University of California Berkeley

CENTER FOR INTERNATIONAL AND DEVELOPMENT ECONOMICS RESEARCH
Working Paper No. C96-062

Currency Crashes in Emerging Markets: Empirical Indicators

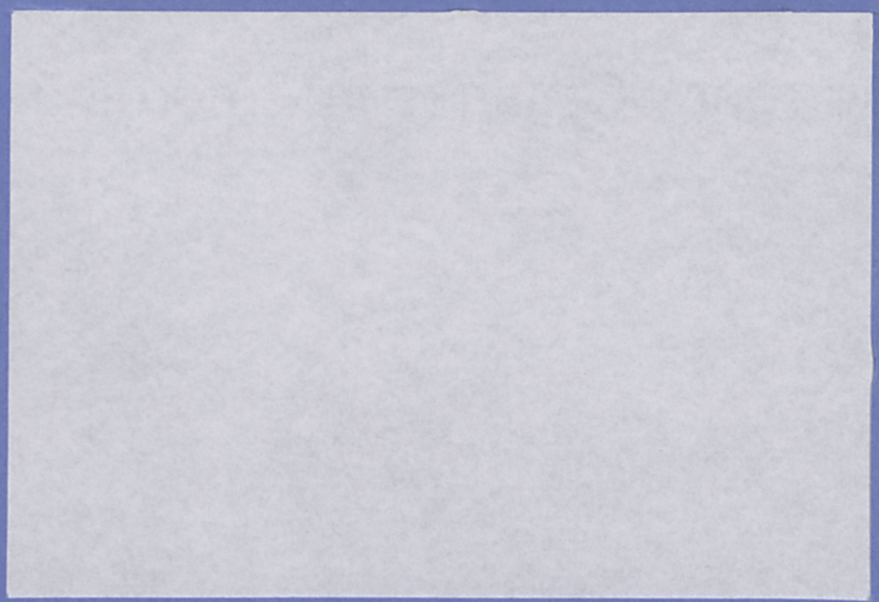
Jeffrey A. Frankel and Andrew K. Rose

January 1996

Department of Economics

CIDER

iber



CIDER

CENTER FOR INTERNATIONAL AND DEVELOPMENT ECONOMICS RESEARCH

The Center for International and Development Economics Research is funded by the Ford Foundation. It is a research unit of the Institute of International Studies which works closely with the Department of Economics and the Institute of Business and Economic Research. CIDER is devoted to promoting research on international economic and development issues among Berkeley faculty and students, and to stimulating collaborative interactions between them and scholars from other developed and developing countries.

INSTITUTE OF BUSINESS AND ECONOMIC RESEARCH

Richard Sutch, Director

The Institute of Business and Economic Research is an organized research unit of the University of California at Berkeley. It exists to promote research in business and economics by University faculty. These working papers are issued to disseminate research results to other scholars.

Individual copies of this paper are available through IBER, 156 Barrows Hall, University of California, Berkeley, CA 94720. Phone (510) 642-1922, fax (510) 642-5018.

UNIVERSITY OF CALIFORNIA AT BERKELEY

Department of Economics

Berkeley, California 94720-3880

CENTER FOR INTERNATIONAL AND DEVELOPMENT
ECONOMICS RESEARCH
Working Paper No. C96-062

Currency Crashes in Emerging Markets: Empirical Indicators

Jeffrey A. Frankel and Andrew K. Rose

January 1996

Key words: exchange rate, developing, panel, data, debt, composition, macroeconomic
JEL Classification: F32, F34

Frankel is Professor of Economics in the Economics Department at the University of California, Berkeley, and Director of the NBER's International Finance and Macroeconomics program. Rose is Associate Professor and Chair of Economic Analysis and Policy in the Haas School of Business at the University of California, Berkeley, a Research Associate of the NBER, and a Research Fellow of the CEPR. For comments, we thank: Andrew Atkeson, Marvin Goodfriend, Enrique Mendoza, John Rogers, Julio Santaella, Ralph Tryon, Carlos Vegh, seminar participants at the International Finance Division of the Board of Governors of the Federal Reserve System, conference participants at the Center for International Economics Conference on Speculative Attacks in the Global Economy and two anonymous referees. We also thank Bill Easterly, Barry Eichengreen, Jon Faust, and Alan Stockman for discussion and encouragement. This work is part of a project for the International Finance Division of the International Economics Department of the World Bank, whom we thank for research support. The STATA 4.0 data set and programs are available upon receipt of two formatted 3.5" diskettes and a self-addressed, stamped mailer in the year after publication.

Abstract

We use a panel of annual data for over one hundred developing countries from 1971 through 1992 to characterize currency crashes. We define a currency crash as a large change of the nominal exchange rate that is also a substantial increase in the rate of change of nominal depreciation. We examine the *composition* of the debt as well as its *level*, and a variety of other macroeconomic factors, external and foreign. Crashes tend to occur when: output growth is low; the growth of domestic credit is high; and the level of foreign interest rates is high. A low ratio of FDI to debt is consistently associated with a high likelihood of a crash.

I: Introduction

Are currency crashes in developing countries all the result of similar policy mistakes? Or are they instead the result of myriad unfortunate shocks? Can they be predicted *ex ante* with standard economic indicators? Do different countries *ex post* react to crashes in similar fashion, or do the policy responses vary by country and over time? In short: *Are currency crashes all alike?*

The objective of this study is to look at a large sample of developing country experiences, and to arrive at a broad-brush statistical characterization of currency crashes. It is not an attempt to formulate or test specific theories of what causes these crashes. Some may have been caused by idiosyncratic shocks that are better viewed as bad luck than anything else. Others may have resulted from poor fundamentals or poor policy. We examine a variety of potential causes of crashes, especially those that add to a country's vulnerability to a crash. We also look at some effects of currency crashes.

We classify the variables in which we are interested into four categories: 1) *foreign* variables like northern interest rates and output; 2) *domestic macroeconomic* indicators, such as output, monetary and fiscal shocks; 3) *external* variables such as over-valuation, the current account and the level of indebtedness; and 4) the *composition* of the debt. We focus particularly on the last set of variables, as they have attracted increased interest in the aftermath of the 1994 Mexican crash. Our work is non-structural, and takes the form of univariate graphical analysis and multivariate statistical analysis.

In section II, we discuss our definition of a currency crash. We look at the variables to be analyzed in section III. Section IV is the heart of the paper. It analyzes the movements of our variables around the time of currency crashes using both univariate graphical techniques and a multivariate statistical approach.

II: The Definition of a Currency Crash

We define a "currency crash" as a nominal depreciation of the currency of at least 25 per cent that is also at least a 10 per cent increase in the rate of depreciation. (Santaella (1995) provides a complimentary approach that analyzes the conditions surrounding IMF financial arrangements in developing countries, while Kaminsky and Reinhart (1995) provide related work on the relationships between banking and balance of payments crises.)

