

CURRENCY CRISES

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<http://web.mit.edu/krugman/www/crises.html>

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On July 2 of this year, after months of asserting that it would do no such thing, the government of Thailand abandoned its efforts to maintain a fixed exchange rate for the baht. The currency quickly depreciated by more than 20 percent; within a few days most neighboring countries had been forced to emulate the Thai example.

What forced Thailand to devalue its currency was massive speculation against the baht, speculation that over a few months had consumed most of what initially seemed an awesomely large war chest of foreign exchange. And why were speculators betting against Thailand? Because they expected the baht to be devalued, of course.

This sort of circular logic - in which investors flee a currency because they expect it to be devalued, and much (though usually not all) of the pressure on the currency comes precisely because of this investor lack of confidence - is the defining feature of a currency crisis. We need not seek a more formal or careful definition; almost always we know a currency crisis when we see one. And we have been seeing a lot of them lately. The 1990s have, in fact, offered the spectacle of three distinct regional waves of currency crises: Europe in 1992-3, Latin America in 1994-5, and the Asian crises still unfolding at the time of writing.

Currency crises have been the subject of an extensive economic literature, both theoretical and empirical. Yet there remain some important unresolved issues, and each new set of crises presents new puzzles. The purpose of this paper is to provide an overview both of what we know and of what we do not know about currency crises, illustrated by reference to recent experience.

The paper begins by describing the "canonical" crisis model, a simple yet suggestive analysis that was developed 20 years ago but remains the starting point for most discussion. Despite that canonical model's virtues, however, it has come in for justified criticism because of its failure to offer a realistic picture either of the objectives of central banks or of the constraints they face; thus the paper turns next to a description of "second-generation" crisis models that try to remedy these defects.

As it turns out, second-generation models have suggested a reconsideration of a basic question that the canonical model seemed to have answered: are currency crises always justified? That is, do currencies always get attacked because the markets perceive (rightly or wrongly) some underlying inconsistency in the nation's policies, or can they happen arbitrarily to countries whose currencies would otherwise have remained sound? The paper describes several different scenarios for currency crises that are not driven by fundamentals, including self-fulfilling crises in which endogenous policy ends up justifying investor pessimism, "herding" by investors, and the machinations of large agents ("Soroi"). Closely related to the question of arbitrary crises is "contagion", the phenomenon in which a currency crisis in one country often seems to trigger crises in other countries which which it seemingly has only weak economic links (e.g., Mexico and Argentina, or Thailand and the Philippines).

From there the paper moves to cases, considering in turn the three regional crisis waves of the 90s (so far). Comparison of these waves turns out to raise a further puzzle: while the onset of crisis was similar in each case, the consequences of the crises seem to have been very different in the European as opposed to the Latin and Asian cases.

Finally, of course, we must ask the big question: is there any way to make crises less frequent, and if so what?

1. The canonical crisis model

The canonical crisis model derives from work done in the mid-1970s by Stephen Salant, at that time at the Federal Reserve's International Finance Section. Salant's concern was not with currency crises, but with the pitfalls of schemes to stabilize commodity prices. Such price stabilization, via the establishment of international agencies that would buy and sell commodities, was a major demand of proponents of the so-called New International Economic Order. Salant, however, argued on theoretical grounds that such schemes would be subject to devastating speculative attacks.

His starting point was the proposition that speculators will hold an exhaustible resource if and only if they expect its price to rise rapidly enough to offer them a rate

of return equivalent (after adjusting for risk) to that on other assets. This proposition is the basis of the famous Hotelling model of exhaustible resource pricing: the price of such a resource should rise over time at the rate of interest, with the level of the price path determined by the requirement that the resource just be exhausted by the time the price has risen to the "choke point" at which there is no more demand.

But what will happen, asked Salant, if an official price stabilization board announces its willingness to buy or sell the resource at some fixed price? As long as the price is above the level that would prevail in the absence of the board - that is, above the Hotelling path - speculators will sell off their holdings, reasoning that they can no longer expect to realize capital gains. Thus the board will initially find itself acquiring a large stockpile. Eventually, however, the price that would have prevailed without the stabilization scheme - the "shadow price" - will rise above the board's target. At that point speculators will regard the commodity as a desirable asset, and will begin buying it up; if the board continues to try to stabilize the price, it will quickly - instantaneously, in the model - find its stocks exhausted. Salant pointed out that a huge wave of speculative buying had in effect forced the closure of the open market in gold in 1969, and suggested that a similar fate would await NIEO price-stabilization schemes.

