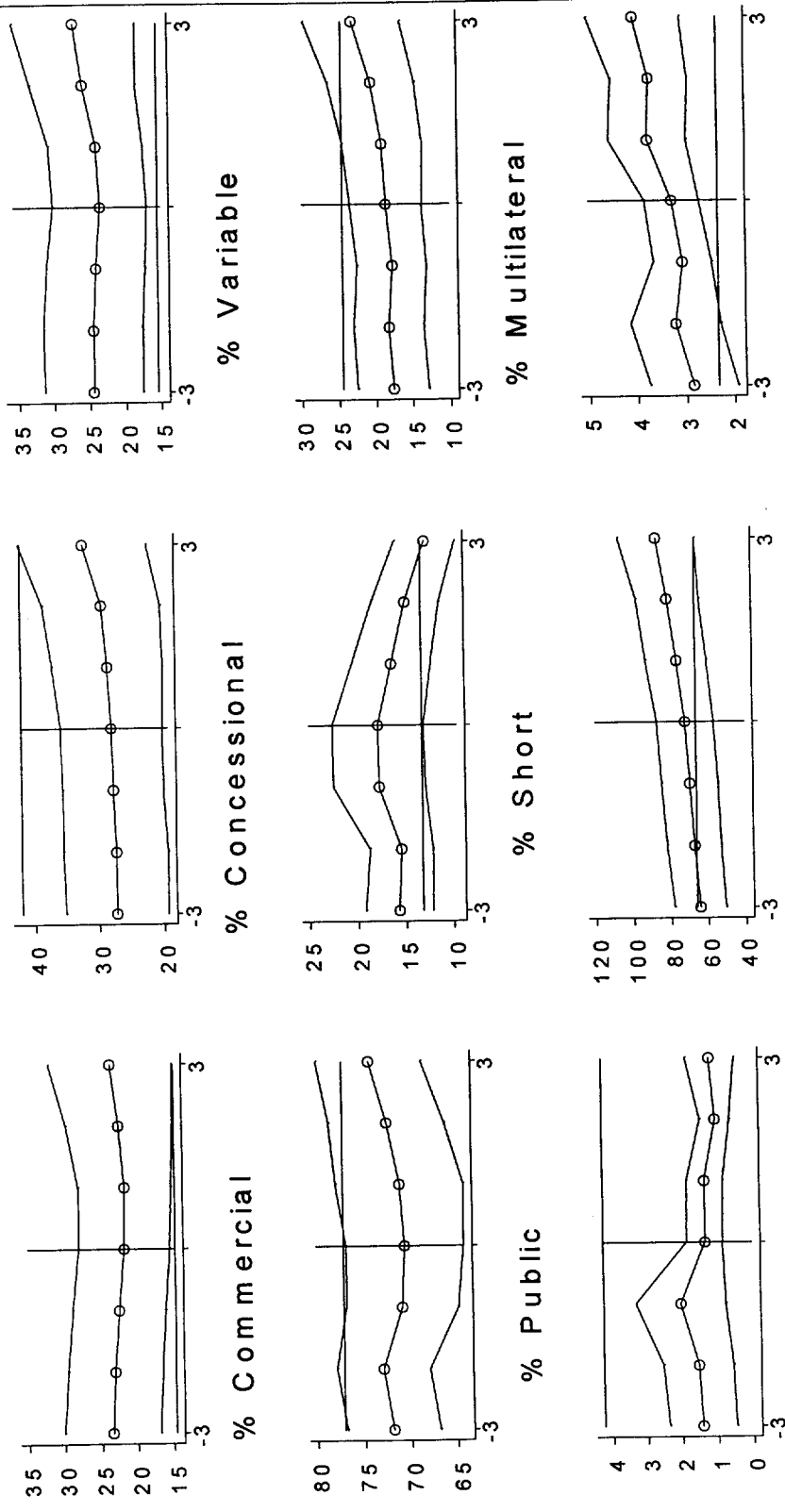
Data from 105 Countries, 1975-1992. Scales and Data Vary by Panel. Onset of Caprio & Klingebiel Crises; Non-Crisis Mean Marked.