Four conceptual issues immediately arise. First, should currency crashes be limited to episodes that end in a large fall in the value of the currency? Second, how big a change in the exchange rate is needed to qualify? Third, how should the exchange rate be measured? Fourth, how does one deal with high-inflation countries that routinely undergo large changes in the exchange rate?

Eichengreen et. al. (1995) define a currency *crisis* to include both the large depreciations that we consider here, and also speculative attacks that are successfully warded off by the authorities. They make the idea of an unsuccessful speculative attack operational by searching for sudden falls in reserves and/or increases in interest rates. Since we focus on developing countries in this paper, it is much more difficult to identify successful defenses against speculative attacks. Reserve movements are notoriously noisy measures of exchange market intervention for almost all countries. In addition, few of our countries have market-determined short-term interest rates with long histories. The standard defenses against speculative attacks -- interest rate hikes and reserve

expenditures -- may also be less relevant in these countries than sudden tightening of reserve requirements, emergency rescue packages from the IMF or other foreign institutions, and especially the imposition of formal or informal controls on capital outflows. It is extremely difficult to measure such policy actions, and we leave this task to future researchers. While extending the analysis to take account of pre-emptive devaluations and successful defenses is important, it may also be of intrinsic interest to look at successful attacks.

We define a currency crash as a decrease in the value of the local currency of at least 25 per cent. This cut-off point is clearly arbitrary. Sensitivity analysis (not reported here) has assured us that the exact figure is not important.

The third question is how the exchange rate should be measured. We use the change in the natural logarithm of the nominal bilateral dollar exchange rate (multiplied by 100). Until the 1970s, devaluations were discrete changes in the exchange rate, which were easily identified *ex post*. However, developing countries have more recently taken advantage of more flexible exchange rate arrangements, including crawling pegs, target zones, and even gliding bands. This forces us to use a technique that can accommodate a diverse set of underlying exchange rate regimes. Also, many of the countries we consider use the U.S. dollar to define their exchange rate (not only Latin American, but East Asian as well[1]). Hence our use of a simple statistical criterion using dollar bilateral rates.

---

1 Frankel and Wei (1994).

The fourth question is how to deal with countries that meet our first criterion -- changes in the exchange rate of 25 per cent or more -- year after year. These are countries with high inflation rates and correspondingly high *expected* rates of depreciation. To ensure that we do not consider each of these depreciations to register as an independent crash, we require that the change in the exchange rate, not only exceed 25 per cent, but exceed the previous year's change in the exchange rate by a margin of at least 10 per cent. We also define a three-year "window" around crashes, as explained below.

III: The Variables of Interest

As noted, we group the domestic variables into four categories: *internal domestic macroeconomic* variables, factors pertaining to the level of international indebtedness and other *external* variables, those pertaining to the *composition* of the debt stock, and *foreign* variables.

Macroeconomic Indicators

The academic literature on "speculative attacks" is relevant to our analysis, even though empirical tests are as yet rather meager, and largely limited to currency crises among industrialized countries.

Krugman (1979) is the classic theoretical model of currency crises as speculative attacks. The original paper assumed that the pre-crisis regime was literally a fixed exchange rate, but the model has been extended to crawling pegs (Connolly, 1986) and currency bands (Krugman and Rotemberg, 1991). The speculative attack model delivers

several factors that should be important in predicting currency crashes: monetary and fiscal expansions, declining price competitiveness, current account deficits, and losses in international reserves.

While some of the predictions of these models have been borne out empirically, some speculative attacks have taken place without large apparent monetary and fiscal imbalances. The response has been a "second generation" of multiple-equilibrium models which generate self-fulfilling attacks; Eichengreen, Rose and Wyplosz (1995) provide a review. These models tend to focus on political factors, such as the political cost of high unemployment or foregone output that result from a tough defense against a speculative attack.

We examine six variables relevant to the speculative attack literature: the rate of growth of domestic credit (a measure of monetary policy), the government budget as a fraction of GDP (a crude measure of fiscal policy), the ratio of reserves to imports, the current account as a percentage of GDP, the growth rate of real output, and the degree of over-valuation.[2]

External Variables

External variables are critical to our analysis. We use the ratio of debt to GNP as our primary measure for the level of international debt. We also use the ratio of foreign

---

2 We would like to have better measures of political stability, but are hampered by the data. The data also constrains us from including: the unemployment rate; *ex post* changes in the terms of trade; and the *ex ante* variability of export prices.

exchange reserves to monthly imports, the ratio of the current account to GDP, and the real exchange rate (which measures competitiveness) as additional measures of vulnerability to external shocks.[3] All have been widely used in the literature

Debt Composition

The composition of both capital inflows and the stock of debt has received much attention recently. Relevant indicators include Foreign Direct Investment (FDI) vs. portfolio flows, long-term vs. short-term portfolio capital, fixed-rate vs. floating-rate borrowing, and domestic-currency vs. foreign-currency denomination. These variables are a central focus of this study.

The hypothesis regarding *Foreign Direct Investment* is that FDI is a safer way to finance investment than is portfolio investment. One argument is that FDI is directly tied to real investment in plant, equipment and infrastructure; whereas borrowing can go to finance consumption. Borrowing to finance consumption does not help add to the productive capacity necessary to generate export earnings to service the debt in the future. But FDI funds may be fungible; an FDI surplus in the capital account is no guarantee of high investment.

The stronger argument in favor of FDI is that of stability. In the event of a crash, investors can suddenly dump securities and banks can refuse to roll over loans, but

---

3 A variety of other ratios have also been proposed in the literature as proxies for the level of the debt burden. These include: the interest/output ratio; the debt/export ratio; the interest/export ratio; the debt service/export ratio; and the current account/export ratio.

multinational corporations cannot quickly pack up their factories and go home. Chuhan et. al. (1995) provide empirical analysis supportive of this view. Yet this argument has been questioned. Dooley *et. al.* (1995) have found that a high level of FDI seems to be associated with *higher* variability in capital flows, not lower. This probably reflects multinational corporations moving money in and out of the country, through transfers between subsidiary and parent, with greater ease than can be done outside the corporate walls. It makes the FDI hypothesis worth testing.

Two relevant aspects of the composition of capital inflows are the fraction of debt which is *concessional* and the fraction that comes from *multilateral development banks.* In both cases, the capital is both easier to service and far less likely to depart quickly in times of trouble than is the case for private market-rate debt. Indeed, the inflows from these sources may even increase when there is a crash.

Within portfolio capital, the *maturity structure* is perhaps the most important of the composition issues, followed closely by the question of *variable-rate arrangements.* In the high-inflation 1970s, there was a worldwide shift toward shorter maturities and towards nominal interest rates that were indexed to short-term interest rates such as LIBOR to protect creditor. The debt crisis that erupted in 1982 was clearly exacerbated by the fact that so much international debt was tied to short-term nominal interest rates. In the Mexican crash of 1994, the problem took the form of a heavy concentration of short-term debt, which describes the tesobonos as well as the CETES and ajustobonos. This not only raised the cost of borrowing in line with U.S. interest rate increases in 1994, but also resulted in difficulties associated with rolling over the debt later on. In other

words, short maturities apparently pose problems of default risk above and beyond those problems of interest rate risk that they share with floating-rate debt; Cole and Kehoe (1995) provide more analysis. Both composition questions, short-term vs. long-term and floating-rate vs. fixed-rate, seem worth investigating.