This basic logic was described briefly in a classic 1978 paper by Salant and his colleague Dale Henderson (their main concern in that paper was with the more recent behavior of the gold price, and in particular with the effects of unpredictable sales of official gold stocks). Other researchers soon realized, however, that similar logic could be applied to speculative attacks not on commodity boards trying to stabilize commodity prices, but on central banks trying to stabilize exchange rates.

The canonical currency-crisis model, as laid out initially by Krugman (1979) and refined by Flood and Garber (1984), was designed to mimic the commodity-board story. The upward trend in the "shadow" price of foreign exchange - the price that would prevail after the speculative attack - was supplied by assuming that the government of the target economy was engaged in steady, uncontrollable issue of money to finance a budget deficit. Despite this trend, the central bank was assumed to try to hold the exchange rate fixed using a stock of foreign exchange reserves, which it stood ready to buy or sell at the target rate.

Given this stylized representation of the situation, the logic of currency crisis was the same as that of speculative attack on a commodity stock. Suppose speculators were to wait until the reserves were exhausted in the natural course of events. At that point they would know that the price of foreign exchange, fixed up to now, would begin rising; this would make holding foreign exchange more attractive than holding domestic currency, leading to a jump in the exchange rate. But foresighted

speculators, realizing that such a jump was in prospect, would sell domestic currency just before the exhaustion of reserves - and in so doing advance the date of that exhaustion, leading speculators to sell even earlier, and so on ... The result would be that when reserves fell to some critical level - perhaps a level that might seem large enough to finance years of payments deficits - there would be an abrupt speculative attack that would quickly drive those reserves to zero and force an abandonment of the fixed exchange rate.

The canonical currency crisis model, then, explains such crises as the result of a fundamental inconsistency between domestic policies - typically the persistence of money-financed budget deficits - and the attempt to maintain a fixed exchange rate. This inconsistency can be temporarily papered over if the central bank has sufficiently large reserves, but when these reserves become inadequate speculators force the issue with a wave of selling.

This model has some important virtues. First of all, many currency crises clearly *do* reflect a basic inconsistency between domestic and exchange rate policy; the specific, highly simplified form of that discrepancy in the canonical model may be viewed as a metaphor for the more complex but often equally stark policy incoherence of many exchange regimes. Second, the model demonstrates clearly that the abrupt, billions-lost-in-days character of runs on a currency need not reflect either investor irrationality or the schemes of market manipulators. It can be simply the result of the logic of the situation, in which holding a currency will become unattractive once its price is no longer stabilized, and the end of the price stabilization is itself triggered by the speculative flight of capital.

These insights are important, especially as a corrective to the tendency of observers unfamiliar with the logic of currency crises to view them as somehow outside the normal universe of economic events - whether as a revelation that markets have been taken over by chaos theory, that "virtual money" has now overpowered the real economy (Drucker 1997), or as *prima facie* evidence of malevolent market manipulation.

Despite the virtues of the canonical model, however, a number of economists have argued that it is an inadequate representation of the forces at work in most real crises. These economists have developed what are sometimes known as "second-generation" crisis models, to which we now turn.

2. More sophisticated models

Perhaps the best way to describe what is wrong with the canonical crisis model is to say that it represents government policy (though not the market response) in a very

mechanical way. The government is assumed to blindly keep on printing money to cover a budget deficit, regardless of the external situation; the central bank is assumed to doggedly sell foreign exchange to peg the exchange rate until the last dollar of reserves is gone. In reality the range of possible policies is much wider. Governments can and do try to condition fiscal policies on the balance of payments. Meanwhile, central banks have a variety of tools other than exchange market intervention available to defend the exchange rate, including in particular the ability to tighten domestic monetary policies. Obviously there are costs to such policies; but it may be important to recognize that the defense of an exchange rate is a matter of tradeoffs rather than a simple matter of selling foreign exchange until the money is gone.

