**The Twin Crises: The Causes of Banking and
Balance-of-Payments Problems**

Graciela L. Kaminsky and Carmen M. Reinhart

Abstract

In the wake of the ERM and Mexican currency crises, the subject of balance-of-payments crises has come to the forefront of academic and policy discussions. This paper focuses on the potential links between banking and balance-of-payments crises. We examine these episodes for a large number of countries and find that: knowing that there are banking problems helps in predicting a balance-of-payments crisis, but the converse is not true; financial liberalization usually predates banking crises, indeed, it helps predict them. Rather than a causal relationship from banking to balance-of-payments crises, the macroeconomic "stylized facts" that characterize these episodes point to common causes.

The Twin Crises: The Causes of Banking and Balance-of-Payments Problems

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I. Introduction

In the wake of the ERM and Mexican currency crises, the subject of balance-of-payments crises has, once again, come to the forefront of academic and policy discussions; a flurry of papers have recently attempted to explain the economic, political, and psychological factors that led to these traumatic events. Some explanations have stressed macroeconomic imbalances (internal and external) that underpin the crises, while others have posited a self-fulfilling nature. In any case, many of the countries that have had currency crises (past and present) have also had full-fledged domestic banking crises around the time when they were experiencing mayhem in their foreign exchange market, with recent examples including Finland, Mexico, Norway and Sweden.

The probable causes of banking panics and banking crises has been the subject of an extensive theoretical and empirical literature.[2] As to balance-of-payments crises, the theoretical literature is vast, although the empirical one is thinner.[3] A number of theoretical papers have analyzed how banking and exchange rate crises interact and in what direction the causal chain runs between these two highly disruptive events.[4] However, few papers have attempted to assess empirically the extent to which the two are linked, despite the fact that banking and balance-of-payments crises often appear closely timed.

[2] See, for instance, Calomiris and Gorton (1991); Kaminsky and Reinhart (1996) offer a recent survey of this literature.

[3] See Agenor, Bhandari, and Flood (1992) for a review of the literature on Krugman-style models; Obstfeld (1994) and (1996) for models of self-fulfilling crises and a survey of that literature; Calvo (1995) for a variety of models of balance-of-payments crises; and Eichengreen, Rose, and Wyplosz (1995) for a comprehensive study of the empirical regularities of both successful and unsuccessful attacks on the currencies of most of the industrial countries.

[4] See Diaz-Alejandro (1985), Velasco (1987), and Calvo (1995), Goldfajn and Valdés (1995), and Miller (1995).

Alternative scenarios could be concocted to explain very different causal patterns among the two events. One chain of causation, recently stressed by Stoker (1995), runs from balance-of-payments problems to financial crisis. Examining English financial crises in the 1800s, he concludes that the commitment to a specie standard causes the financial sector to magnify real shocks –the loss of gold reserves results in a credit crunch that gives rise to increased bankruptcies and financial crisis. In the modern context, this causal pattern could emerge if the loss of reserves is not sterilized and the speculative attack on the currency is accompanied or followed by bank runs and by a period of abnormally high interest rates, as the central bank attempts to defend the parity. The position of banks could be weakened further if much of their outstanding debt is denominated in a foreign currency.

While such arguments have an intuitive appeal, equally compelling arguments can be made to support the reverse chain of causation –that problems in the financial sector eventually give rise to a balance-of-payments crisis. As the central bank finances the bail-out of troubled financial institutions, its ability to maintain the prevailing exchange rate commitment erodes. If the central bank finances the bail-out by printing money, we have the Krugman (1979) story; if it finances by issuing large amounts of debt, markets may come to expect future monetization, and the crisis may become self-fulfilling.[5] The central banks' capacity for defending the currency can be further undermined by its inability to raise interest rates once the currency has come under attack. Diaz-Alejandro (1985) emphasized this chain of events when he wrote about the period leading up to Chile's June 1982 balance-of-payments crisis:

> *The massive use of central bank credit to "bail out" private agents raises doubts about the validity of pre-1982 analyses of the fiscal position and debt of the Chilean public sector.*

He concludes:

> *Ex-post it turned out that the public sector, including the Central Bank, had been accumulating an explosive amount of contingent liabilities to both foreign and domestic agents, who held deposits in, or made loans to the rickety domestic financial sector. This hidden public debt could be turned into cash as the financial system threatened to collapse.*

In some sense, the capital flight and economic contraction that often accompany or follow a balance-of-payments crisis simply put the nail in the coffin of what was already a defunct

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[5] See Calvo (1995) and Obstfeld (1994) and (1996).

financial system. Velasco (1987), Calvo (1995), and Miller (1995) put this logic in formal models.

A third possibility is, of course, that balance-of-payments and financial crises are caused by common factors or events. Because the seeds of the problems are sown at the same time, which event occurs first is a matter of circumstance. An example of how a common factor can give rise to the two crises can be found in the "perverse" dynamics of an exchange rate-based inflation stabilization plan, such as that of Mexico in 1987, and the Southern Cone in the late 1970s. The empirical evidence suggests that such plans have well-defined dynamics (Reinhart and Vegh (1995)): at the early stages of the plan a boom in consumption occurs; since inflation converges to international levels only gradually, there is a marked cumulative real exchange rate appreciation; financed by borrowing from the rest of the world, the current account continues to widen to levels that, at some point, are perceived by financial markets to be unsustainable. Those dynamics can, and often have, made countries vulnerable to speculative attacks on their currencies -and most of those attacks succeeded (see also Dornbusch, Goldfajn, and Valdés (1996)).[6] Since the consumption boom is usually financed by an explosion in bank credit, as banks borrow abroad, when the capital inflows become outflows and asset markets crash, the banking system caves in. Oftentimes, banking problems emerge even earlier, as business profits are squeezed by the real exchange rate appreciation, which leads to a rise in bankruptcies.

Financial liberalization can also generate similar boom-bust dynamics. As formalized in McKinnon and Pill (1994), macroeconomic distortions, such as implicit deposit insurance, can fuel the lending boom that leads to the eventual collapse of the banking system. Large swings in international interest rates and capital inflows may also produce an exaggerated business cycle that ends in financial and currency crashes (see Calve, Leiderman, and Reinhart (1993), Frankel and Rose (1996), and Goldfajn and Valdés (1995)).

This paper focuses on the links between these "twin" crises by examining these episodes for a number of industrial and developing countries. The former include: Denmark, Finland, Norway, Spain, and Sweden. The latter focuses on: Argentina, Bolivia, Brazil, Chile, Colombia, Indonesia, Israel, Malaysia. Mexico, Peru, the Philippines, Thailand, Turkey, Uruguay, and Venezuela. The period covered spans the 1970s through the 1990s.

The issue of causality is addressed in two ways: First, we construct indices of banking and balance-of-payments crises from a chronology of events and from examining the behavior

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6 Examining periods leading up to large devaluations and balance-of-payments difficulties Edwards and Montiel(1989) find many of those features present.

of exchange rates and reserves. From this timetable of crises, inference can be drawn (albeit cautiously) about the possible causal patterns among the banking and balance-of-payments problems. Second, we examine the behavior around the periods of crises of various domestic and external macroeconomic indicators that have been stressed in the literature on banking crises and speculative attacks, along the lines of Eichengreen, Rose, and Wyplosz (1995) and Frankel and Rose (1996). The aim there is to assess whether the two crises share a common macroeconomic background.