We are also interested in the distinction between securities sales and commercial bank borrowing. Syndicated commercial bank loans were the preferred vehicle of international finance in the 1970s, but the 1982 crisis changed that. In the 1990s, their place has been largely been taken by portfolio managers and institutional investors buying stocks and bonds (as was the norm before W.W.II). Some have argued that crashes in the 1990s are likely to be far less costly to the borrowing countries than was the crisis of the 1980s, because countries need no longer deal with banks to the same degree. Also, equities are a more efficient vehicle for risk-sharing than either loans or conventional bonds. With equities, unlike bonds or bank loans, the cost of the obligation does not stay fixed when the ability of the country to earn export revenue falls.

Foreign Variables

It is critical to look not only at individual country variables, but at the global financial environment as well. Global variables potentially include world economic activity, commodity prices, real interest rates, and other financial market shocks. The debt crisis of 1982, and subsequent debtor devaluations, were to a large extent triggered by the tight northern monetary policy which resulted in high interest rates and a global recession.

It is quite striking that most of the econometric studies that were undertaken in 1993-94 on the causes of renewed large capital inflows to Latin America and East Asia in the early 1990s concluded that external factors were a major cause, perhaps *the* major cause. Calvo, Leiderman and Reinhart (1993, p. 136-137) found that "foreign factors account for a sizable fraction (about 50 per cent) of the monthly forecast error variance in the real exchange rate...[and]...also account for a sizable fraction of the forecast error variance in monthly reserves." They warned that "The importance of external factors suggests that a reversal of those conditions may lead to a future capital outflow." Chuhan, Claessens and Mamingi (1994) estimated that U.S. factors explained about half of portfolio flows to Latin America, though they explained less than country factors in the case of East Asia. Fernandez-Arias (1994) found that the fall in U.S. returns was the key cause of the change in capital flows in the 1990s. Dooley, Fernandez-Arias and Kletzer (1994), studied the determinants of the increase in secondary debt prices among 18 countries since 1986 and concluded that "International interest rates are the key underlying factor." The steep rise in American interest rates during 1994 constituted a test of the warning which most of these studies had carried [explicitly or implicitly], that an adverse shift in world financial conditions could lead to an abrupt halt to the inflows and a new crisis on the order of 1982.

In this paper, we focus on two important foreign variables: short-term northern interest rates and real OECD output growth.[4]

---

4 We have added both the level and the percentage change in the IMF's Developing Country Commodity Price Index, but neither is ever significant.

The Data Set

Most of our data set was extracted from the 1994 World Bank's *World Data* CD-ROM (the exact definitions are tabulated in Appendix 1). It consists of annual observations from 1971 through 1992 for one hundred and five countries.[5] The sample was selected, with respect to choice of both country and time, to maximize data availability. However, numerous observations are missing for individual variables. We checked the data via both simple descriptive statistics and graphical techniques. We have also used exchange rates and interest rates from the IMF's *International Financial Statistics* CD-ROM, and aggregate real output from the OECD.

We examine seven different characteristics of the *composition* of capital inflows or the debt. Each is expressed as a percentage of the total stock of external debt. The variables are: 1) the amount of debt lent by commercial banks; 2) the amount that is concessional, 3) the amount that is variable-rate; 4) the amount that is public sector, 5) the amount that is short-term; 6) the amount lent by multilateral development banks (this

---

5 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.

includes the World Bank and regional development banks, but not the International Monetary Fund; and 7) the flow of Foreign Direct Investment (FDI) expressed as a percentage of the debt stock.

As measures of vulnerability to external shocks, we examine: 1) the ratio of total debt to GNP; 2) the ratio of reserves to monthly import values; 3) the current account surplus (+) or deficit (-) expressed as a percentage of domestic output; and 4) the degree of overvaluation. We define the latter simply as the deviation from Purchasing Power Parity, and measure the latter as the country-specific average bilateral real exchange rate over the period in question.

For macroeconomic purposes, we examine: 1) the total government budget surplus (+) or deficit (-), again, expressed as a percentage of GDP; 2) the domestic credit growth rate; and 3) the growth rate of real GDP per capita.

Finally, we use the percentage growth rate of real OECD output (in American dollars, at 1990 exchange rates and prices) as our measure of northern demand. We construct the "foreign interest rate" as the weighted average of short-term interest rates for the United States, Germany, Japan, France, the United Kingdom and Switzerland; the weights for the debtor in question are proportional to its fractions of debt denominated in the relevant currencies.[6] There is a good deal of heterogeneity by country (within-year) in foreign interest rates. However, they generally move together, rising in the mid-1970s, the early 1980s and the early 1990s.

---

6 We use IFS line 60b, money market interest rates. Using lending rates (IFS line 60l) does not change any results.

IV: Results

Event Study Methodology

We begin our investigation by characterizing the behavior of countries suffering from a currency crash. Our methodology is that used by Eichengreen, Rose, and Wyplosz (1995).

As noted, we define a crash as an observation where the nominal dollar exchange rate increases by at least 25% in a year and has increased by at least 10% more than it did in the previous year. We exclude crashes which occurred within three years of each other to avoid counting the same crash twice.

Our definition of a currency crash yields 117 different crashes (74 crashes are deleted because of the three-year "windowing.) These are spread over a large number of countries, but have a slight tendency to be clustered in the early-to-mid 1980s. Thus the observations probably should not be treated as independent observations. The actual crashes are tabulated in Appendix 2.

Non-crash observations that are not within three years of a crash constitute a sample of "tranquil" observations (some of these observations occur in countries that never had a crash throughout the sample under study). We use these as a control sample, and compare behavior around crash episodes with behavior during periods of tranquility.

The figure is a set of sixteen "small multiple" graphics, each an "event study" of the sort used in finance. Each of the graphics portrays the movement in a variable of interest beginning three years before the crash and continuing through the crash (marked by a

vertical bar) until three years afterwards. Thus, the "seeds" of crashes can be examined, along with their aftermath. The averages for periods of tranquility are explicitly marked with a horizontal line, making it easy to compare behavior around crashes to that during more "typical" periods of tranquility.[7] The scales of individual panels are not comparable across variables, nor is the sample size (because of data availability problems). Mean values are provided, along with a band delimiting plus and minus two standard deviations.[8]

A graphical approach like this has disadvantages. The graphs are informal. More importantly, they are intrinsically *univariate*. They encourage readers to examine individual variables by themselves, whereas the norm in econometrics is to look at the marginal contribution of each variable conditional on the others.

