Introduction

Currency and banking crises are potholes on the road to financial liberalization. It is relatively rare for them to cause the vehicle to break an axle — to bring the process of growth and liberalization to an utter and extended halt. But the flats they cause can result in significant losses of time and output and set back the process of policy reform. The output costs of both currency and banking crises can be a year or more of economic growth, and the resolution costs of banking crises have often been the equivalent of two or more years of GNP growth. As capital becomes increasingly mobile the severity and prevalence of these problems has grown, as amply demonstrated by recent experience in Asia, Latin America, and Europe.
There is no shortage of theoretical models of the causes and consequences of banking and financial crises. But in comparison, systematic empirical work has long been scarce. For the last several years, together, and with a number of collaborators, we have therefore been pursuing a research project which has attempted to reorient work on this subject in empirical directions.

In this note we review this empirical research on currency and banking crises. But unlike the typical NBER Reporter article, we also provide a critical review of related literature. In addition we offer some suggestions — and cautions — for future research.

Currency Crises

Contrary to the assumption of convenience made in some other recent writings, currency crises cannot be identified with changes in the exchange rate regime. Not all decisions to devalue or float the exchange rate are preceded by speculative attacks. More importantly, a central bank may successfully defend its currency against attack by using its international reserves to intervene in the foreign exchange market. Alternatively, it may discourage speculation against the currency by raising interest rates or forcing the government to adopt other

http://haas.berkeley.edu/~arose.


3 Recall, for example, the decision of the Taiwanese authorities in October 1997 to devalue their currency despite the absence of significant speculative pressure in the foreign exchange market, or the numerous EMS realignments undertaken in periods of tranquility before
austerity policies.

An innovation of our work has therefore been to construct empirical measures of speculative attacks. We measure speculative pressure as a weighted average of exchange rate changes, interest rate changes and reserve changes, where all variables are measured relative to those of a center country.\(^4\) Intuitively, speculative pressure can lead to a loss of reserves, be rebuffed by a rise in domestic interest rates, or be conceded by a depreciation or devaluation of the exchange rate.\(^5\) Speculative attacks or currency crises (we use the terms interchangeably), are then defined as periods when this speculative pressure index reaches extreme values.

With this distinction in mind, we have analyzed of the experience of more than twenty OECD countries, using data which stretches back to the late 1950s.\(^6\) We find that devaluations – as distinct from currency crises – have generally occurred after periods of overly expansionary

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\(^5\) Other empirical studies, which have failed to distinguish actual changes in exchange rates from speculative attacks, can therefore be subject to serious bias. Models like those of Lance Girton and Don Roper, “A Monetary Model of Exchange Market Pressure Applied to Postwar Canadian Experience,” *American Economic Review* 67, pp.537-548 can be used to derive the weights on the three elements of our speculative-pressure index. Given the limitations of the empirical literature on exchange rate determination, we instead choose weights on the basis of data characteristics, and undertake extensive sensitivity analysis.

monetary and fiscal policies. These expansionary policies lead to price and wage inflation, deteriorating international competitiveness, and weak external accounts. They occur when unemployment is high, as if governments are attempting to stimulate an economy in which unemployment has political and economic costs. But that stimulus leads to a loss of reserves, which jeopardizes exchange rate stability. There are some signs that governments react by adjusting policy in more restrictive directions in an effort to stem the loss of reserves. But in episodes that culminate in devaluation, these adjustments prove inadequate. Reserves continue to decline, eventually forcing the government to devalue the exchange rate. When devaluation finally occurs, it is accompanied by some monetary and fiscal retrenchment to reassure investors and render the new level of the exchange rate sustainable. As inflationary pressures fall, there is a sustained boost to competitiveness that helps to restore balance to the external accounts. This comes at the expense of sustained unemployment, and falling employment and output growth.