So-called second-generation models (perhaps best represented by Obstfeld (1994)), require three ingredients. First, there must be a reason why the government would like to abandon its fixed exchange rate. Second, there must be a reason why the government would like to *defend* the exchange rate - so that there is a tension between these motives. Finally, in order to create the circular logic that drives a crisis, the cost of defending a fixed rate must itself increase when people expect (or at least suspect) that the rate might be abandoned.

Why might a government have a motive to allow its currency to depreciate? The general slogan here is that "it takes two nominals to make a real". In order for a government to have a real incentive to change the exchange rate, *something* must be awkwardly fixed in domestic currency. One obvious possibility is a large debt burden denominated in domestic currency - a burden that a government might be tempted to inflate away, but cannot as long as it is committed to a fixed exchange rate. (For example, the attacks on the French franc during the 1920s were triggered mainly by suspicions that the government might try to inflate away its legacy of debt from World War I). Another possibility is that the country suffers from unemployment due to downwardly rigid nominal wage rate, and would like to adopt a more expansionary monetary policy, but cannot as long as it is committed to a fixed exchange rate. (This was in essence the motivation both for Britain's abandonment of the gold standard in 1931 and its departure from the exchange rate mechanism of the European Monetary System in 1992).

Given a motive to depreciate, why would a government choose instead to defend a fixed rate? One answer might be that it believes that a fixed rate is important in facilitating international trade and investment. Another might be that it has a history of inflation, and regards a fixed rate as a guarantor of credibility. Finally, the exchange rate often takes on an important role as a symbol of national pride and/or commitment to international cooperation (as in the European Monetary System).

Finally, why would public lack of confidence in the maintenance of a fixed rate itself have the effect of making that rate more difficult to defend? Here there is a somewhat subtle distinction between two variants of the story. Some modelers - notably Obstfeld (1994) - emphasize that a fixed rate will be costly to defend if people expected *in the past* that it would be depreciated *now*. For example, debt-holders might have demanded a high rate of interest in anticipation of a depreciation, therefore making the current debt burden so large that it is hard to manage without a depreciation. Or unions, expecting depreciation, might have set wages at levels that leave the country's industry uncompetitive at the current exchange rate.

The alternative (which to my mind seems much closer to what happens in real crises) is to suppose that a fixed rate is costly to defend if people *now* expect that it will be depreciated *in the future*. The usual channel involves short-term interest rates: to defend the currency in the face of expectations of future depreciation requires high short-term rates; but such high rates may either worsen the cash flow of the government (or indebted enterprises) or depress output and employment.

Suppose we take these three generic elements together: a reason to depreciate, another reason not to depreciate, and some reason why expectations of a depreciation themselves alter the balance between the costs and benefits of maintaining a fixed parity. As pointed out in Krugman (1996), it is possible to combine these elements to produce a general story about currency crises that is quite similar to that in the canonical model. Suppose that a country's fundamental tradeoff between the costs of maintaining the current parity and the costs of abandoning it is predictably deteriorating, so that at some future date the country would be likely to devalue even in the absence of a speculative attack. Then speculators would surely try to get out of the currency ahead of that devaluation - but in so doing they would worsen the government's tradeoff, leading to an earlier devaluation. Smart investors, realizing this, would try to get out still earlier ... the end result will therefore be a crisis that ends the fixed exchange rate regime well before the fundamentals would appear to make devaluation necessary.

We can actually be more specific: given an inevitable eventual abandonment of a currency peg, and perfectly informed investors, a speculative attack on a currency will occur *at the earliest date at which such an attack could succeed*. The reason is essentially arbitrage: an attack at any later date would offer speculators a sure profit; this profit will be competed away by attempts to anticipate the crisis.

It is important to notice one point about this scenario. In the case just described - as in the canonical model - the crisis is ultimately provoked by the inconsistency of government policies, which make the long-run survival of the fixed rate impossible. In that sense the crisis is driven by economic fundamentals. Yet that is not the way it

might seem when the crisis actually strikes: the government of the target country would feel that it was fully prepared to maintain the exchange rate for a long time, and would in fact have done so, yet was forced to abandon it by a speculative attack that made defending the rate simply too expensive.