But graphical methods also have advantages. They impose no parametric structure on the data, and impose few of the assumptions that are sometimes necessary for statistical inference or estimation but are frequently untenable. This is especially appropriate in a non-structural exploration of the data. They are often more accessible and informative than tables of coefficient estimates. For these reasons, we use our graphs cautiously. We also verify our ocular analysis with more rigorous statistical techniques, using probit models estimated with maximum likelihood to check our results.

---

7 A +/- 2σ confidence interval for the tranquil mean is ticked on the ordinate, centered around the tranquil mean.

8 These may not represent well-defined confidence intervals, given the issue of potential non-independence.

Graphical Analysis

The results in the figure are essentially as hypothesized. Countries experiencing currency crashes tend to have: high proportions of their debt lent by commercial banks (compared, as always, to tranquil observations), high proportions of their debt on variable-rate terms and in short maturities; and relatively low fractions of debt that are concessional, lent by the multilateral organizations or lent to the public sector. Crash countries tend to experience disproportionately small inflows of FDI (i.e., relatively high "hot money" portfolio) flows.

Foreign interest rates tend to be high in the period preceding currency crashes, exceeding tranquil foreign interest rates by over one percentage point. This corroborates the commonly-held view that foreign interest rates are an important source of currency crashes. Also, northern growth is much lower in the periods around crashes.

Countries experiencing crashes also tend to have currencies that are over-valued by over ten per cent. Unsurprisingly, debt burdens for crashing countries are high and rising. International reserves are also low and falling. Thus, external conditions for crashing countries are generally weak. There is one important exception. While the current account is in deficit, this deficit is small (compared with tranquil observations) and shrinking. Curiously enough, the government budget situation is very similar to that of the current account; small shrinking deficits which do not vary significantly from times of tranquility.

Our negative results on the current account and fiscal side are in striking contrast with the literature. They are especially interesting in light of the strong results we find

elsewhere on the domestic macroeconomic side. For instance, domestic credit growth is noticeably high, consistent with the classic speculative attack model.

Most variables (except, trivially, the real exchange rate) tend to move very sluggishly in the years surrounding currency crashes.[9] This leads one to expect that it will be difficult to predict the exact timing of a currency crash with precision. The notable exception is the growth rate of real output per capita, which dips significantly (in both the economic and statistical senses) below the tranquil norm in the year of the crash. Of course, the direction of causality is unclear (especially at the annual frequency) since the crash may be precipitated in part by slow growth, but may also itself induce recession. The flow of FDI varies dramatically across episodes immediately after the crash.

Regression Analysis

The "event study" analysis is both naive and intrinsically univariate. More confirmation can be provided by simple regression work. In particular, we estimate probit models linking our binary crash measure to our variables.

We have seven debt-composition regressors, each expressed as percentages of total debt: 1) commercial bank debt; 2) concessional debt; 3) variable-rate debt; 4) short-term debt; 5) FDI; 6) public sector debt; and 7) multilateral debt. Our list of external variables includes: 1) the ratio of international reserves to monthly imports; 2) the current account as a percentage of GDP; 3) the external debt as a percentage of GNP; and 4) real

---

9 Any revaluation effects on trade flows appear to be small.

exchange rate divergence (over-valuation). As domestic macroeconomic variables, we include: 1) the government budget as a percentage of GDP; 2) the percentage growth rate of domestic credit; and 3) the percentage growth rate of real output per capita. We also include the foreign interest rate and the northern growth rate, in percentage points.

We use a multivariate model where all the variables are employed simultaneously. Throughout, we pool all the available data across both countries and time periods, and estimate probit models using maximum likelihood. Combining the effects of the variables together into a single model reduces the sample size dramatically.

Our benchmark results are tabulated in the middle of Table 1. Since probit coefficients are not easily interpretable, we report the effects of one-unit changes in regressors on the probability of crash (expressed in percentage points), evaluated at the mean of the data. We also tabulate the associated z-statistics which test the null hypothesis of no effect. Diagnostic statistics follow at the bottom of the table, including actual and predicted crash cross-tabulations, and joint hypothesis tests for the significance of debt composition, external, macroeconomic, and all effects.

Most of the debt composition variables do not have statistically significant coefficients, though some (like the concessional variable) are close to significant. The somewhat weak results are probably the result of multicollinearity among our long list of different debt characteristics.[10] The coefficients for commercial bank and public sector

---

10 We have experimented with factor analysis, and found that a single factor accounts for much variation in the debt composition variables.

proportions of debt are inappropriately, though insignificantly signed. We also note that the proportion of short-term debt has an insignificant effect on crash incidence. On the other hand, the proportion of external debt accounted for by FDI is consistently strongly and significantly associated with crash incidence; a fall in FDI inflows by one percent of the debt is associated with an increase in the probability of a crash by .3%. The debt composition variables have a weak but non-negligible effect on crash incidence overall.

Interestingly, neither the current account nor the budget deficit has the predicted sign, though neither effect is statistically significant at conventional levels (consistent with the graphical results). But the external effects exert a strong and sensible influence on the likelihood of crash incidence. Higher debt, lower reserves, and a more over-valued real exchange rate all seem to raise the odds of crash incidence. Each of these effects have marginally significant individual effects that are jointly significant.

The domestic macroeconomic effects are quite strong. High domestic credit growth and a recession both coincide with an increased probability of a crash.

Finally, increases in northern interest rates increase the likelihood of a crash by an amount that is both statistically and economically significant. A one percentage point increase in the foreign interest rate raises the probability of a crash by over one percent, holding all other influences constant. But Northern real output growth has little effect on crash likelihood, once other effects have been taken into account.

On the right-hand side of Table I, we tabulate analogous results in which all the regressors are lagged. This amounts to a crude test of the ability of the regressors to predict crashes, *precisely* one year in advance.[11]

Interestingly enough, the results are mostly stronger than those in the contemporaneous regression. The joint effects of debt composition, external, and internal effects are now all significant. Low fractions of debt which is either concessional or accounted for by FDI or a high fraction which is public-sector, all raise the probability of a future crash. Low reserves and over-valuation are also crash predictors, as are high foreign interest rates or high domestic credit growth.

Sensitivity Analysis

Table 2 performs a variety of robustness checks. The first reports the results of weighted estimation, where the weights are proportional to real output per capita. Using weights proportional to the actual exchange rate jump does not significantly change our benchmark results. The second performs the estimation only on Latin countries; the third analyzes only post-1982 data. Our reports are somewhat sensitive to the exact way in which the data are used for estimation. But our most important results come through relatively clearly. Low FDI flows, high domestic credit growth, low output growth and

---

11 A more satisfying way to examine the predictive power of the model would be to examine the intensity of the future expectations of a crash.

high foreign interest rates are all associated with currency crashes. Current account and budget deficits remain insignificant determinants of crash incidence.

Table 3 provides more sensitivity analysis. Three perturbations of the model are examined. The first replaces the foreign interest with interactive effects between the level of foreign interest rates and such domestic variables as the debt/output ratio, the variable-rate proportion of debt, and the short-term proportion of debt. Only the product of the interest rate with the debt/GDP ratio is statistically significant. Its effect seems sensible: it is the *combination* of high indebtedness and an increase in world interest rates that is particularly lethal.