It is more difficult to generalize about currency crises. Put another way, devaluations are more predictable than speculative attacks. While there are signs that crises, like devaluations, are preceded by loose monetary policies and inflation, there is less sign of governments attempting to rein in their expansionary policies as the threat to the exchange rate develops. The

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7 That currency crises are more heterogeneous than devaluations and that their timing is difficult to predict is consistent with the conclusions of Rose and Svensson, who find that macroeconomic fundamentals are of relatively little use for explaining the credibility of exchange-rate parities. Eichengreen and Wyplosz also founds that fundamentals did not obviously predict the timing of the 1992 attack on the EMS. Andrew Rose and Lars Svensson, “European Exchange Rate Credibility Before the Fall,” *European Economic Review* 38 (1994), pp. 1185-1216; Barry Eichengreen and Charles Wyplosz, “The Unstable EMS,” *Brookings Papers on Economic Activity* 1, pp.51-144.
foreign exchange market intervention which occurs is sterilized (its potential effects on the domestic money supply are neutralized, and its effectiveness is therefore reduced). There are fewer signs of monetary and fiscal retrenchment in the wake of the event. The exchange rate changes that take place in response tend to be disorderly. They do not lead to the establishment of parities that are clearly sustainable. Indeed, the exchange rate is frequently floated rather than merely being devalued.

Thus, the failure of governments to adapt policy in a manner consistent with their exchange rate targets is at the heart of many currency crises. This points to the need to study political incentives and constraints on economic policy formulation. One approach is to build on the theory of optimum currency areas and ask whether economic characteristics of countries which make exchange-rate stability advantageous are in fact associated with extensive and concerted foreign-exchange market intervention.\(^8\) Another is to consider political considerations directly. We have tested whether speculative attacks are more likely to occur before or after elections and whether left- or right-wing governments are more susceptible to their effects. We also ask whether changes in government and changes in the finance minister help to explain speculative attacks. We find that these standard measures of political conditions are in fact only loosely linked to speculative attacks and devaluations, although there is some evidence that when a new government assumes office due to the electoral defeat of its predecessor, it feels relatively free to devalue the currency. On other occasions the finance minister is used as the sacrificial

lamb and assigned the blame for the unsuccessful defense. It is perhaps unsurprising that the evidence on political determinants of currency crises is less than definitive, since identifying them requires pinning down a number of separate effects — the effect of politics on economic policies, the effect of economic policies on expectations, and the effect of expectations on financial-market outcomes — each of which is elusive. Clearly, this is an important area for further work.

Theoretical models suggest that speculative attacks unfold differently in situations of high and low capital mobility. Our empirical work confirms this supposition. The presence of capital controls makes devaluations less likely and increases the likelihood that a government will be able to rebuff a speculative attack. In our empirical analysis, we have taken pains to control for the fact that capital controls are endogenous. Indeed, we find that controls are more likely to appear after the exchange rate has been devalued and to disappear after a failed attack.

Contagion

The Asian crisis has focused attention not just on the determinants of speculative attacks but also on contagion. We think of contagion as a tendency for a currency crisis somewhere in the world to increase the probability of a crisis in another country after controlling for the latter’s fundamentals. Some continue to question whether contagion exists, arguing that when several countries are attacked simultaneously this reflects not contagion but the fact that they all exhibit a weak underlying economic and financial position. Using our measure of currency crises, we

9 Charles Wyplosz, “Capital Controls and Balance of Payments Crises,” Journal of

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have considered this question in a series of recent papers. \cite{10} We do so by adding the incidence of crises elsewhere in the world to the standard domestic determinants of currency crises. The results strongly suggest that the existence of a currency crisis elsewhere in the world (whether it leads to a devaluation or not) raises the probability of an attack on the domestic currency by about eight per cent, even after taking into account a variety of domestic political and economic factors. This evidence is strikingly robust: a variety of tests and battery of sensitivity analyses confirm that a crisis abroad increases the probability of a speculative attack by an economically and statistically significant amount, even after controlling for economic and political fundamentals in the country concerned. This would appear to be the first systematic evidence of the existence of contagious currency crises.