I think that it is fair to say that the standard reaction both of most economists and of international officials to currency crises is, at least informally, based on something like the scenario just described. That is, they recognize that the speculative attack, driven by expectations of devaluation, was itself the main proximate reason for devaluation; yet they regard the whole process as ultimately caused by the policies of the attacked country, and in particular by a conflict between domestic objectives and the currency peg which made an eventual collapse of that peg inevitable. In effect, the financial markets simply bring home the news, albeit sooner than the country might have wanted to hear it.

A significant number of economists studying this issue do, however, believe that the complaints of countries that they are being unfairly or arbitrarily attacked have at least some potential merit. So let me turn to the possible ways that - especially in the context of "second-generation" models - such complaints might in fact be justified.

3. Disputed issues: self-fulfilling crises etc.

I have just argued that although the detailed workings of a "second-generation" currency crisis model may be very different from those of the original models, their general result can be much the same: a currency crisis is essentially the result of policies inconsistent with the long-run maintenance of a fixed exchange rate. Financial markets simply force the issue, and indeed must do so as long as investors are forward-looking.

However, it is possible to conceive of a number of circumstances under which the financial markets are not as blameless as all that. The list below may not include all the relevant scenarios, but seems to cover the cases most often mentioned.

Self-fulfilling crises

Suppose that, contrary to our earlier assumption, an eventual end to a currency peg is not completely preordained. There may be no worsening trend in the fundamentals; or there may be an adverse trend, but at least some realistic possibility that policies may change in a way that reverses that trend. Nonetheless, it may be the case that the government will abandon the peg if faced with a sufficiently severe speculative attack.

The result in such cases will be the possibility of self-fulfilling exchange rate crises. An individual investor will not pull his money out of the country if he believes that the currency regime is in no imminent danger; but he will do so if a currency collapse seems likely. A crisis, however, will materialize precisely if many individual investors do pull their money out. The result is that either optimism or pessimism will be self-confirming; and in the case of self-confirming pessimism, a country will be justified in claiming that it suffered an unnecessary crisis.

How seriously should we take this analysis? One obvious caveat understood by the economists studying this issue, but perhaps too easily forgotten by political figures, is that this analysis does not imply either that any currency can be subject to speculative attack or that all speculative attacks are unjustified by fundamentals. Even in models with self-fulfilling features, it is only when fundamentals - such as foreign exchange reserves, the government fiscal position, the political commitment of the government to the exchange regime - are sufficiently weak that the country is potentially vulnerable to speculative attack. A country whose government is expected to defend its currency firmly and effectively will probably not need to do so, while a country whose government is very likely to abandon its peg eventually in any case will almost surely find its timetable accelerated by speculative pressure. Or to put it a bit differently: one can think of a range of fundamentals in which a crisis cannot happen, and a range of fundamentals in which it must happen; at most, self-fulfilling crisis models say that there is an intermediate range in which a crisis can happen, but need not. It is an empirical question (though not an easy one) how wide this range is.

It is also important to remember that a country whose fundamentals are persistently and predictably deteriorating will necessarily have a crisis at some point. Since the logic of predictable crises is that they happen well before the fundamentals have reached the point at which the exchange rate would have collapsed in the absence of speculative attack - indeed, as argued above, they happen as soon as an attack can "succeed" - it will always seem at the time that the crisis has been provoked by a speculative attack not justified by current fundamentals.

Let me add a conjecture here, which has not to my knowledge been addressed in the theoretical literature to date. A situation in which a crisis could happen but need not presents speculators with a "one-way option": they will reap a capital gain (or, if you measure it in foreign currency, avoid a capital loss) by selling domestic currency if the exchange regime collapses, but will not suffer an equivalent loss if it does not. What, then, prevents them from fleeing the currency at even a hint of trouble? My conjecture is that microeconomic frictions - transaction costs, the difficulty of arranging credit lines, and so on - play an important role. Ordinarily we think of these frictions as being of trivial importance for macroeconomic issues, on the grounds that they are only a small fraction of a percentage point of the value transacted. However, currency

crises unfold over very short periods, in which even small transaction costs can offset very large annualized rates of return. It may be small frictions that prevent a subjectively low-probability crisis from ballooning into a full-fledged speculative attack. If this is true, then the improving technical efficiency of markets may actually be a contributory factor to the frequency of currency crises in the 1990s.

If self-fulfilling crises are a real possibility, what sets them off? The answer is that anything could in principle be the trigger. That is, we are now in the familiar terrain of "sunspot" dynamics, in which any arbitrary piece of information becomes relevant if market participants believe it is relevant.