A second perturbation involves adding a variable to reflect the "currency exposure" of debtors to fluctuations in the exchange rates among the dollar, yen, franc and other major currencies. We defined the currency exposure variable for a given debtor to be a weighted average of the changes in the dollar exchange rates of the major currencies, where the weights were the shares of that debtor's liabilities denominated in the currencies in question. Thus a country with a heavy share of yen-denominated debt would show a high vulnerability in a year when the yen appreciated sharply against the dollar. The currency exposure variable enters the regression with high statistical significance, but the wrong sign. This result is dominated by the yen/dollar exchange rate: countries with a lot of debt denominated in the ever-appreciating yen did better in the sample than others. East Asian countries have the heavy share of yen debt, and have probably done well for other reasons, so our finding may be spurious.

A third check adds continent dummy variables. None of the important results is affected.

To sum up: our major results appear not to depend strongly on the exact econometric methodology we employ.

V: Summary and Conclusion

Much of the literature on speculative attacks focuses on a few episodes. In this paper we search for the stylized facts associated with currency crashes -- large currency depreciations -- in a broad group of emerging markets. We use annual data from over one hundred developing countries and over two decades.

Our empirical results stem from a non-structural investigation of the data, and mostly come from a grossly over-parameterized statistical model. Thus we eschew structural interpretations. Nevertheless, we find that currency crashes can be characterized in what appears to be a sensible way. Crashes tend to occur when FDI inflows dry up, when reserves are low, when domestic credit growth is high, when northern interest rates rise, and when the real exchange rate shows over-valuation. They also tend to be associated with sharp recessions, though the causal linkages are very unclear. Curiously, neither current account nor government budget deficits appear to play an important role in a typical crash.

We think of this as an encouraging starting point for future research.

References

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, no.1, March, pp.108-150.

Chuhan, Punam, Stijn Claessens and Nlandu Mamingi (1994) "Equity and Bond Flows to Latin America and Asia: The Role of Global and Country Factors," World Bank mimeo.

Chuhan, Punam, Gabriel Perez-Quiros and Helen Popper (1995) "International Capital Flows: Do Short-Term Investment and Direct Investment Differ?" World Bank mimeo.

Cole, Harold L. and Timothy J. Kehoe (1995) "Self-Fulfilling Debt Crises" mimeo.

Connolly, Michael B. (1986) "The Speculative Attack on the Peso and the Real Exchange Rate," *Journal of International Money and Finance* 5, supplement, 117-130.

Dooley, Michael, Eduardo Fernandez-Arias, and Kenneth Kletzer (1994) "Recent Private Capital Inflows to Developing Countries: Is the Debt Crisis History?" NBER WP No. 4792.

Edwards, Sebastian (1988) *Exchange Rate Misalignment in Developing Countries*, Johns Hopkins University Press, Baltimore.

Edwards, Sebastian (1994) "Real and Monetary Determinants of Real Exchange Rate Behavior: Theory and Evidence from Developing Countries," Chapter 3 in *Estimating Equilibrium Exchange Rates*, J. Williamson, ed., Institute for International Economics, Washington, DC.

Eichengreen, Barry, Andrew Rose and Charles Wyplosz (1995) "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks," *Economic Policy*.

Fernandez-Arias, Eduardo (1994) "The New Wave of Private Capital Inflows: Push or Pull?" *Policy Research Working Paper* 1312, Debt and International Finance Division, International Economics Department, The World Bank, June.

Frankel, Jeffrey, and Shang-Jin Wei (1994) "Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian Economies" in *Macroeconomic Linkages: Savings, Exchange Rates, and Capital Flows, NBER - East Asia Seminar on Economics, Volume 3*, Takatoshi Ito and Anne Krueger, editors, University of Chicago Press, Chicago.

Kaminsky, Graciela, and Carmen Reinhart (1995) "The Twin Crises" IMF mimeo.

Krugman, Paul (1979) "A Model of Balance of Payments Crises," *Journal of Money, Credit and Banking* 11, 311-325.

Krugman, Paul, and Julio Rotemberg (1991) "Speculative Attacks on Target Zones," in P. Krugman and M. Miller, eds. *Target Zones and Currency Bands*, Oxford University Press, Oxford.

Obstfeld, Maurice (1994) "The Logic of Currency Crises," *Cahiers Economiques et Monetaires*, Banque de France, Paris, 189-213.

Santaella, Julio A. (1995) "Four Decades of Fund Arrangements: Macroeconomic Stylized Facts before the Adjustment Programs" IMF WP/95/74.

Table 1: Probit Estimates

	Default		Predictive	
	$\delta F(x)/\delta x$	|z|	$\delta F(x)/\delta x$	|z|
Comm'l Bank/Debt	-.07	0.57	.03	0.21
Concessional	-.10	1.74	**-.14**	2.10
Variable Rate	.03	0.21	- .03	0.22
Short Term	.04	0.34	.23	1.97
FDI/Debt	**-.33**	2.88	**-.31**	2.47
Public Sector/Debt	.11	1.32	**.19**	2.18
Multilateral/Debt	-.03	0.46	-.06	0.81
Debt/GNP	.03	1.33	-.04	1.71
Reserves/Imports	**-.01**	1.99	**-.01**	3.39
Current Account	.10	1.03	.02	0.22
Over-Valuation	.05	1.51	**.08**	2.53
Gov't Budget	.27	1.90	.16	1.06
Domestic Credit	**.13**	4.78	**.10**	3.24
Growth Rate	**-.38**	3.13	-.16	1.29
Northern Growth	.55	0.98	-.85	1.50
Foreign Interest	**1.27**	4.50	**.80**	2.60
Sample Size	803		780	
Pseudo-R2	.20	P-Val	.17	P-Val
Ho: Slopes=0; $\chi 2(16)$	93.6	.00	81.2	.00
Ho: Debt Effects=0; $\chi 2(7)$	14.2	.05	25.5	.00
Ho: External Effects=0; $\chi 2(4)$	8.8	.07	16.5	.00
Ho: Macro Effects=0; $\chi 2(3)$	32.9	.00	12.3	.01
Ho: Foreign Effects-0; $\chi 2(2)$	21.5	.00	15.4	.00

Probit slope derivatives (x100, to convert into percentages) and associated z-statistics (for hypothesis of no effect). Slopes significantly different from zero at the .05 value in bold.
Model estimated with a constant, by maximum likelihood.
Predictive Model lags all regressors one year.