How does the infection spread? One possibility is that attacks spread contagiously to other countries with which the subject country trades. In the presence of nominal rigidities, countries which devalue gain competitiveness at the expense of their trading partners. These competitors are therefore less likely to resist attacks and thus more likely to be attacked themselves. A second possibility is that attacks spread to other countries where macroeconomic and financial conditions are broadly similar, so that there is reason to suspect that the same underlying problems exist. We test these hypotheses by weighting our measure of contagion

(i.e., currency crises in other countries) by the importance of trade linkages, and, alternatively, by the similarity of macroeconomic policies and conditions. For our panel of 20 OECD countries, it turns out that contagion operating through trade is stronger than contagion as a result of macroeconomic similarities. When measures of both are included in the specification, trade-related contagion dominates. Moreover, our proxies for both trade-related contagion and macro-weighted contagion outperform a naive contagion measure (the simple existence of speculative attacks in other countries). We take this as confirmation that what our results are picking up is contagion per se and not just the effects of omitted environment factors common to the countries in question, although the latter may still be present. Admittedly, similarities in macroeconomic policies and performance across countries are more difficult to capture than the intensity of trade linkages; the stronger showing of trade-related contagion may simply reflect our greater success in proxying this effect. But, reassuringly, our OECD panel evidence has been confirmed by other investigators using cross-sectional evidence for OECD and developing countries.11

Future work needs to pay more attention to currency crises in emerging markets. Unfortunately, attempts to construct proper measures of exchange market pressure tend to be stymied by the absence of comparable interest-rate data for a large cross section of developing countries. It may be argued that the absence of relevant interest-rate data reflects the underdevelopment of the relevant financial markets, implying in turn that the authorities are not able to use the interest rate as an instrument for defending the currency. With this justification it is possible to construct a measure of currency crashes, either as a weighted average of exchange

11 Reuven Glick and Andrew Rose, “Contagion and Trade: Why Are Currency Crises
rate changes and reserve losses, or simply as large changes in the exchange rate. Analyzing the correlates of the latter measure suggests that currency crashes in developing countries are subject to many of same determinants as those in advanced industrial countries.\textsuperscript{12} Crashes tend to occur when the rate of growth of domestic credit is high and when output growth is slow, consistent with the behavior of industrial countries. In addition, emerging-market crashes are most likely when global interest rates are high and rising and when the share of foreign direct investment in total external debt is relatively low. A fall in FDI inflows by ten per cent of total debt is associated with an increase in the probability of a crash by 3 per cent. Still, there is much work to be done. For example, developing countries are much more likely to threaten or impose capital controls in the face of speculative attacks; they are also much more likely to receive IMF-lead bailout packages. Incorporating the effects of these factors remains an important topic in the research agenda.

\textbf{Banking Crises}

Compared to currency crises, far less empirical work of a systemic, cross-country comparative nature has been done on the causes and consequences of banking crises, especially in emerging markets.\textsuperscript{13} Our own work does, however, point to a number of regularities.\textsuperscript{14} We

\begin{thebibliography}{9}
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\bibitem{demirgucdetragiache} An important exception is Asli Demirguc-Kunt and Enrica Detragiache, “The Determinants of Banking Crises: Evidence from Developing and Developed countries,” IMF Working Paper 97/107 (September 1997).
\end{thebibliography}
find that the stage is set for banking crises by the interaction of fragilities in domestic financial structure and unpropitious global economic conditions. Our central finding is of a large, highly-significant correlation between changes in industrial-country interest rates and banking crises in emerging markets. We show that interest rates in the U.S., Europe and Japan tend to rise sharply and significantly in the year preceding the onset of banking crises. This result comes through strongly in univariate and multivariate analyses alike and is robust to changes in specification. There is also some evidence that the global business cycles and OECD growth in particular play an important role in the incidence of banking crises, with slowing growth in the advanced industrial countries being associated with the onset of crises. These results thus point to the role of external conditions in heightening the vulnerability of emerging markets to banking problems. There are also signs that real overvaluation and slow growth at home help to set the stage for bank crises, but the evidence is inconsistent with the notion that domestic macroeconomic problems provide the entire explanation for emerging-market banking crises. This is the precisely the same result found, of course, for emerging-market currency crashes.

In addition, our analysis confirms that banking crises can have quite severe, if short-lived, macroeconomic effects. The disruptions associated with a banking crisis cause output growth to decline by 2-3 per cent relative to the control group of non-crisis countries. That effect lasts only for a year, however; by the second post-crisis year, growth has recovered nearly to the levels typical of non-crisis developing countries.