The next section focuses on the definition and chronology of the crises and other events (such as financial liberalization) that may be relevant in explaining crises and discusses the issue of causality. In Section III, we review the stylized facts that characterize the periods surrounding the crises. The final section summarizes the main findings and discusses areas for future research.

II. The Links Between Banking and Balance-of-payments Crises

Alternative criteria can be used to define a crisis. A crisis can involve a well-defined "event," such as a devaluation; however, an event is not a prerequisite for a crisis. For instance, when the central bank succeeds in fighting off a speculative attack on its currency, there is no event (i.e., no devaluation) although there was a crisis. In what follows, we consider both criteria in constructing our indices of crises.

1. A Balance-of-Payments Crises Index

Most of the time, currency crises are resolved through a devaluation of the domestic currency or the floating of the exchange rate. But central banks can and, on occasion do, resort to contractionary monetary policy and foreign exchange market intervention to fight the speculative attack. In these latter cases, currency market turbulence will be reflected in steep increases in domestic interest rates and interest rate differentials (for example, Sweden in September of 1992 allowed the interbank rate to reach 500 percent), and massive losses of foreign exchange reserves. Hence, an index of balance-of-payments crises should capture these different manifestations of speculative attacks.

In the spirit of Eichengreen, Rose, and Wyplosz (1995), we constructed an index of currency market turbulence as a weighted average of exchange rate changes and reserve changes, with weights such that the two components of the index have equal conditional volatilities.[7] Readings of this index that were three standard deviations or more above the

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[7] Eichengreen, Rose, and Wyplosz (1995) also include interest rates in this index changes. However, our

mean were cataloged as crises.[8] Because these capture the magnitude of sudden reserve losses and exchange rate movements, these indices also provide an equivalent of the "Richter scale)' for judging the severity of currency crises.

Most often, our definition of crises coincides with '(events," such as devaluations, changes in exchange rate arrangements, capital controls, the temporary shutdown of foreign exchange markets (particularly in the earlier crises of the 1970s), and the indefinite suspension of convertibility. The appendix summarizes some of the events around the crises dates.

2. Defining Banking Crises

With regard to banking crises, our analysis stresses events. The main reason for relying exclusively on events to mark the beginning of the financial crisis has to do with the lack of high frequency data that consistently signals that a financial crisis is underway. If the beginning of a banking crisis is marked by a run on banks and abnormally large withdrawals, as was frequently the case in the banking panics of the last century (see Calomiris and Gorton (1991)), then changes in bank deposits could be used to mark the crises periods. However, quite often, the banking problems do not arise from the liability side, but from a protracted deterioration in asset quality, be it from a collapse in real estate prices or increased bankruptcies in the nonfinancial sector (see Kaminsky and Reinhart (1996)). In this case, changes in asset prices or a large increase in bankruptcies could be used to mark the onset of the crisis (see Gorton (1988)). However, large monthly swings in asset prices, particularly equity, are commonplace in the volatile and shallow emerging markets that characterize the bulk of the countries in our sample. Further, for many of the earlier crises, stock market data is not available. Indicators of business failures are even scarcer and are usually available only at low frequencies, if at all.

Given these limitations, we mark the beginning of a banking crisis by an event that

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data on market-determined interest rates (particularly for developing countries) does not span the entire sample.

8 With countries i, t h, sample that, at different times, experienced hyperinflation, the construction of the index had to be modified. While a 100 percent devaluation may be traumatic for a country with moderate-to-low inflation, a devaluation of that magnitude is commonplace during hyperinflations. If we constructed a single index for the countries that had hyperinflation episodes, sizable devaluations and reserve losses in the more moderate inflation periods would be left out, since the historic mean is distorted by the high inflation episode. To avoid this problem, we divided the sample according to whether inflation in the past six months was higher than 150 percent and then constructed an index for each subsample. While this method is ad-hoc, the appendix shows that our cataloging of crises for these countries coincides fairly tightly with our chronology of currency market disruptions.

indicates either: i) bank runs that lead to the closure, merging, or takeover by the public sector of one or more financial institutions (Argentina 1980, and 1994, Philippines, 1981, Thailand 1983, Turkey, 1991, Uruguay 1981 and, Venezuela 1993); ii) if there are no runs, the closure, merging, takeover, or large-scale government assistance of an important financial institution (or group of institutions), that marks the start of a string of similar outcomes for other financial restitutions (Chile 1982, Colombia 1992, Denmark 1987, Finland 1991, Indonesia 1992, Mexico 1992, Norway 1988, Peru 1983, Spain 1978, Sweden 1991, Thailand 1991, and Uruguay 1971). To date these events, we rely heavily on existing studies of banking crises and on the financial press around the time of the crisis.

This approach to dating the beginning of the banking crises is, of course, not without drawbacks. It could be argued that it dates the crises "too late," because the financial problems usually begin well before a bank is finally closed or merged; alternatively, it could be argued it dates the crises "too early" because the peak of a full-blown crisis may come later. With these limitations in mind, the appendix chronicles these episodes of financial market turmoil.

3. The Links

We focus on 20 countries in Asia, Europe, Latin America, and the Middle-East for the period 1970-mid-1995 This period encompasses a total of 25 banking crises and 71 balance-of-payments crises; the incidence of these crises are shown in Figure 1. The specific countries in our sample are those listed in the introduction and the appendix. Figure 1 and the chronology presented in the appendix offer some qualitative evidence on the possible links between financial and currency crises and other key developments, such as financial liberalization; more formal statistical tests of these links are also examined. The key observations that emerge from the analysis are:

First, there are distinct patterns in the incidence of crises across decades. During the 1970s we observe a total of 25 balance-of-payments crises, yet banking crises were rare during that period, with only 3 taking place. The absence of banking crises may reflect the highly regulated nature of financial markets during the bulk of the 1970s. By contrast, while the number of balance-of-payments crises per year does not increase much during the 1980s and 1990s, the number of banking crises per year more than quadruples in the post-financial liberalization period (bottom panel, Figure 1).

Second, 56 percent of the banking crises in our sample were followed by a balance-of-payments crises within three years (top panel, Table 1); 24 percent of the banking crises got

underway a year (or less) before the currency crisis. On the other hand, only 12 percent of the balance-of-payments crises were followed by banking crises within three years; less than 3 percent of the currency crises were followed by a banking crisis within a year. Argentina 1981, Brazil 1987, Chile 1982, Colombia 1983, Finland 1991 and 1992, Mexico 1994, Norway 1992, Peru 1985, Spain 1992, Sweden 1992, Thailand 1983, Turkey 1994, Uruguay 1982, Venezuela 1994 are among the cases where financial crises got underway before the balance-of-payments problems. Most often, the banking crisis erupted one to two years before the currency crisis. Hence, it could be argued (as Diaz Alejandro (1985) and Velasco (1987) did for the case of Chile in 1982), that, in an important number of cases, the bail out of the banking system may have contributed to the acceleration in credit creation observed prior to the balance-of-payments crises (see Blanco and Garber (1986), Edwards (1989), Edwards and Montiel (1989), and Eichengreen, Rose, and Wyplosz (1995)). Even in the absence of a large-scale bailout, a frail banking system is likely to tie the hands of the central bank in defending the currency. Banking crises appear to have something to say about which countries were able to withstand the speculative attack during the ERM crises, and which eventually succumbed.