Default Model: Goodness of Fit

	Tranquility	Crash	Total
Predicted Tranquility	727	65	792
Predicted Crash	6	5	11
Total	733	70	803

Predictive Model: Goodness of Fit

	Tranquility	Crash	Total
Predicted Tranquility	707	64	771
Predicted Crash	4	5	9
Total	711	69	780

Table 2: Robustness

	Weighted		Latin		Post '82	
	δF(x)/ δx	|z|	δF(x)/ δx	|z|	δF(x)/ δx	|z|
Comm'l Bank/Debt	.21	1.71	.03	0.14	.03	0.13
Concessional	.03	0.47	-.09	0.49	-.16	1.68
Variable Rate	.07	0.49	.15	0.62	-.16	0.73
Short Term	.77	5.43	**-.50**	2.20	.20	0.99
FDI/Debt	**-.90**	3.57	-.68	1.52	**-1.36**	2.47
Public Sector/Debt	**.84**	8.08	.26	1.77	.21	1.29
Multilateral/Debt	-.26	2.78	-.27	1.53	-.02	0.22
Debt/GNP	**-.13**	4.55	-.01	0.19	-.05	1.41
Reserves/Imports	**-.02**	5.90	-.00	0.14	-.00	0.26
Current Account	-.13	1.22	.35	1.18	-.05	0.26
Over-Valuation	.03	0.92	-.06	0.68	.10	2.01
Gov't Budget	-.17	0.87	.42	1.15	.42	1.54
Domestic Credit	-.03	1.13	**.13**	2.92	**.23**	4.50
Growth Rate	-.16	1.30	-.68	2.73	**-.72**	3.52
Northern Growth	**.90**	2.78	-.41	.42	-.41	0.32
Foreign Interest	.72	3.12	1.35	2.32	1.48	1.65
Sample Size	803		198		369	
Pseudo-R2	.43	**P-Val**	.40	**P-Val**	.25	**P-Val**
Ho: Slopes=0; χ2(16)	229.7	.00	63.1	.00	63.5	.00
Ho: Debt Effects=0; χ2(7)	87.2	.00	13.4	.06	11.1	.13
Ho: External Effects=0; χ2(4)	39.2	.00	4.9	.30	5.2	.27
Ho: Macro Effects=0; χ2(3)	3.5	.33	17.4	.00	29.9	.00
Ho: Foreign Effects-0; χ2(2)	14.9	.00	6.8	.03	2.7	.26

Probit slope derivatives (x100, to convert into percentages) and associated z-statistics (for hypothesis of no effect).
Model estimated with a constant, by maximum likelihood.
Slopes significantly different from zero at the .05 value are in bold.

Table 3: Sensitivity Analysis

	δF(x)/ δx	|z|	δF(x)/ δx	|z|	δF(x)/ δx	|z|
Comm'l Bank/Debt	-.08	0.56	-.09	0.76	-.02	0.19
Concessional	-.11	1.94	-.09	1.58	-.06	1.31
Variable Rate	-.10	0.54	.06	0.48	.00	0.13
Short Term	.23	1.04	.07	0.62	.05	0.53
FDI/Debt	**-.31**	2.79	**-.30**	2.85	**-.22**	2.81
Public Sector/Debt	.13	1.48	.11	1.37	.08	1.20
Multilateral/Debt	.00	0.05	-.03	0.53	-.02	0.53
Debt/GNP	**-.16**	2.86	.03	1.43	.02	1.13
Reserves/Imports	**-.01**	2.02	-.01	1.73	-.00	1.28
Current Account	.14	1.38	.10	1.01	.09	1.24
Over-Valuation	.05	1.45	.04	1.30	.04	1.58
Gov't Budget	**.42**	2.83	.24	1.84	.17	1.72
Domestic Credit	**.14**	5.09	**.12**	4.61	**.09**	4.52
Growth Rate	**-.40**	3.21	**-.41**	3.54	**-.26**	2.97
Northern Growth	.42	.75	.47	.90	.30	0.76
Foreign Interest			**.66**	2.25	**.88**	4.33
Foreign Interest*Short Term	-.02	.91				
Foreign Interest*Variable Rate	.01	0.90				
Foreign Interest*Debt/GNP	**.02**	3.77				
Currency Exposure			**.62**	3.95		
Africa					**91.**	5.55
Asia					**95.**	5.16
Latin America					**98.**	5.13
Sample Size	803		803		803	
Pseudo-R^2	.21	**P-Val**	.23	**P-Val**	.21	**P-Val**
Ho: Slopes=0; $\chi 2(16)$	101.3	.00	110.4	.00	60.1	.00
Ho: Debt Effects=0; $\chi 2(7)$	13.4	.06	28.6	.00	13.2	.07
Ho: External Effects=0; $\chi 2(4)$	13.0	.01	7.5	.11	7.3	.12
Ho: Macro Effects=0; $\chi 2(3)$	37.3	.00	33.9	.00	28.9	.00
Ho: Foreign Effects-0; $\chi 2(2)$	25.8	.00	5.1	.08	20.4	.00

Probit slope derivatives (x100, to convert into percentages) and associated z-statistics (for hypothesis of no effect). Slopes significantly different from zero at .05 in bold. Model estimated with a constant, by maximum likelihood.

Appendix 1: Variable Definitions

Commercial Bank Debt: (World Data mnemonic "DT DOD DCBK CD")

Concessional Debt: (World Data mnemonic "DT DOD ALLC CD")

Variable Rate Debt: (World Data mnemonic "DT DOD VTOT CD")

Public Sector Debt: (World Data mnemonic "DT DOD PUBC CD")

Total Debt: (World Data mnemonic "DT DOD DECT CD")

Short Term/Total Debt: (World Data mnemonic "DT DOD DSTC ZS")

Multilateral/Total Debt: (World Data mnemonic "DT DOD MLAT ZS")

Foreign Direct Investment: (World Data mnemonic "BN KLT DINV CD")

Portfolio Investment: (World Data mnemonic "BN KLT PORT CD")

Debt/Annual Exports: (World Data mnemonic "DT DOD DECT BX")

Debt/GNP: (World Data mnemonic "DT DOD DECT GN")

Interest Payments/GNP: (World Data mnemonic "DT INT DECT GN")

Reserves/Monthly Imports: (World Data mnemonic "FI RES TOTL BM")

International Reserves: (World Data mnemonic "FI RES TOTL CD WB")

Current Account/GNP: (World Data mnemonic "BN CAB XOTR ZS")

Government Deficit/Surplus: (World Data mnemonic "GV BAL OVRL CN")

Gross National Product: (World Data mnemonic "NY GNP MKTP CN")

Domestic Credit: (World Data mnemonic "FM AST DOMS CN")

GNP per capita: (World Data mnemonic "NY GNP MKTP KD 87")

Net Long Term Capital Flow: (World Data mnemonic "BN KLT XRSL CD")

Net Short Term Capital Flow: (World Data mnemonic "BN KST XRSL CD")

Average Interest Rate: (World Data mnemonic "DT INR DPPG")

Average Private Interest Rate: (World Data mnemonic "DT INR PRVT")

Lending Rate: (World Data mnemonic "FR INR LEND")

Debt Denominated in Dollars: (World Data mnemonic "DT COM USDL ZS")

Debt Denominated in Deutschemark: (World Data mnemonic "DT COM DMAK ZS")

Debt Denominated in Yen: (World Data mnemonic "DT COM JYEN ZS")