Herding

Both the canonical currency crisis model and the "second-generation" models presume that foreign exchange markets are efficient - that is, that they make the best use of the available information. There is, however, very little evidence that such markets are in fact efficient - on the contrary, the foreign exchange market (like financial markets in general) exhibits strong "anomalies" that can be reconciled with efficiency, if at all, only with layers of otherwise unpersuasive assumptions that irresistibly suggest the epicycles of pre-Copernican astronomy.

What difference might inefficient markets make to the study of currency crises? The most obvious difference is the possibility of "herding". In general, herding can be exemplified by the result found by Shiller's (1989) remarkable survey of investors during the 1987 stock market crash: the only reason consistently given by those selling stocks for their actions was the fact that prices were going down. In the context of a currency crisis, of course, such behavior could mean that a wave of selling, whatever its initial cause, could be magnified through sheer imitation and turn, quite literally, into a stampede out of the currency.

Aside from the (very real) biases and limitations of human cognition, why might herding occur? Theorists have proposed two answers consistent with individual rationality. One involves bandwagon effects driven by the awareness that investors have private information. Suppose that investor 1 has special information about the Thai real estate market, investor 2 has special information about the financial condition of the banks, investor 3 has information about the internal discussions of the government. If investor 1 gets some negative information, he may sell, since that is all he has to go on; if investor 2 learns that 1 has sold, he may sell also even if his own private information is neutral or even slightly positive. And investor 3 may then end up selling even if his own information is favorable, because the fact that both 1 and 2 have sold leads him to conclude that both may well have received bad news, even though in fact they have not. Kehoe and Chari (1996) have argued that such

bandwagon effects in markets with private information create a sort of "hot money" that at least sometimes causes foreign exchange markets to overreact to news about national economic prospects.

Another explanation focusses on the fact that much of the money that has been invested in crisis-prone countries is managed by agents rather than directly by principals. Imagine a pension-fund manager investing in emerging-market funds. She surely has far more to lose from staying in a currently unpopular market and turning out to be wrong than she does to gain from sticking with the market and turning out to be right. To the extent that money managers are compensated based on comparison with other money managers, then, they may have strong incentives to act alike even if they have information suggesting that the market's judgement is in fact wrong. (As an aside, herding by individual investors may well result from a similar kind of internal principal-agent problem; as Schelling (198?) has argued, many aspects of individual behavior make sense only if viewed as the result of a sort of internal struggle between agents with longer-term and shorter-term perspectives. Put it this way: I will probably *feel* worse if I lose money in a Thai devaluation when others do not than I will if I lose the same amount of money in a general rout).

A final point: anyone who has followed the currency crises of the 1990s must at least have speculated on what we might call reverse herding: in general, as described at greater length below, the markets seem to have been oddly complacent until shortly before the crises, even though there were ample reasons to think that there was at least some risk of such crises. Principal-agent-type stories might be one explanation of this passivity: money managers (or internal, subjective money management "modules") were less concerned about crisis than they should have been, because they were acting the same way as everyone else.

Contagion

The currency crises of the 1990s have consisted of three regional "waves": the ERM crises in Europe from 1992-3, the Latin American crises of 1994-5, and the Asian crises currently in progress. But why should there be such regional waves - as Ronald Reagan said after visiting Latin America, they are all different countries, so why should they experience a common crisis? This is the issue of "contagion".

One simple explanation of contagion involves real linkages between the countries: a currency crisis in country A worsens the fundamentals of country B. For example, the southeast Asian countries currently under speculative attack are, to at least some extent, selling similar products in world export markets; thus a Thai devaluation tends to depress Malaysian exports, and could push Malaysia past the critical point that triggers a crisis. In the European crises of 1992-3, there was an element of competitive

devaluation: depreciation of the pound adversely affected the trade and employment of France, or at least was perceived to do so, and thus increased the pressures on the French government to abandon its own commitment to a fixed exchange rate.

However, even in the European and Asian cases the trade links appear fairly weak; and in the Latin American crisis of 1995 they were virtually nil. Mexico is neither an important market nor an important competitor for Argentina; why, then, should one peso crisis have triggered another?