To examine these links more formally, we estimate a probit model where our binary measure of balance-of-payments crisis is regressed against our index of banking crises lagged, under alternative specifications, 12, and 36 months and a dummy for financial liberalization. Similarly, we regress our measure of banking crises against the balance-of-payments measure (using the same lag schemes as before) and the financial liberalization dummy. The results presented in the bottom panel of Table 1 indicate that banking crises (irrespective of which lag horizon is used) are significant in helping to predict balance-of-payments crises; the converse is not true.

Third, in 18 of the 25 banking crises studied here, the financial sector had been liberalized during the preceding five years, or usually less. This suggests that the twin crises may have their common origins in the deregulation of the financial system and the credit booms and asset bubbles that, all too often, appear to accompany these (see Kaminsky and Reinhart (1996)). It is the surge in credit that often finances the import boom and the current account deterioration that is prevalent in the periods prior to currency crises. Indeed, while financial liberalization is not significant in the probit equations that predict balance-of-payments crises (Table 1); it is significant in predicting the probability of banking crises in all the specifications.

A **fourth** feature worth noting is that '(events" and our measure of crisis almost always

coincide. This suggests that for the cases examined here, speculative attacks almost always succeeded, in that they led to either a devaluation, capital controls, a switch in exchange rate regimes, or a combination of these outcomes. **Fifth,** currency crises are far more *severe* in developing than in industrial countries. The severity index for the industrial countries tends to remain well below 0.20, with the highest recorded levels for Sweden during the 1992 ERM crisis. The profile of this index for balance-of-payments crises in developing countries, with the exception of Colombia and Thailand, is strikingly different. This difference is primarily driven by huge devaluations (Chile's 19731,306 percent devaluation sets the record for these countries) or depreciations when the exchange rate is allowed to float.

Last, as Figure 1 shows, crises (both banking and balance-of-payments) were heavily bunched in the early 1980s, when real interest rates in the United States were at their highest level since the 1930s. This observation suggests that, external factors, such as interest rates in the United States, matter a great deal à la Calve, Leiderman, and Reinhart (1993). Indeed, Frankel and Rose (1996) find that foreign interest rates play a significant role in predicting currency crashes. Of course, a second explanation why crises are bunched is that contagion effects may be present, creating a domino effect among those countries that have anything less than immaculate fundamentals. Eichengreen, Rose, and Wyplosz (1995) find that it was not possible to explain all speculative attacks (especially those that failed) through macroeconomic fundamentals. Calvo and Reinhart (1996) present evidence of contagion in capital flows to Latin American countries and regional contagion among emerging equity and fixed income markets in Asia and in Latin America.

III. The Macroeconomic Background of the Crises

This section updates and extends[*] an earlier literature that attempted to ascertain the empirical regularities of periods leading to balance-of-payments and banking crises; we also examine the crises' aftermath. A review of the empirical regularities will also help assess whether financial and currency crises had common causes.

1. Balance-of-Payments Crises

We analyze the evolution of nine macroeconomic and financial variables around the time of the crises (18 months before and after the onset of the crises) relative to their behavior in "tranquil" times, which include all the other observations in the sample. The variables used in the analysis were chosen in light of theoretical considerations and subject to data availability.

For balance-of-payments crises, we examine the behavior of: real exchange rates,[9] the value of exports and imports (in U.S. dollars), the terms of trade (defined as the unit value of exports ever the unit value of imports), an index production, [10] M1, foreign exchange reserves (in U.S. dollars), the ratio of M2 (converted into dollars) to foreign exchange reserves,[11] and domestic-foreign interest rate differentials. [12] With the exception of interest rate differentials and real exchange rates, we focus on 12-month percent changes (relative to '(tranquil)' times). Interest rate differentials are reported in levels and real exchange rates are the percent difference in the index level (all relative to "tranquil" times)

A. Stylized Facts

Figure 2 illustrates the behavior of the variables of interest around the time of the crises for all the countries in the sample. Each panel portrays a different macroeconomic variable. The horizontal axis records the number of months before and after the month that marks the beginning of the crisis; the vertical axis, is the percent difference between and crisis periods. So, for instance, by the time a balance-of-payments crisis begins, the 12-month change in international reserves is, on average, about 45 percent below the average during tranquil periods.

The top left panel shows the evolution of real exchange rates. As stressed in Dornbusch, Goldfajn, and Valdés (1996), the real exchange rate is '"vervalued,') relative to its average level during "tranquil" times, in periods preceding the currency crash. The real exchange rate appreciation does reverse itself rapidly with the devaluation, suggesting that productivity shocks or preference changes were unlikely to account for the initial appreciation. On

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[9] The real exchange rate measure is based on consumer price indexes and is defined as the relative Price of foreign goods (in domestic currency) to the price of domestic goods. Hence, an increase in the index denotes a depreciation. If the central bank of the home country pegs the currency to the dollar (Deutsche mark), the relevant foreign price index is that of the United States (Germany). Hence, for all the European countries the foreign price index is that of Germany while for all the other countries, we use consumer prices in the United States.

[10] For most countries in the sample, the index used is industrial production. However, for some countries (the commodity exporters) an index of output of primary commodities is used.

[11] This indicator, recently used by Calvo and Mendoza (1996), captures to what extent the liabilities of the banking system are backed by international reserves. Since, in the event of a currency crisis, individuals may rush to convert their domestic currency deposits into foreign currency, this ratio captures the ability of the central bank to meet those demands.

[12] As in the case of the real exchange rate, interest rates in the home country are compared with interest rates in the United States (Germany) if the domestic central bank pegs the currency to the dollar (Deutsche mark).

the other hand, exchange rate-based inflation stabilization plans have often given rise to large cumulative real exchange rate appreciations, as domestic inflation fails to converge to international levels. As noted in Reinhart and Végh (1995), many of those plans have ended in a balance-of-payments crisis. Following the crash, the real exchange rate depreciates to about its "tranquil" period average and oscillates around that level during the post-crisis period.

The large real appreciation of the domestic currency before the crises is, not surprisingly, accompanied by a deterioration in the performance of exports, as shown in the next panel. By the time the crisis is underway, export growth is about 20 percent below the growth observed in normal periods. Once the appreciation is reversed, export performance improves dramatically, in effect outperforming the performance during tranquil periods about nine months after the crisis began. The behavior of imports is more difficult to justify on the basis of relative price developments. Import growth falls well below that observed during tranquil periods about a year before the crisis; possibly, this may be due to the slowdown in economic activity (see below) during that time. Indeed, import growth remains below that of normal periods throughout the post-crisis period.

The next two panels provide evidence on external shocks and economic activity before and aft er the crises. The first panel shows the evolution of the terms of trade. Crises are preceded, on average, by a deterioration of the terms of trade, with an annual decline that is about 10 percent deeper than those observed in "tranquil" times. The deterioration of the terms of trade is reflected in economic activity, as shown in the next panel, through a decline in output. The evidence that output usually contracts in advance of balance-of-payments crises provides some support for models in which devaluations are triggered by the government's desire to offset negative output shocks. However, these devaluations may move the economy to a bad equilibrium as nominal wage-growth expectations erode competitiveness and make devaluations more frequent. As Obstfeld (1994) indicates, models in which the government cannot precommit to a fixed exchange rate can engender multiple equilibria, in which a sudden shift in market sentiment regarding the government's willingness to tolerate unemployment can trigger a devaluation that would not have occurred under different private expectations. The economic contraction deepens for months following the crisis. Despite a recovery in the terms of trade, as late as a year-and-a-half following the crisis, production growth remains below that of tranquil times.