Debt Denominated in French Francs: (World Data mnemonic "DT COM FFRC ZS")

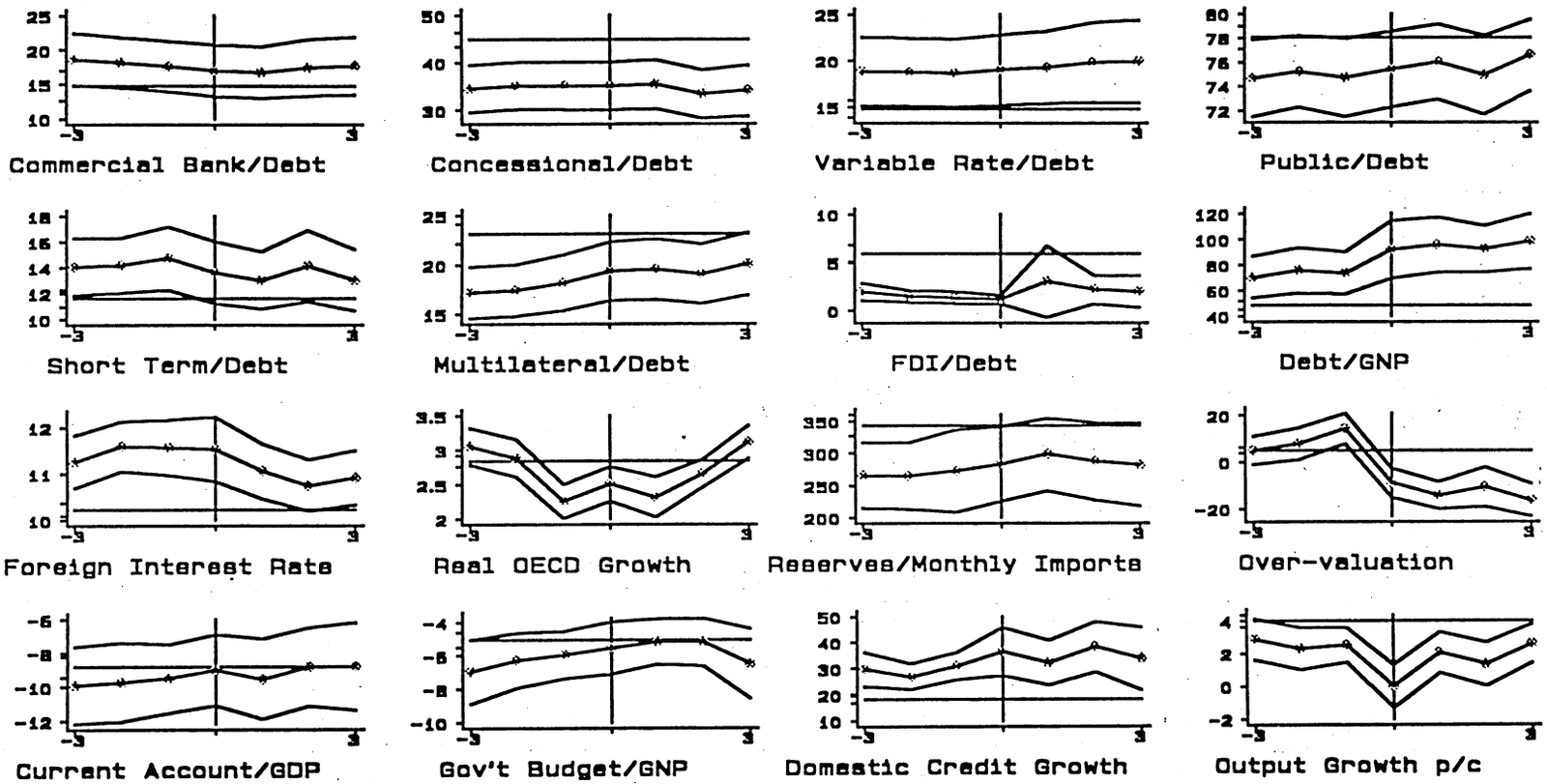
Debt Denominated in Pound Sterling: (World Data mnemonic "DT COM UKPS ZS")

Debt Denominated in Swiss Francs: (World Data mnemonic "DT COM SWFR ZS")

Appendix 2: Currency Crashes

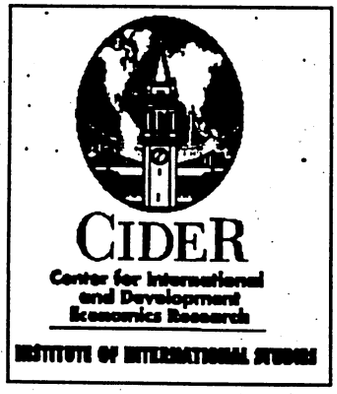
Argentina 1975	Argentina 1981	Argentina 1987
Burundi 1984	Benin 1981	Burkina Faso 1981
Bangladesh 1975	Bolivia 1973	Bolivia 1982
Brazil 1979	Brazil 1983	Brazil 1987
Brazil 1992	Bhutan 1991	Botswana 1985
Central African Republic 1981	Chile 1973	Chile 1982
Cote d'Ivoire 1981	Cameroon 1981	Congo 1981
Comoros 1981	Costa Rica 1981	Costa Rica 1991
Dominican Republic 1985	Dominican Republic 1990	Algeria 1991
Ecuador 1983	Egypt 1979	Egypt 1990
Ethiopia 1992	Gabon 1981	Ghana 1978
Ghana 1983	Guinea 1986	Gambia, The 1984
Guinea-Bissau 1984	Guinea-Bissau 1991	Equatorial Guinea 1981
Guatemala 1986	Guatemala 1990	Guyana 1987
Guyana 1991	Honduras 1990	Indonesia 1979
Indonesia 1983	India 1991	Jamaica 1978
Jamaica 1984	Jamaica 1991	Jordan 1989
Laos 1976	Laos 1980	Laos 1985
Lebanon 1984	Lebanon 1990	Sri Lanka 1978
Lesotho 1984	Morocco 1981	Madagascar 1981
Madagascar 1987	Maldives 1975	Maldives 1987
Mexico 1977	Mexico 1982	Mexico 1986
Mali 1981	Myanmar 1975	Malawi 1992
Niger 1981	Nigeria 1986	Nigeria 1992
Nicaragua 1979	Nicaragua 1985	Peru 1976
Peru 1981	Peru 1985	Philippines 1983
Paraguay 1984	Romania 1973	Romania 1990
Rwanda 1991	Sudan 1982	Sudan 1988
Senegal 1981	Sierra Leone 1983	Sierra Leone 1989
El Salvador 1986	El Salvador 1990	Somalia 1982
Somalia 1988	Sao Tome and Principe 1987	Sao Tome and Principe 1991
Swaziland 1984	Syrian Arab Republic 1988	Chad 1981
Togo 1981	Trinidad & Tobago 1986	Turkey 1978
Turkey 1984	Turkey 1988	Tanzania 1984
Tanzania 1992	Uganda 1981	Uruguay 1975
Uruguay 1983	Uruguay 1990	Venezuela 1984
Vanuatu 1981	Zaire 1976	Zaire 1983
Zaire 1987	Zaire 1991	Zambia 1983
Zambia 1989	Zimbabwe 1983	Zimbabwe 1991

Event: de>25%, de-de[-1]>10%. Tranquil Averages Marked.
Data from 105 LDCs, 1971-1992. Scales and Data Vary by Panel.