At this point two interesting "rational" explanations for crisis contagion between seemingly unlinked economies have been advanced (Drazen 1997). One is that countries are perceived as a group with some common, but imperfectly observed characteristics. To caricature this position, Latin American countries share a common culture and therefore, perhaps, a "Latin temperament"; but the implications of that temperament for economic policy may be unclear. Once investors have seen one country with that cultural background abandon its peg under pressure, they may revise downward their estimate of the willingness of other such countries to defend their parities. (A personal observation: in 1982 Latin countries suffered a crisis which, although it mainly involved dollar-denominated debt rather than domestic currency, was similar in form and psychology to currency crises. This crisis quickly spread from Mexico through the whole area. The Philippines, however, were at first unaffected, even though both the policies and the debt burden were quite as bad as those of Mexico, Argentina, and Brazil; it was not until almost a year after the original onset that investors seem to have decided that this former Spanish colony was in fact a Latin rather than an Asian country, and attacked).

Alternatively, one may argue that the political commitment to a fixed exchange rate is itself subject to herding effects. This is perhaps clearest in the European crises: once Britain and Italy have left the exchange rate mechanism, it is less politically costly for Sweden to abandon its peg to the Deutsche mark than it would have been had Sweden devalued on its own.

One may also argue, of course, that contagion reflects irrational behavior on the part of investors, either because individuals are really irrational or because money managers face asymmetric incentives. South Korea has few strong trade links with the troubled economies of Southeast Asia; yet a fund manager who did not reduce exposure in South Korea, then was caught in a devaluation of the won, might well be blamed for lack of due diligence - after all, Asian currencies have been risky in recent months, haven't they?

As in the case of herding in general, there seems to be positive as well as negative contagion. During the wave of optimism that followed Mexican and Argentine

reforms in the early 1990s, countries that had done little actual reform, such as Brazil, were also lifted by the rising tide; and the apparent myopia of markets about Asian risks seems to have been fed by a general sense of optimism about Asian economies in general.

Market manipulation

Scenarios in which crises are generated either by self-fulfilling rational expectations or by irrational herding behavior imply at least the possibility of profitable market manipulation by large speculators. (Krugman 1996 proposes that such hypothetical agents be referred to as "Soroi"). Suppose that a country is vulnerable to a run on its currency: either investors believe that it will abandon its currency peg if challenged by a speculative attack, or they simply emulate each other and can therefore be stampeded. Then a large investor could engineer profits for himself by first quietly taking a short position in that country's currency, then deliberately triggering a crisis - which he could do through some combination of public statements and ostentatious selling.

The classic example of this strategy is, of course, George Soros' attack on the British pound in 1992. As argued in the case study below, it is likely that the pound would have dropped out of the exchange rate mechanism in any case; but Soros's actions may have triggered an earlier exit than would have happened otherwise.

In addition to being the classic example of how a market manipulator can generate a crisis, however, Soros's attack on the pound may be the only example in recent years. At any rate, it is hard to come up with any other clear-cut examples. This has not, of course, prevented politicians from blaming market manipulation in general and Soros in particular for currency crises, even when there is no evidence that they have played a role.

Why are such engineered speculative attacks rare? One answer is that the scope for self-fulfilling crises is actually rather limited: most currencies tend to get attacked soon after it becomes apparent that they are vulnerable to such an attack. As argued earlier, this will happen if a continuing deterioration in the fundamentals is predictable: knowing that an eventual collapse of the exchange regime is inevitable, investors will try to anticipate the collapse, thereby bringing it forward in time, and thus will tend to attack as soon as such an attack can succeed. In Krugman 1996 I also argue that the existence of Soroi itself tends to advance the date of speculative attack: since everyone knows that a currency that is vulnerable to a self-fulfilling attack presents a profit opportunity for large players, investors will sell the currency in anticipation that one or another of these players will in fact undermine the exchange

regime - and in so doing investors will force the collapse of the regime even without the aid of a Soros.

Of course, if currencies spontaneously collapse as soon as a potential profit for Soros appears, this will eliminate the opportunity for Soros to make profits; but if nobody is playing that game, investors will no longer expect collapsible currency regimes to be collapsed ... This paradox is essentially the same as that which arises in the context of struggles for corporate control: a takeover attempt will not be profitable if the potential gains are already in the stock price, but there will be no gains if there is no takeover attempt. From a modelling point of view this seems to suggest the absence of any equilibrium, unless one introduces sufficient "noise" into the story. In practical terms we may simply note that for whatever reason, the success of Soros at making money by provoking the pound's devaluation seems thus far to have been a one-time event.