The next two panels show the evolution of the monetary aggregates. The first panel shows the growth rate of M1 before and after the crises. The months preceding the crises are

characterized by a highly expansionary monetary policy, providing additional support for the traditional models of balance-of-payments crises. After the crisis, the growth rate of Ml declines significantly; the decline notwithstanding, the growth rate of Ml remains well above those observed in "tranquil" times during the months following the crisis. The slowdown perhaps reflects that large devaluations and balance-of-payments crises were followed, in some cases, by stabilization attempts, which combine fiscal austerity with a contraction in monetary policy. For a discussion of this issue, see Kaminsky and Leiderman (1996), who examine the stabilization programs of Argentina, Israel, and Mexico in the 1980s.

The second panel shows the evolution of the ratio of M2 (in U.S. dollars) to foreign exchange reserves of central banks. With a fixed or nearly fixed exchange rate regime, it is reasonable to expect that the monetary authority must stand ready to back some substantial portion of the monetary base (as is required with a currency board). If the banking sector has a large stock of highly liquid short-term debt, as is the case in most of the countries in the sample, the central bank may have to stand ready to cover some portion of the broader monetary aggregates as well. This is because the possibility of a devaluation may lead to a flight away from domestic-currency-denominated assets into dollar-denominated assets, with the consequent loss of reserves of the monetary authority.[13] As Calvo and Mendoza (1996) observe for Mexico during 1994, the M2/reserves ratio indicates an abrupt decrease in the backing-ratio in the months preceding the crisis, with growth rate of 70 percent in excess of those recorded during "tranquil" periods, indicating the heightened vulnerability of the system. Following the crisis, the recovery in reserves and the slowing in monetary growth bring this ratio back to levels observed during non-crisis periods.

The next panel shows the 12-month percentage change in foreign exchange reserves of the central banks. As expected, reserves fall substantially in the months prior to the crises. Although we report 12-month changes, which introduces positive serial correlation in the data, reserves do not decrease continuously. There are short-lived reversals in the path followed by reserves, which suggests that the central banks may have had spells in which they fought the reserve loss with contractionary monetary policy before finally conceding defeat and devaluing. Following the devaluation, foreign exchange reserves of central banks

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[13] If the banking system also holds foreign-currency denominated debt and if the banking sYstem `` perceived as sound, the perspective of a balance-of-payments crisis need not imply a massive loss of reserves of the central bank due to bank runs (this issue is discussed at length in Rojas-Suarez and Weisbrod (1995)). In principle, banks would face a drop in the demand for deposits in domestic currency and a rise the demand for foreign-currency -denominated deposits . In this case, the central bank should stand ready to back up only the monetary base. In contrast, if the banking sector is perceived as weak, a balance-of-payments crisis would generate a run against the domestic currency –the central bank may end up backing Ml or even M2.

start to increase again, albeit, at growth rates that remain below those recorded in "tranquil" periods as late as nine months following the crisis.

Finally, the last panel shows the evolution of interest rate differentials. The high (relative to normal periods) interest differentials observed immediately before the crisis could be a sign that monetary policy was tightened, in order to stem reserve losses, or it could be the result of a rise in the risk premia. The extent to which the runup in interest rates makes the crises self-fulfilling, as in Calvo (1995) and Obstfeld (1994) and (1996), remains an open question. After the crises, interest rate differentials narrow, although these remain above those observed during normal time.

To summarize, there is a clear Indication that balance-of-payments crises are preceded by recessions or, at least, below "normal" growth in economic activity. This is consistent with the finding by Eichengreen, Rose, and Wyplosz (1995) that the unemployment rate is higher in the period immediately before the crisis. The weakness of the economy may be, in part, attributable to a worsening of the terms of trade and to an overvalued exchange rate; exports are particularly hard hit. Monetary policy turns significantly more expansionary (on average) only about half a year before the crisis, suggesting that the slump in economic activity may make central banks more attentive to domestic objectives, compromising the exchange rate target. The financial vulnerability of the economy increases sharply as the crisis approaches and the unbacked liabilities of the banking system climb.

2. Banking Crises

As noted, banking crises proliferate in the 1980s and 1990s and were not limited to developing countries. However, it is true that banking crises have had a more lasting effect on developing countries, perhaps due to the orders of magnitude involved. For example, the fiscal cost of the U.S. savings and loans crisis reached approximately 4 percent of GDP (in 1990 dollars) and the loan losses of banks in the Nordic countries in 1991-1992 amounted to 5 to 7 percent of GDP. However, these figures pale in comparison with the fiscal cost of the banking crisis that erupted in Venezuela in early 1994; estimates place the cost of the bailout at about 13 percent of GDP, even before another wave of banks were taken over in the second half of 1994. In this section we examine the macroeconomic environment leading up to and following financial crises. Some explanations of banking crises emphasize the role of the business cycle and adverse shocks, hence, many of the variables suggested by theory are also the ones stressed in explanations of balance-of-payments crises. We employ the following variables: the terms of trade, an index of production, the real exchange rate

and, foreign exchange reserves of the central bank, as in the balance-of-payments crises; we introduce a stock price index, banking credit to the private sector (in real terms), the money multiplier, M2 over the monetary base (M2/M0), real interest rates on deposits, and deposits at commercial banks. With the exception of the real interest rate and the real exchange rate, all variables are reported in annual growth rates (relative to "tranquil" times).

A. Stylized Facts

Figure 3 illustrates the behavior of the above-described variables 18 months before and after the beginning of the banking crises. The first four panels show several indicators that characterize the health of the economy around the time banking crises get underway. According to the asymmetric theory of banking crises, crises are most likely when bad news immediately follows a period of sustained high loan demand and sanguine expectations; at the cyclical peak, banks leverage is highest. Hence, an economic downturn, a decline in the terms of trade, or a stock market or real estate market crash will reduce the profitability of bank debtors, who in some cases will find themselves unable to service their debt. In these circumstances, good loans turn bad and a seemingly healthy banking industry crumbles. The data summarized in Figure 3 seems to support this explanation of events.

Output and the stock market peak about a year before the beginning of the banking crisis; the growth rates up to that point suggest a boom in activity over and beyond that observed in tranquil periods. The stock market also shows an exaggerated cycle (perhaps an asset-price bubble), with returns far exceeding those of non-crises periods. By the time the crisis begins, the growth in economic activity, is about 7 percentage points below growth rates in normal times (i.e., without banking crises). The beginning of the recession is also reflected in the stock market, which collapses the year before the crisis; this collapse is also apparent in other asset markets, most notably real estate (see Kaminsky and Reinhart (1996)). The stock market initiates a long and protracted decline.[14] A factor behind the slump in economic activity may well be the substantial real exchange rate appreciation (relative to normal times) that characterizes pre-crisis periods which, in turn, squeezes profit margins, eventually leading to increased bankruptcies, and deepening the economic contraction.