Mean plus two standard deviation band; all figures are percentages.
Movements 3 Years Before and After (39) Bank Crises

Figure 2: Characteristics of External Debt Around the Time of Banking Crises

Data from 105 Countries, 1975-1992. Scales and Data Vary by Panel. Onset of Caprio & Klingebiel Crises; Non-Crisis Mean Marked.



Mean plus two standard deviation band; all figures are percentages.
Movements 3 Years Before and After (39) Bank Crises

Table 1: Banking Crises

	Default	Unweighted	Predictive	Without 1970s
External Debt/GDP	.002 (1.6)	.025 (2.5)	.001 (2.3)	.001 (1.4)
Reserves/Imports	.000 (1.9)	.001 (0.8)	.000 (1.0)	.000 (1.8)
Current Account (% GDP)	-.005 (1.0)	.010 (0.2)	-.002 (1.1)	-.005 (1.1)
Over-Valuation	.005 (2.9)	.018 (0.7)	.003 (3.8)	.005 (2.9)
Budget (% GDP)	.025 (2.8)	.239 (2.2)	.014 (3.5)	.018 (2.4)
Domestic Credit Growth	.002 (1.4)	.007 (0.5)	.001 (1.7)	-.000 (0.0)
Output Growth	-.015 (2.4)	-.076 (0.9)	-.004 (1.7)	-.011 (2.1)
Northern Interest Rate	.030 (2.4)	.476 (2.3)	.003 (5.3)	.022 (2.2)
Northern Output Growth	-.045 (2.2)	-.075 (0.2)	.001 (1.3)	-.044 (2.4)
Observations	906	906	878	818
McFadden's R2	.37	.06	.50	.42
Slopes [$\chi^2(9)$] (P-value)	60 (.00)	16.4 (.06)	80.3 (.00)	75.5 (.00)
International [$\chi^2(4)$] (P-value)	13.3 (.01)	6.6 (.16)	18.9 (.00)	13.0 (.01)
Domestic [$\chi^2(3)$] (P-value)	11.0 (.01)	5.6 (.13)	16.4 (.00)	7.7 (.05)
External [$\chi^2(2)$] (P-value)	17.8 (.00)	8.4 (.02)	29.7 (.00)	15.4 (.00)

Probit Regressions estimated with maximum likelihood, weighted by GNP per capita.

Derivatives (x100) reported for regressors; absolute z-statistics (for no significant effect) in parentheses.

Table 2: Banking Crises and Exchange Rate Regimes
Fixed or Floating

External Debt/GDP	-0.001 (0.3)	.000 (0.1)	-.000 (0.3)
Reserves/Imports	.0004 (1.8)	.000 (0.1)	.0003 (1.8)
Current Account (% GDP)	-.024 (1.8)	-.011 (1.0)	-.024 (2.0)
Over-Valuation	.001 (0.2)	.003 (0.8)	.000 (0.0)
Budget (% GDP)	.026 (1.2)	.013 (0.6)	.025 (1.3)
Domestic Credit Growth	-.007 (1.2)	-.005 (1.1)	-.007 (1.3)
Output Growth	-.009 (0.7)	-.004 (0.3)	-.009 (0.7)
Northern Interest Rate	.011 (0.4)	.022 (0.8)	.009 (0.3)
Northern Output Growth	-.065 (0.9)	-.013 (0.2)	-.056 (0.9)
Fixed Peg	.101 (0.4)	.163 (0.8)	
Intermediate Peg	.015 (0.1)		
Managed Peg			.048 (0.2)
Observations	495	443	495
McFadden's R2	.38	.40	.37
Slopes [$\chi^2(11/10)$] (P-value)	16.4 (.13)	11.5 (.32)	16.2 (.09)

Probit Regressions estimated with maximum likelihood, weighted by GNP per capita.

Derivatives (x100) reported for regressors; absolute z-statistics (for no significant effect) in parentheses.