4. Case study 1: the ERM crises of 1992-3

In the fall of 1992 massive capital flows led to the exit of Britain, Italy, and Spain from the exchange rate mechanism of the European Monetary System. (Strictly speaking, they remained within the system itself). In the summer of 1993 a second wave of attacks led to a decision to widen the exchange rate bands of that system, essentially to allow the French franc to depreciate without any formal exit. In subsequent years events have unfolded in somewhat ironic ways: France, having been given leeway for a somewhat weaker franc, chose not to use it, returning to the original narrow band against the mark; while the boom in the UK economy that followed the exit from the ERM has now pushed the pound above the rate at which it originally exited. Still, the ERM crises remain one of the classic episodes of speculative attack, and is the most thoroughly studied such episode.

Part of what makes the ERM crises so classic is that they so clearly demonstrate the importance of second-, as opposed to first-, generation models. The European countries attacked in 1992 and 1993 did not fit the canonical crisis model at all. In all cases, governments retained full access to capital markets, both domestic and foreign. This meant, first of all, that they had no need to monetize their budget deficits; and indeed they did not have exceptionally rapid growth of domestic credit (Eichengreen, Rose, and Wyplosz 1995). It also meant that they were not suffering from any ironclad limitation on foreign exchange reserves: they remained able to borrow on foreign markets, and indeed clearly retained the ability to stabilize their currencies had they so chosen simply by raising domestic interest rates sufficiently. Finally, all of the target economies had low and stable inflation both before and after the crisis.

What, then, provided the motivation for devaluation that we have seen is a crucial ingredient for second-generation models? The answer was clearly unemployment due to inadequate demand, and the resulting pressure on monetary authorities to engage in expansionary policies - policies that could not be pursued as long as the countries remained committed to a fixed exchange rate - was the essential fuel for the crises. Essentially we can think of European governments as facing a tradeoff between the political costs of unemployment over and above its "structural" or "natural" level, on one side, and the political costs of dropping out of the ERM on the other.

Behind the unemployment problem, in turn, was an unusual situation triggered by the interaction between the fall of the Berlin Wall and the role of the Deutsche mark as the de facto key currency of the European Monetary System. The heavy expenditures by Germany on its newly reunited eastern Lander amounted to an expansionary fiscal policy for Western Germany; the Bundesbank, like the Federal Reserve faced with the deficit spending of the 1980s, responded with a tight monetary policy. However, other European countries pegging to the mark found themselves obliged to match the tight monetary policy without the fiscal expansion; thus they were pushed into recession.

All the ingredients for crisis, then, were in place. However, four special aspects of the ERM crises should be noted.

First was the role of a large actor - George Soros - in triggering the crisis. Soros had divined early in the game the possibility of a sterling devaluation, and set about discreetly establishing a short position in the form of a number of short-term credit lines, totalling approximately \$15 billion. He was thus in a position to profit from a collapse of the exchange regime, and did in fact attempt by his own sales to precipitate that collapse. It remains unclear, however, how important a role his actions actually played; it is arguable that the fundamental reasons for the crisis would have set it off even without any action on Soros's part. A guess might be that he advanced the date of the crisis by only a few weeks or months.

Second, the crisis demonstrated the near-irrelevance of foreign exchange reserves in a world of high capital mobility. The central banks of both Britain and Italy had substantial reserves, and were also entitled under ERM rules to credit lines from Germany. Thus they were able to engage in direct foreign exchange intervention on a very large scale - Britain appears to have bought some \$50 billion worth of sterling over the course of a few days. However, this intervention was sterilized - that is, it was offset by open market operations so as to avoid reducing the size of the monetary base. And it was clearly ineffectual. It became clear that sterling could be defended only by a domestic monetary contraction, and after only two (?) days of higher interest rates the Bank of England abandoned the fixed parity.

Third, retrospectives on the ERM crises turn up a surprising fact: the crises seem to have been virtually unanticipated by the financial markets. Rose and Svensson (1994) show that interest differentials against the target currencies did not begin to widen until August 1992 - a month before the breakup.