As shown in the next panel, banking crises are, indeed, preceded by lending booms (see also Gavin and Hausman (1995)), which may have been fueled by capital inflows and by

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14 The swing in stock Prices have been quite dramatic. For example, in the boom period leading up to the 1981 Argentine banking crisis, stock returns (in U.S. dollars) were as high as 813 percent during the 12 months ending May 1979; by May 1981, the 12-month capital loss was 60 percent.

financial liberalization. The boom in capital flows and lending occurs somewhat earlier than out 18-month window allowed here. Nonetheless, in the months just prior to the crisis credit growth remains above average. As in Goldfajn and Valdés (1995), the banking crisis may be fueled by a reversal of capital inflows, as reflected in the evolution of central bank foreign exchange reserves (next panel). It is generally at this point that the fragility of the banking sector reaches overwhelming proportions and major rescue packages are put together.

The next two panels show the evolution of the money multiplier and real interest rates. Until the 1970s most financial markets were highly regulated with rationed credits at very negative real interest rates and with small firms and households only able to obtain funds in expensive and unstable informal credit markets. The late 1970s and beginning of the 1980s witnessed dramatic financial reforms both in developed and emerging markets, which led to substantial increases in real interest rates (see Galbis (1993)). The sharp expansion in the money multiplier that precedes the crisis is usually the product of the reductions in reserve requirements that are usually part of the financial liberalization process. Most of the banking crises occurred after financial deregulation, which explains why real interest rates around the beginning of the banking crisis are about 1 percentage point (about 13 percentage points at an annual rate) above the average rate during normal times -most of them before financial deregulation. Naturally, high real interest rates also tell a tale of a central-bank-induced liquidity crunch, motivated perhaps by an attempt to defend the value of the domestic currency. High real interest rates, in turn, if sufficiently persistent may transform a fragile banking sector into a financial crisis.

The last panel shows the evolution of deposits at commercial banks. As recession leads to bankruptcies and bad loans portfolios for banks, depositors, worried about the solvency of the financial institutions, may begin to flee from some or ail the banks, which could threaten to destabilize the financial sector as a whole. For many countries in Latin America, the period following financial crises have been characterized by high inflation and massive capital flight, manifested in large part in the persistence of the contraction in bank deposits. Further, our chronology marks the beginning of the financial crisis, and history has shown that banking crises can be protracted phenomenon.

V. Final Remarks

In this paper we have analyzed the potential linkages between balance-of-payments and banking crises and described the macroeconomic background that characterize these episodes. The main conclusions we arrive at are:

First, with regard to the linkages among the crises, our analysis shows no apparent link between balance-of-payments crises and banking crises during the 1970s, when financial markets were highly regulated. In the 1980s and 1990s banking crises proliferate; in about half of the cases the banking crisis gets underway before the balance-of-payments crisis. While the issue of causality remains nebulous, knowing that there is a banking crisis underway helps to predict currency crises. We find very few instances of the causal pattern stressed by Stoker (1995), from the balance-of-payments crisis to the banking crisis. Indeed, knowing that there was a balance-of-payments crisis does not help "predict" a future banking crisis.

Second, most of the banking crises in our sample were preceded by financial liberalization; statistically, financial liberalization plays a significant role in explaining the probability of a banking crisis. This may be due to the fact that, judging from the literature reviewed in a related paper (Kaminsky and Reinhart (1996)), more often than not, liberalization came without an adequate regulatory and supervisory framework to accompany it. The increased risk-taking by banks on the wake of financial deregulation is often cited as a key cause of the banking problems. However, we should be cautious in interpreting this result, as it might also owe to selection bias, in that we only included countries that experienced crises. That is, the sample does not include countries that liberalized but did not have either banking or balance-of-payments crises.

Third, as to the stylized facts around the crises, some of our results confirm earlier studies, others are novel. Both domestic and external shocks appear to be at the root of crises. Recessionary conditions characterize the periods preceding both banking and balance-of-payments crises: economic activity is declining; the export sector is weakening; real interest rates are high and the stock market is sinking. On the monetary side, balance-of-payments crises appear to be preceded by falling foreign exchange reserves, accelerating money growth, and a rapid rise in the liabilities of the banking system not backed by international reserves. Credit expansions predate many of the banking crises; large increases in the money multiplier (usually a product of the liberalization process and reductions in reserve requirements) are evident on the eve of banking crises. External shocks also matter: terms-of-trade declines usually precede both crises; crises are often bunched in a given year or years suggesting the importance of other common shocks, such as international interest rates or contagion effects.

The results presented in this paper are a first step in evaluating the complex linkages between currency and domestic financial crises. Obviously, analyzing how the authorities deal and finance the banking problems and how the problems affect exchange rat e expect at ions will help determine whether a banking crises will lead to a balance-of-payments crisis. We

have only considered macroeconomic data in our list of indicators, but data of the health of bank balance sheets would be a logical complement to the macro data. Future analysis could evaluate the univariate and multivariate signaling properties of various macroeconomic time series and composite indices that may help detect when a crisis is coming. Lastly, events (such as a balance-of-payments crises in a neighboring country) may also help assess whether a crisis is brewing in the home front; hence, the role of contagion effects may warrant further empirical scrutiny.

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Appendix. The Chronology of Crises

Country	Financial Liberalization	Beginning of the Banking Crisis Date		Date	Severity Index	Beginning of Balance-of-Payments Crisis Events (if applicable)
Argentina				June, 1975	I 70	Commercial rate depreciated by 160 % exchange transactions were suspended
	1977	March, 1980	The failure of a large private bank (Banco de Intercambio Regional) led to runs on three other banks that had to be intervened soon thereafter	April, 1981		On April 2, the tablita stabilization plan was abandoned. The exchange rate was devalued by 30%.
		May, 1985	In early May the government closed a large bank, leading to large runs, which led the government to freeze dollar deposits on May 19.	July, 1982	1.49	Dual market intoduced; multiple devaluations amounting to about 136%.
		December, 1994	The Mexican devaluation led to a run on banks, which resulted in an 18% decline in deposits between December and March.	April, 1989	3.97	The dual exchange rate was unified.
				February, 1990	2.30	The currency was devalued bt 220%
Bolivia				November, 1982	3.59	Unification of dual exchange rate; the exchange rate was devalued by 354%.
				November, 19S3	1.55	Exchange rate was devalued by 155%.
				September, 198s	14.21	Exchange rate auctions introduced; the currency depreciated by 94%.
	198s	October, 19S7	The central bank liquidated two of twelve @ate commercial banks; seven more reported large losses			
Brad	1975		"	February, 1983	0.65	Exchange rate was devalued by 23%
		November, 1985	Three large banks. Comind, Maison Nave, and Auxiliar were taken over by the government	February, 1987	0.46	The Cruzado plan was abandoned and the exchange rate was floated.
				July, 1989	0.45	Exchange rate was devalued by 11%.
				November, 1990	0.53	Exchange rate was devalued by 35%.
		July, 1994	17 small banks were liquidated, 3 private banks intervened, and 5 state banks placed under sped administration.	October, 1991	0.57	Exchange rate was devalued by 38%.
Chile				December, 1971	0.29	Exchange transactions were suspended on December 6.
				August, 1972	0.59	Exchange rate was devalued by 38%.
				October, 1973	10.23	On September 30, the exchange rate was devalued by 1,306%,
				December, 1974	0.36	Exchange rate was devalued by 28%.
				January, 1976	0.23	Exchange rate was devalued by 21%,
	1974-1976	September, 1981	Three banks, which were finally intervened 2 months later, began to lose deposits.	June, 1982	0.26	on June 17, the tablita stabilization plan was abandoned. A devaluation of 0.8% per month was announced. Two months later the exchange rate was allowed to float.
				September, 1984	0.24	Exchange rate was devalued by 19%
Colombia						State of economic emergency declared for 45 days.
	1980	July, 1982	Banco Nacional becomes the first of 6 major banks and 8 finance companies to be intervened	March, 1983		The rate of crawl was accelerated by 5% in March and again in April. The black market premia hit a historic high.
				February, 198S	0.07	