Table 3: Banking Crises and Exchange Rate Stability

External Debt/GDP	.001 (1.6)	.001 (1.3)	.000 (1.6)
Reserves/Imports	.000 (1.8)	.000 (1.7)	.000 (1.8)
Current Account (% GDP)	-.003 (0.8)	-.005 (1.2)	-.004 (1.3)
Over-Valuation	.004 (3.1)	.004 (3.3)	.003 (3.1)
Budget (% GDP)	.015 (2.4)	.023 (3.2)	.017 (3.6)
Domestic Credit Growth	.001 (1.5)	.002 (1.6)	.000 (0.8)
Output Growth	-.012 (2.6)	-.010 (2.2)	-.005 (1.7)
Northern Interest Rate	.020 (2.4)	.028 (2.9)	.014 (2.4)
Northern Output Growth	-.027 (1.9)	-.031 (2.0)	-.028 (2.7)
Exchange Rate Crash	-.043 (1.1)		
 Exchange Rate Change <5%		-.079 (2.2)	
 Exchange Rate Change <10%			-.215 (3.2)
Banking Crisis			
Observations	906	906	906
McFadden's R2	.39	.40	.44
Slopes [$\chi^2(10)$] (P-value)	62.3 (.00)	65.2 (.00)	71.6 (.00)

Probit Regressions estimated with maximum likelihood, weighted by GNP per capita.

Derivatives (x100) reported for regressors; absolute z-statistics (for no significant effect) in parentheses.

Table 4: Banking Crises and External Debt

External Debt/GDP	-0.000 (0.0)
Reserves/Imports	.000 (1.0)
Current Account (% GDP)	-0.006 (0.8)
Over-Valuation	.007 (2.9)
Budget (% GDP)	.030 (3.0)
Domestic Credit Growth	.000 (0.3)
Output Growth	-0.011 (1.9)
Northern Interest Rate	.022 (1.5)
Northern Output Growth	-0.053 (2.4)
% Debt Commercial	.005 (0.7)
% Debt Concessional	-0.012 (3.0)
% Debt Variable Rate	-0.010 (1.8)
% Debt Public	-0.008 (1.7)
% Debt Short	-0.014 (2.2)
% Debt Multilateral	.009 (2.0)
FDI/Debt	-0.016 (0.9)
Observations	824
McFadden's R2	.50
Slopes [$\chi^2(16)$] (P-value)	72 (.00)
Debt Slopes [$\chi^2(7)$] (P-value)	15.5 (.03)

Probit Regressions estimated with maximum likelihood, weighted by GNP per capita.

Derivatives (x100) reported for regressors; absolute z-statistics (for no significant effect) in parentheses.

Endnotes

- 1 The locus classicus of this literature, Friedman and Schwartz (1963), is in fact on the United States, but subsequent work such as Bernanke and James (1993) extends it both analytically and geographically.
- 2 Of course, no list of East Asian financial crises would be complete without also mentioning the case of Japan. Although our focus here is on emerging markets, a comprehensive survey would include also systemic banking problems in the 1980s in the U.S. And U.K. And, toward the end of the decade, in the Nordic countries.
- 3 It is important to ask whether the banking crises caused the recessions in a meaningful economic sense, or whether recessionary forces set on foot for independent reasons themselves provoked the banking crises and persisted into the post-crisis period. Gorton (1988) argues that the direction of causality throughout U.S. History has been mainly from recessions to bank failures rather than the other way around. We revisit this point below.
- 4 Rojas-Suarez and Weisbrod (1994), writing before the most recent Mexican crisis, emphasize the disproportionate importance of banking systems for small-firm finance in Latin America and hence the scope for a banking crisis to give rise to a severe credit crunch.
- 5 Economist (1997).
- 6 E.g., Caprio and Klingebiel (1997).
- 7 The same is true of the Kaminsky-Reinhart sample of 20 countries and of the Granger causality analysis for seven economies conducted by Sunderarajan and Balino.
- 8 Considering 29 detailed country studies, they find a role for deteriorating terms of trade in 20 of them and of domestic recession in 16.
- 9 Kaminsky and Reinhart utilize changes in the level of real interest rates as a proxy for financial liberalization, although there are obviously also reasons why this might be regarded as a measure of macroeconomic conditions.
- 10 Demirgüç-Kunt and Detragiache (1997) simultaneously and independently of us use similar methods and data. They also use a panel approach, but combine developing and developed countries together using a logit approach to analyze data for the 1980s and 1990s. Whereas we focus on the onset of banking crises using the Caprio-Klingebiel crisis dates, they study the incidence of banking crises (of whatever duration) developed using four different criteria. The studies share a set of macroeconomic regressors (e.g., both studies show that output growth is low during banking crises); we find an important role for external interest rates, while they find an important role for deposit insurance and law enforcement.
- 11 And that do not fall within an exclusion windows we construct around our crisis observations.
- 12 See also Gavin and Hausmann (1996) and Eichengreen and Fishlow (1996).
- 13 Previous discussions of this issue, on which we build, include Mishkin (1996), who emphasizes the implications of asymmetric information for the structure and performance of the banking industry, and Gavin and Hausmann (1996), who are mainly concerned with the macroeconomic implications of banking crises.
- 14 Except in the event of doubts about the bank's own stability, as we describe below.
- 15 Bernanke and Blinder (1988, 1992) have provided formal models of the credit channel. Edwards and Vegh (1997) show that the mechanisms highlighted in these models are consistent with the assumption of optimizing behavior on the part of households and firms.