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14 Barry Eichengreen and Andrew Rose, “Staying Afloat When the Wind Shifts: External
Back to Theory

These results provide some guidance as to what kind of theoretical models are likely to reward further study. The results for OECD countries suggest that models in which governments are reluctant to raise interest rates to defend the currency for fear of aggravating an already serious domestic unemployment problem are likely to have considerable relevance. The results for emerging markets — for example, that the share of FDI in foreign debt is associated with currency and financial stability — are consistent with the many models in which the maturity structure of the debt is an important determinant of vulnerability to currency and financial crises. And in turn, these conclusions point to the relevance of so-called “second-generation models” of currency and financial crises, where crises cannot simply be predicted on the basis of macroeconomic fundamentals like the stance of monetary and fiscal policy. Instead, crises are possible – but not necessary – when the economy enters a zone of vulnerability in which the authorities will be reluctant to use restrictive policies to defend the currency for fear of aggravating already-existing economic and financial fragilities. In such circumstances, attacks may occur if a sufficient number of currency traders coordinate on short-sales of a currency. We expect future theoretical work to continue this line of argument.


Misleading Indicators

Concern over the disruptive effects of currency and banking crises has led to the development of a considerable industry in which econometric models like these are used in a mechanistic attempt to predict currency and banking crises. Our work suggests that these exercises are subject to important criticisms. Devaluations and flotations are intrinsically heterogeneous from a theoretical perspective; they may be caused by the slow deterioration of macroeconomic fundamentals (as in “first generation” models), or they may result from self-fulfilling attacks. As a result, they defy generalization empirically, complicating efforts at prediction. Theoretical models have identified the kind of variables that can sap a government’s ability to defend itself and thereby rendered it vulnerable to attack; but the domestic considerations that governments weigh when contemplating a costly defense of the currency vary across time and country. High unemployment, weak economic growth, a fragile banking system, and large amounts of short-term debt may have rendered governments reluctant to hike interest rates in the past, but one could imagine in the future that a government will be concerned instead with the level of property prices, the solvency of a heavily indebted non-financial corporation, or some very different consideration.

Nor do these variables provide much guidance on when the attack will come. Whether speculators attack will depend not just on the weakness of the banking system or the level of

unemployment but on how much governments care about further aggravating these problems when deciding whether to defend the currency. The only thing more difficult to measure than governments’ resolve is investors’ assessment of it. And even if observers conclude that the currency peg is vulnerable, no one market participant is likely to be large enough by himself to build up the short position needed to exhaust the authorities’ reserves. For that to occur, multiple investors will have to coordinate their actions. Coordinating devices vary from case to case and generally elude prediction; both the French Referendum on the Maastricht Treaty and the Chiapas uprising were exceptional non-economic events. All in all, it is easy to understand why so many speculative attacks have come as surprises, even to the speculators themselves.\textsuperscript{18}

A close look at existing attempts to build early-warning systems underscores these points.\textsuperscript{19} These studies show that the estimated relationship between observable macroeconomic and financial indicators and the probability of large changes in exchange rates and reserves tends to be very sensitive to the sample of countries and the period for which the exercise is carried out. This belies the notion that there exist a single set of variables and a stable set of relationships on which crisis forecasting can be based. Since most attacks come as surprises, models which rely on time-series data tend always to predict “no crisis.”\textsuperscript{20} The models which perform best, in statistical terms, tend to be cross-sectional. They ask which countries were affected most

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\textsuperscript{18} IMF Working Paper no. 98/91 (June 1998).
\textsuperscript{19} Rose and Svensson (1994).
\textsuperscript{20} Another study which makes these points is Andrew Berg and Catherine Pattillo, “Are Currency Crises Predictable? A Test,” unpublished manuscript, International Monetary Fund, July 1998.

Indeed, suppose that forecasts of a country’s vulnerability trigger corrective policy actions which then prevent a crisis. In this case, the model would appear to forecast poorly, since
severely during episodes of speculative pressure, and rely on variables like reversals in the
direction of capital flows and sudden reserve losses. Such variables are properly regarded as
concurrent rather than leading indicators of currency crises; once this information is available,
the horse has left the barn. The same criticisms apply to models which rely for their predictive
power on the number of crises erupting in other countries in the current or immediately preceding
months.

None of this is to deny the value of statistical studies seeking to deepen our understanding
of past crises. But the success of future papers in explaining past crises does not mean that they
will necessarily succeed in predicting future crises. This creates a real danger that the policy
community, if led to think otherwise, will be lulled into a false sense of complacency.

the potential for a crisis would never be followed by an actual crisis.