Source: Kaminsky and Reinhart (1996)

Appendix. The Chronology Of Crises

Country	Financial Liberalization	Beginning of the Banking Crisis		Beginning of Balance-of-Payments Crisis		
		Date	Events	Date	Severity Index	Events (if applicable)
Denmark				May, 1971	0.04	A speculative attack results in reserve losses of 23% in April and 12% in May,
				June, 1973	0.06	The currency was devalued by 6%.
				November, 1979	0.05	EMS parities increased; implied devaluation of 4.8%.
Finland	Early 1980s	March, 1987	The collapse of two small banks shook the banking system and led to moves to curb bank lending	August, 1993	0.07	on August 2 the intervention binds were widened from 2.25% to 15%
				June, 1973	0.09	The currency was devalued by 7%.
				October, 1982	0.11	On October 6, the exchange rate was depreciated by 4.2%; a week later it was depreciated by 5.7%.
	1982-1991	September, 1991	A large bank (Skophank) collapses on September 19 and is intervened	November, 1991	0.18	On November 15, the currency was devalued by 12.3%, following a temporary nod the previous day.
				September, 1992	0.21	On September 8, the peg to the ECU was discontinued and the currency was allowed to float.
Indonesia				November, 1978	0.52	on November 15, currency was devalued by 34%.
				April, 1983	0.49	On March 30, the currency was devalued by 28%.
				September, 1986	0.47	On September 12, the Currency was devalued by 31%,
	1983-1983	November, 1992	A large bank (Bank Summa) collapses and triggers runs on three smaller banks			
Israel				November, 1974	0.30	The currency was devalued by 43%.
				November, 1977	0.48	Currency allowed to float; depreciates by 50%.
				October, 1983	0.35	The currency was devalued by 20%.
				July, 1984	0.35	Foreign exchange transactions suspended for a day to permit changes in exchange controls.
Malaysia				July, 1975	0.07	
	1978-85	July, 1985	Runs against some branches of a large domestic bank, following the collapse of a related bank in Hong Kong			
Mexico	1974-			September, 1976	0.72	on September 1, the peso was allowed to float; in November banks and credit institutions forbidden to transact in foreign exchange.
		September, 1982	Government takes over the banks	February, 1982	0.82	On February 18, the currency was devalued by 75%.
				December, 1982	0.98	Foreign exchange market closed. Foreign currency deposits converted and controls imposed.
	1991	Late, 1992	Several financial institutions that held Ajustabonos were hurt by the rise in real interest rates in the second half of 1992	December, 1994	0.77	On December 19 the currency was devalued by 15%; two days later the currency was allowed to float

Source: Kaminsky and Reinhart (1996)

Appendix. The Chronology of Crises

Country	Financial Liberalization	Beginning of the Banking Crisis Events		Date	Severity Index	Beginning of Balance-of-Payments Crisis Events (if applicable)
Norway				June, 1973	0.06	The currency was devalued by 13%.
				February, 1978	0.09	On February 13, the currency was devalued by 8%.
				May, 1986	0.07	On May 12, the currency was devalued by 10.7%.
	1980-90	November, 1988	Two regional saving banks fail. The banks are eventually merged and the bailout begins.	December, 1992	0.08	On December 10, the peg to the ECU was discontinued and the currency was allowed to float
Peru				June, 1976	0.52	The currency was devalued by 44%. Suspension of convertibility.
	1991	April, 1983	Two large banks fail	October, 1987	0.33	The currency was devalued by 25%.
				September, 1988	4.00	
Philippines				February, 1970	0.38	Currency allowed to float and depreciated by 47%.
	1980-84	January, 1981	Commercial paper market collapses, triggering bank runs and the failure on nonbank financial intitutions and thrift banks.	October, 1983	38	Banks were required to sell their foreign exchange to the central bank. The authorities announced a moratorium on external debt.
				June, 1984	0.34	Banks were required to sell their foreign exchange to the central bank. The The currency depreciated by 29%.
				February, 1986	0.0	
Spain	Begins in 1974			February, 1976	0.12	On February 9 the currency was devalued by 13 %.
				July, 1977	0.31	Currency was allowed to float to a 20% depreciation.
		November, 978	Bank of Spain begins to rescue a number of the smaller banks	December, 1982	0.14	On December 4, the currency was devalued by 8%.
				September, 1992	0.16	Central rate of currency in the ERM devalued by 4.8% on September 17.
				May, 1993	0.12	Central rate of currency in the ERM devalued by 8% on May 13.
Sweden				August, 1977	0.13	Discontinued European common margins agreements; currency depreciated by 10%.
				September, 198	0.3	On September 14, the currency was devalued by 10% vs. a basket.
				October, 1982	0.17	On October 2, currency was devalued by 15.9%.
	1980-1990	November, 1991	The Swedish government rescues Nordbanken, the nation's second largest bank.	November, 1992	0.20	On November 19, the peg to the ECU was discontinued and the currency was allowed to float

Source: Kaminsky and Reinhart (1996).

Country	Financial Liberalization	Beginning of the Banking Crisis Events		Date	Severity Index	Beginning of Balance-of-Payments Crisis Events (if applicable)
Thailand				**November, 1978**	0.05	On November 1, the currency was allowed to float
		Early 1979	Following the stock market crash, one of the largest finance comppanies failed	**July, 1981**	n.10	Currency was devalued by 9%
	19s9-1990	**October 1983**	The bail-out of the financial sector began Large losses in a finance company lead to runs and government intervention	**November, 1984**	1).18	Currency was devalued by 15%
Turkey				**August, 1970**	n.63	On August 10, the currency was devalued by 67%
	1980 **December, 1983-June, 1987** Interest rate controls reimposed			**January, 1980**	1.09	The currency was devalued by 100%.
	1987	**January, 1991**	The start of the (half War led to massive withdrawals and a run on banks, prompting the government to guarantee all deposits.	**March, 1994**	n.39	On January 26, the central bank devalued the currency by 13%
Uruguay			Banco Mercantil fails			
		1971	A wave of bank mergers and bankruptcies developed, driven by high real interest rates	**December, 1971**	0.47	On November 30, exchange transactions were suspended; multiple exchange rates were introduced. On March 1, the exchange rate was devalued by 202%. Exchange rate allowed to float; exchange rate depreciated by 40%.
	1976-1979	**March 1981**	A large scale run on banks came on the wake of the Argentine devaluation, which marked the end of the Argentine tablita.	**November, 1982**	0.56	The tablita plan was abandoned and the exchange rate was allowed to float.
Venezuela	**1981**			**February, 1983**		Foreign exchange transactions were suspended, later followed by the suspension of convertibility.
	1984-January, 1989 Interest rate controls reimposed			**February, 1984** **December, 1986**	0.75 1.06	Effective depreciation of 74%. Effective depreciation of 93%.
				March, 1989	1.48	System of multiple exchange rates replaced by a float, lead@ to a 154Y0 depreciation.
	1989	**October, 1993**	Bank runs on the country's second largest bank (Banco Latino); on January 1994 the bank is closed	**May, 1994**	0.57	Following massive capital flight, exchange controls were imposed in June

Source: Kaminsky and Reinhart (1996).