16 The existence of this incentive has given rise to a literature on random bank runs, in which depositors uncertain of a banks' solvency queue up to withdraw their deposits before the institution's limited liquidity is exhausted (Diamond and Dybvig 1983). Since a bank holding fractional reserves can satisfy only some of its depositors' demands for liquidity, such a run can be self-fulfilling. While the generality of these models has been questioned (viz. Schwartz 1996), the possibility they highlight serves to underscore the intrinsic fragility of banking systems.

17 Previous reviews of these issues, on which we build, include Goldstein and Turner (1996) and Demirgüç-Kunt and Detragiache (1997).

18 Inevitably these categories are overlapping, as will become apparent momentarily, but this five-part distinction is useful nonetheless.

19 And is emphasized by, inter alia, and Gavin and Hausmann (1996), Kaminsky and Reinhart (1996), Demirgüç-Kunt and Detragiache (1997), Honohan (1997) and Kapur (1997). Caprio and Klingebiel (1997), on the other hand, question the generality of the association of lending booms with banking crises.

20 This is the typical sequence of events described by Kindleberger (1978) and emphasized by Gavin and Hausmann (1996) in the Latin American context.

21 Demirgüç-Kunt and Detragiache (1997) find weak evidence that terms of trade volatility is associated with banking crises.

22 Mishkin (1996) also argues that an increase in interest rates in the presence of adverse selection can precipitate banking crises by aggravating credit rationing and provoking a downturn in economic activity, augmenting the number of nonperforming loans.

23 The literature on this connection, along with historical evidence on its operation, may be found in Eichengreen (1997).

24 And is emphasized in the context of domestic financial structure by a number of authors; see for example Kapur (1997).

25 Goldstein and Turner (1996) note that in Germany nearly half of the liabilities of depository institutions are long term, while the comparable figure for Japan is one third; in developing countries, in contrast, banks have few sources of longer-term financing.

26 This regularity is emphasized by, among others, Goldstein and Turner (1996) and Honohan (1997).

27 See for example Smallhout (1997). Demirgüç-Kunt and Detragiache (1997) find that a measure of the strength of law enforcement is strongly associated with the incidence of banking crises.

28 For example, see de Juan (1995).

29 Calomiris and Gorton (1991) define a banking panic, a closely allied concept, as a situation in which bank debt holders at all or many banks in the banking system suddenly demand that banks convert their debt claims into cash.