Mean plus two standard deviation band; all figures are percentages.

Movements 3 Years Before and After (117) Crashes



University of California, Berkeley

Center for International and Development Economics Research

Working Paper Series

The Center for International and Development Economics Research at the University of California, Berkeley is funded by the Ford Foundation. It is a research unit of the Institute of International Studies which works closely with the Department of Economics and the Institute of Business and Economic Research (IBER). Single copies of papers are free. All requests for papers in this series should be directed to IBER, F502 Haas Building, University of California at Berkeley, Berkeley CA 94720-1922; (510) 642-1922; e-mail bagdon@haas.berkeley.edu.

C93-022 "The Crisis in the EMS and the Transition to EMU: An Interim Assessment." Barry Eichengreen. September 1993.

C93-023 "Financial Links around the Pacific Rim: 1982-1992." Menzie David Chinn and Jeffrey A. Frankel. October 1993.

C93-024 "Sterilization of Money Inflows: Difficult (Calvo) or Easy (Reisen)?" Jeffrey A. Frankel. October 1993.

C93-025 "Is There a Currency Bloc in the Pacific?" Jeffrey A. Frankel and Shang-Jin Wei. October 1993.

C93-026 "Emerging Currency Blocs." Jeffrey A. Frankel and Shang-Jin Wei. October 1993.

C93-027 "The Implications of New Growth Theory for Trade and Development: An Overview." Pranab Bardhan. October 1993.

C93-028 "The Reconstruction of the International Economy, 1945-1960." Barry Eichengreen. November 1993.

C93-029 "International Economics and Domestic Politics: Notes on the 1920s." Barry Eichengreen and Beth Simmons. November 1993.

C93-030 "One Money or Many? On Analyzing the Prospects for Monetary Unification in Various Parts of the World." Tamim Bayoumi and Barry Eichengreen. November 1993.

C93-031 "Recent Changes in the Financial Systems of Asian and Pacific Countries." Jeffrey A. Frankel. December 1993.

C94-032 "Deja Vu All Over Again: Lessons from the Gold Standard for European Monetary Unification." Barry Eichengreen. January 1994.

C94-033 "The Internationalization of Equity Markets: Introduction." Jeffrey A. Frankel. April 1994.

C94-034 "Trading Blocs: The Natural, the Unnatural, and the Super-Natural." Jeffrey Frankel, Ernesto Stein and Shang-jin Wei. April 1994.

C94-035 "A Two-Country Analysis of International Targeting of Nominal GNP." Jeffrey A. Frankel and Norbert Funke. April 1994.

C94-036 "Monetary Regime Choices for a Semi-Open Country." Jeffrey A. Frankel. April 1994.

C94-037 "International Capital Mobility in the 1990s." Maurice Obstfeld. May 1994.

C94-038 "The Contributions of Endogenous Growth Theory to the Analysis of Development Problems: An Assessment." Pranab Bardhan. July 1994.

C94-039 "Political Stabilization Cycles in High Inflation Economies." Ernesto Stein and Jorge Streb. August 1994.

C94-040 "The Stability of the Gold Standard and the Evolution of the International Monetary System." Tamim Bayoumi and Barry Eichengreen. October 1994.

C94-041 "History and Reform of the International Monetary System." Barry Eichengreen. October 1994.

C94-042 "The Geography of the Gold Standard." Barry Eichengreen and Marc Flandreau. October 1994.

C94-043 "The Bretton Woods System: Paradise Lost?" Barry Eichengreen. October 1994.

C94-044 "The Intertemporal Approach to the Current Account." Maurice Obstfeld and Kenneth Rogoff. November 1994.

C94-045 "Two Cases for Sand in the Wheels of International Finance." Barry Eichengreen, James Tobin, and Charles Wyplosz. December 1994.

C95-046 "Speculative Attacks on Pegged Exchange Rates: An Empirical Exploration with Special Reference to the European Monetary System." Barry Eichengreen, Andrew K. Rose, and Charles Wyplosz. January 1995.

C95-047 "Is There a Safe Passage to EMU? Evidence on Capital Controls and a Proposal." Barry Eichengreen, Andrew K. Rose, and Charles Wyplosz. January 1995.

C95-048 "Exchange Rate Dynamics Redux." Maurice Obstfeld and Kenneth Rogoff. January 1995.

C95-049 Sterling in Decline Again: The 1931 and 1992 Crises Compared." Barry Eichengreen and Chang-Tai Hsieh. June 1995.

C95-050 "Trade and Growth in East Asian Countries: Cause and Effect?" Jeffrey A. Frankel, David Romer and Teresa Cyrus. June 1995.

C95-051 "A Survey of Empirical Research on Nominal Exchange Rates." Jeffrey A. Frankel and Andrew K. Rose. June 1995.

C95-052 "A Panel Project on Purchasing Power Parity: Mean Reversion Within and Between Countries." Jeffrey A. Frankel and Andrew K. Rose. June 1995.

C95-053 "European Integration and the Regionalization of World Trade and Currencies: The Economics and the Politics." Jeffrey A. Frankel and Shang-Jin Wei. June 1995.

C95-054 "Liberalized Portfolio Capital Inflows in Emerging Markets: Sterilization, Expectations, and the Incompleteness of Interest Rate Convergence." Jeffrey A. Frankel and Chudozie Okongwu. June 1995.

C95-055 "A Proposal to Introduce the ECU First in the East." Jeffrey Frankel and Charles Wyplosz. June 1995.

C95-056 "Fiscal Policy and Monetary Union: Federalism, Fiscal Restrictions and the No-Bailout Rule." Barry Eichengreen and Jurgen von Hagen. September 1995.

C95-057 "What Do Currency Crises Tell Us About the Future of the International Monetary System?" Barry Eichengreen and Charles Wyplosz. October 1995.

C95-058 "How Well Do Foreign Exchange Markets Function: Might a Tobin Tax Help?" Jeffrey Frankel. November 1995.

C96-059 "Regional Trading Arrangements: Natural or Super-Natural?" Jeffrey A. Frankel, Ernesto Stein, and Shang-Jin Wei. January 1996.

C96-060 "Recent Exchange Rate Experience and Proposals for Reform." Jeffrey A. Frankel. January 1996.

C96-061 "The World Over the Next Twenty-five Years: Global Trade Liberalization, and the Relative Growth of Different Regions." Jeffrey Frankel. January 1996.

C96-062 "Currency Crashes in Emerging Markets: Empirical Indicators." Jeffrey J. Frankel and Andrew K. Rose. January 1996.