Table 1
Linkages Between Financial Liberalization and Banking and BOP Crises

An Accounting Exercise

Interval Between Crises	Percent of BOP Crises Followed by Banking Crises			Percent of Banking Crises Followed by BOP Crises		
	Total	Financial Liberalization		Total	Financial Liberalization	
		Before	After		Before	After
12 months	3	1	1	24	4	20
36 months	13	3	10	56	12	44

Probit Estimates

Predicting BOP Crises

	Explanatory Variable	Coefficient	Standard Error	Significance
Regression 1	Financial Liberalization	-0.0211	0.0924	0.8195
	Banking Crises 12-months Prior	0.4353	0.1466	0.0030
Regression 2	Financial Liberalization	-0.0326	0.0935	0.7274
	Banking Crises 36-months Prior	0.2413	0.1157	0.0370

Note: The dependent variable takes on a value of one if there is a BOP crisis in that month and zero otherwise. The financial liberalization variable takes on a value of one if financial markets are deregulated and zero otherwise. The banking crises variable takes on a value of one if a banking crisis has occurred in the 12 (36) months prior to the current month and zero otherwise.

Predicting Banking Crises

	Explanatory Variable	Coefficient	Standard Error	Significance
Regression 1	Financial Liberalization	0.4425	0.1717	0.0099
	BOP Crises 12-months Prior	-0.2090	0.2363	0.3765
Regression 2	Financial Liberalization	0.4451	0.1718	0.0096
	BOP Crises 36-months Prior	-0.0322	0.1462	0.8255

Note: The dependent variable takes on a value of one if there is a banking crisis in that month and zero otherwise. The financial liberalization variable takes on a value of one if financial markets are deregulated and zero otherwise. The BOP crises variable takes on a value of one if a BOP crisis has occurred in the 12 (36) months prior to the current month and zero otherwise.

Figure 1

Number of Crises Per Year
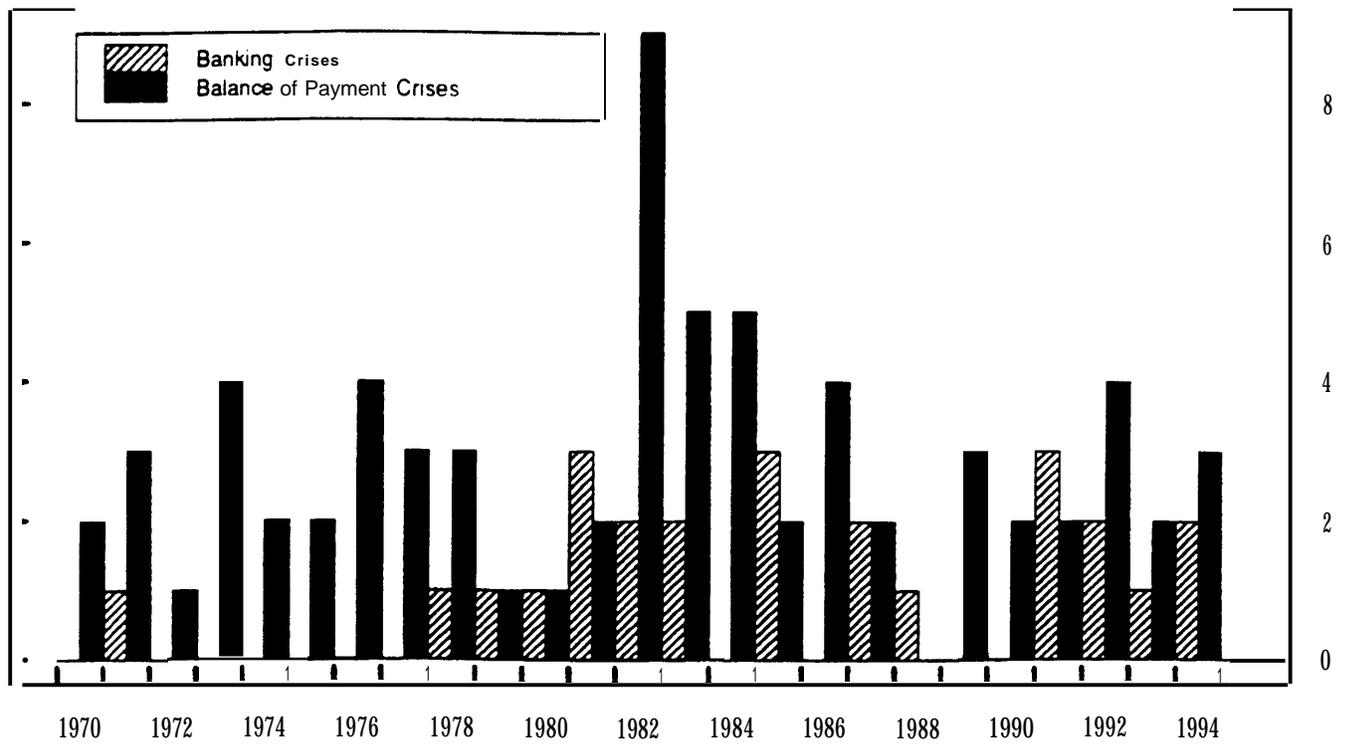
Number of Crises

	1970-1995		1970-1979		1980-1995	
	Total	**Average per Year**	**Total**	**Average per Year**	**Total**	**Average per Year**
BOP	71	2.73	25	2.5	46	2.88
Banking	25	0.96	3	0.3	22	1.38