30 Slight judgement is sometimes involved, since not all banking crises are identified with individual years.

31 Eichengreen (1997) emphasizes parallels between industrial- and developing-country experiences.

32 However, numerous observations are missing for individual variables. The countries we include are: Algeria; Argentina; Bangladesh; Barbados; Belize; Benin; Bhutan; Bolivia; Botswana; Brazil; Burkina Faso; Burundi;

Cameroon; Cape Verde; Central African Republic; Chad; Chile; China; Colombia; Comoros; Congo; Costa Rica; Cote d'Ivoire; Djibouti; Dominican Republic; Ecuador; Arab Republic of Egypt; El Salvador; Equatorial Guinea; Ethiopia; Fiji; Gabon; The Gambia; Ghana; Grenada; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Hungary; India; Indonesia; Islamic Republic of Iran; Jamaica; Jordan; Kenya; Republic of Korea; Lao People's Democratic Republic; Lebanon; Lesotho; Liberia; Madagascar; Malawi; Malaysia; Maldives; Mali; Malta; Mauritania; Mauritius; Mexico; Morocco; Myanmar; Nepal; Nicaragua; Niger; Nigeria; Oman; Pakistan; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Portugal; Romania; Rwanda; St. Vincent and the Grenadines; Sao Tome and Principe; Senegal; Seychelles; Sierra Leone; Solomon Islands; Somalia; Sri Lanka; Sudan; Swaziland; Syrian Arab Republic; Tanzania; Thailand; Togo; Trinidad and Tobago; Tunisia; Turkey; Uganda; Uruguay; Vanuatu; Venezuela; Western Samoa; Republic of Yemen; Federal Republic of Yugoslavia; Zaire; Zambia; and Zimbabwe.

33 The actual list includes: Argentina 1980; Argentina 1989 Benin 1988; Burkina Faso 1988; Bangladesh 1988; Bolivia 1986; Brazil 1990; Central African Republic 1980; Chile 1976; Chile 1981; Cote d'Ivoire 1988; Cameroon 1987; Congo 1980; Colombia 1982; Costa Rica 1987; Ecuador 1980; Egypt 1980; Egypt 1990; Ghana 1982; Guinea 1985; Hungary 1991; Kenya 1985; Kenya 1992; Morocco 1980; Madagascar 1988; Mexico 1981; Mauritania 1984; Malaysia 1985; Nigeria 1990; Nepal 1988; Philippines 1981; Romania 1990; Senegal 1988; Thailand 1983; Turkey 1982; Tanzania 1987; Uruguay 1981; Venezuela 1980; and Zaire 1991.

34 This suggests that the incidence of banking crises is easier to explain in terms of the systematic macroeconomic factors (both domestic and foreign) considered in the analysis in the relatively high-income developing countries, while crises in low-income developing countries are more heavily driven by idiosyncratic factors.

35 The baseline results should be interpreted therefore as attaching the most importance to relatively high-income developing countries.

36 We are unable to explain this result, which appears consistently throughout the analysis which follows.

37 An alternative explanation would emphasize the endogeneity of this variable: that countries vulnerable to banking crises build up an extra cushion of reserves precisely in order to protect against this contingency. This behavior is evident, for example, in the recent experience of Argentina.

38 We have also experimented by splitting the sample by regime with a similar lack of success.

39 In addition, in some regressions we also interacted these variables with the domestic growth rate, and we estimated our baseline regression separately for countries with pegged and floating rates. None of these specifications turned up evidence of an association between the exchange rate regime and the incidence of banking crises.

40 It could be that a currency crash destabilizes the banking system only with a lag (because, for example, it takes time for depreciation to translate into default by borrowers with foreign-currency-denominated debts but domestic-currency-denominated revenues, as in Mexico). We therefore substituted the lagged crash variable for its current value, but without success; the coefficient on the lagged crash variable is economically and statistically similar to that on the current value.

41 Japanese long rates ticked up from 2 to 2½ per cent when the outlook for the Japanese economy appeared to brighten after March, and short rates firmed with talk that the Bank of Japan might raise rates by the end of the year. There were also small but significant increases in interest rates in the U.K. and Germany in the spring of 1997. A rise in U.S. rates may not have eventuated, but rumors that it was coming did nonetheless circulate. See IMF (1997).