Figure 2
Empirical Regularities During Balance of Payments Crises

Real Exchange Rate

Exports

Imports

Terms of Trade

Output

M1

M2/Reserves

Reserves

Interest Rate Differential
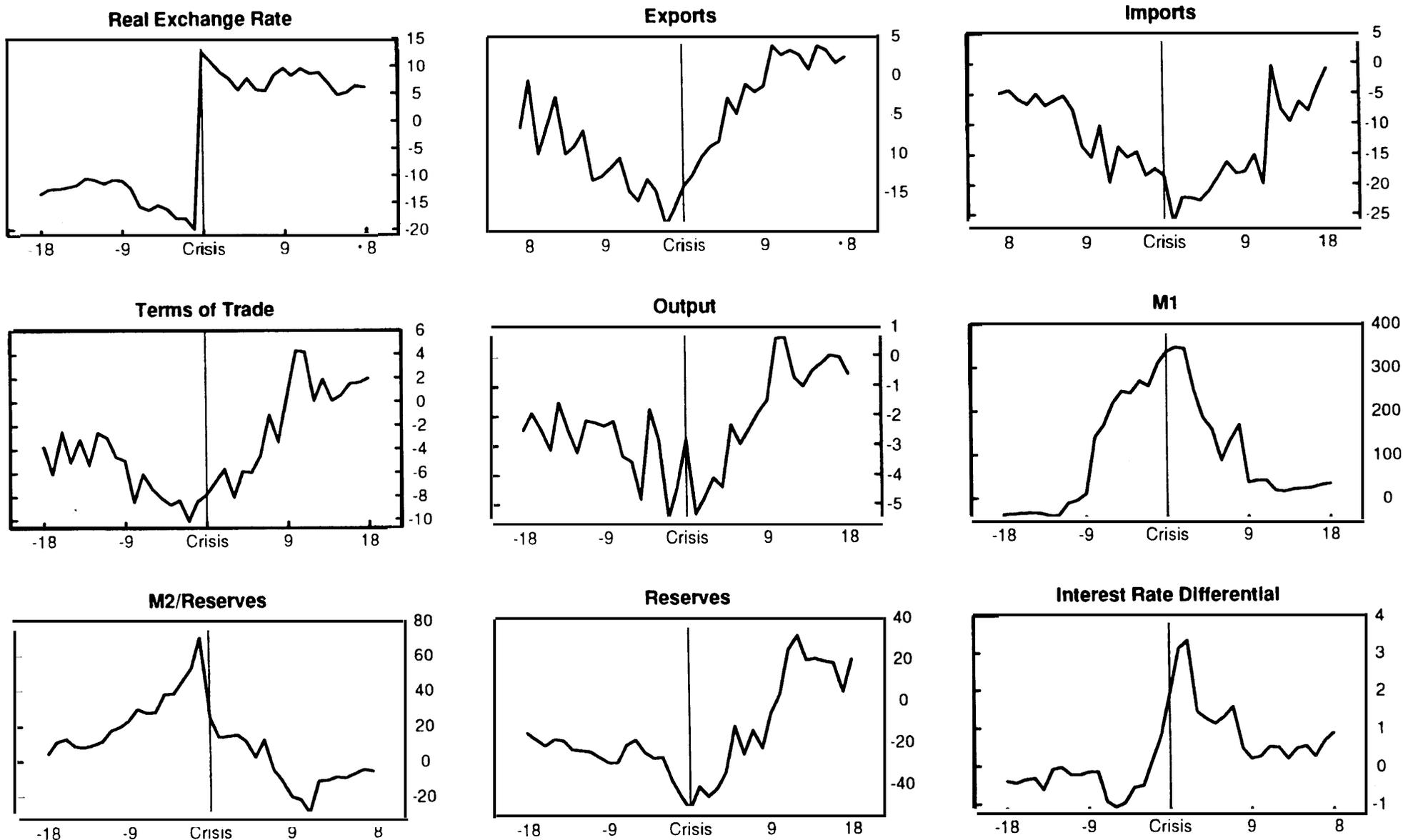
Note: The real exchange rate and the interest rate differentials are reported in levels while all other variables are reported in 12-month changes. All of them are relative to 't aoɾuil times. The vertical axes are in percent and the horizontal axes are the number of months.

Figure 3
Empirical Regularities During Banking Crises

Terms of Trade

Output

Stock Market

Real Exchange Rate

Real Domestic Credit

Reserves

M2 Multiplier

Real Interest Rate

Deposits
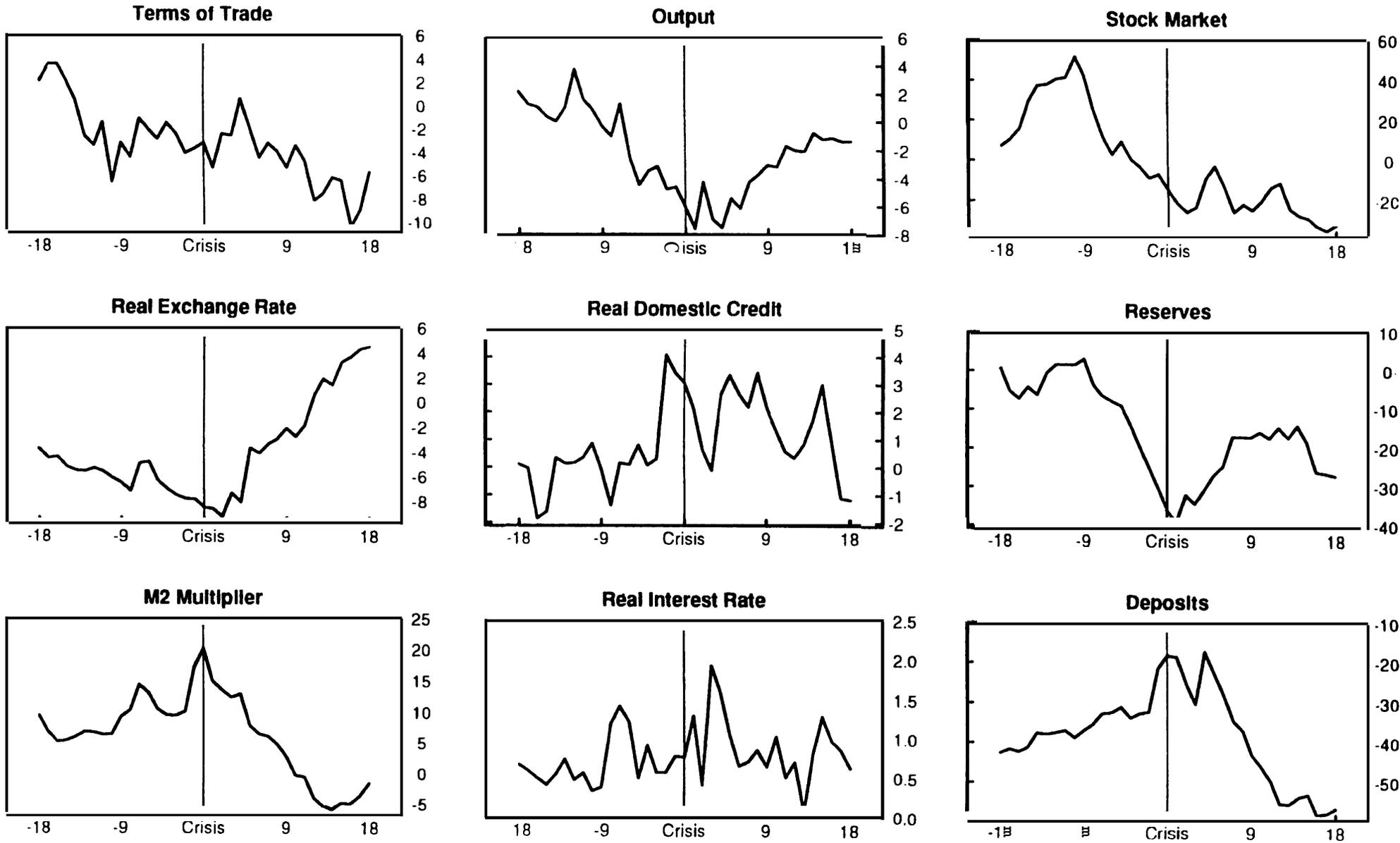
Note: The real exchange rate and the real interest rate are reported in levels while all other variables are reported in 12-month changes. All of them are relative to 'tranquil' times The vertical axes are in percent and the horizontal axes are the number of months.

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