Finally, a remarkable fact about the ERM crises is that the countries which "failed", and were driven off their pegs, did better by almost any measure in the following period than those that succeeded in defending their currencies. The UK, in particular, experienced a rapid drop in its unemployment rate without any corresponding rise in inflation.

5. Case study 2: the Latin crises, 1994-5

The Latin crisis of 1994-5 was similar to the ERM crises in some respects, quite different in others. Above all, its consequences were much more severe for the affected economies.

Claims that several Latin currencies, in particular the Mexican and Argentine peso, were common among economists as early as the beginning of 1993 (see, for example, Dornbusch 1993). These claims were based on one or more of three observations: purchasing power parity calculations, which suggested that costs and prices had gotten out of line with those of trading partners; large current account deficits; and slow growth (in the case of Mexico) or high unemployment (in the case of Argentina), suggesting that there would be room for monetary expansion if only the exchange rate were not a constraint.

In Latin America, however, as in Europe, these warnings appear to have been more or less ignored by financial markets. Government officials were adamant that devaluation was not under consideration, and the markets believed them. Through the whole of 1993 interest premia on the pesos remained low, and the current account deficits were easily financed.

Mexico experienced a deteriorating situation over the course of 1994. Political uncertainty emerged following two unexpected events: the peasant rebellion in Chiapas, and the assassination of the ruling party's Presidential candidate. The government also appeared to relax monetary and fiscal discipline in the runup to the presidential election. Foreign capital inflows began to dry up, and there was a rapid decline in foreign exchange reserves. A critical point was reached when the government found itself unable to roll over the *tesobonos*, dollar-denominated short-term debt.

Faced with this external pressure, Mexico decided shortly after the election to devalue the peso. However, the devaluation was botched in several respects. First, the size of the devaluation, at 15 percent, was widely regarded as inadequate; thus the government had sacrificed the credibility of its commitment to a fixed rate without satisfying markets that the devaluation was behind it. Second, by consulting business leaders about the plan, the government in effect gave Mexican insiders the opportunity to make profits at the expense of uninformed foreign investors, helping to discredit the policy. Finally, Mexican officials managed to convey a sense of both arrogance and incompetence to foreign investors in the days immediately following the devaluation.

Perhaps for these reasons, the initial small devaluation was followed by a near-complete loss of confidence in Mexican policies and prospects. The peso quickly fell to half its pre-crisis value; the resulting spike in import prices caused inflation, which had previously fallen to low single-digit levels, to soar. In order to stabilize the peso and the inflation rate, the government was obliged to raise domestic interest rates to very high levels, peaking at above 80 percent. The high rates in turn led to a sharp contraction in domestic demand, and real GDP fell by 7 percent in the year following the crisis.

Fears that the crisis would undermine Mexico's political stability led the United States to engineer a massive international loan to the Mexican government, hoping to buy a breathing space while confidence was restored. This effort was successful: during 1996 economic growth resumed, and Mexico regained normal access to international capital markets, repaying the emergency loan ahead of schedule.

Argentina had initially hoped that its very different currency regime - a currency board system, with the peso rigidly linked to the dollar at a one-for-one parity, and with every peso in the monetary base backed by a dollar of reserves, would protect it from any spillover from the Mexican crisis. In effect, Argentina had ensured that it was not vulnerable to the kind of crisis envisaged by the canonical crisis model. Argentina might also have expected that the absence of any strong trade linkage with Mexico would prevent any contagion. However, speculators attacked the currency nonetheless, presumably suspecting that Argentina might abandon the currency board in order to reduce the unemployment rate. (We might call this the revenge of the second-generation model).

Under the currency board system, the capital outflows led to a rapid decline in the monetary base. This, in turn, created a crisis in the banking system, which contributed to a downturn milder than Mexico's but still extremely severe. International official loans, albeit on a smaller scale than Mexico's, were needed to prop up the banking system.

In contrast to Mexico, Argentina chose to hang tough on its exchange rate regime, betting that the financial markets would eventually realize that its commitment was absolute and that the pressure would ease. And in 1996 Argentina also resumed economic growth.

The Latin crises thus share some common features with the European experience but also show some strong differences. The most striking commonality was the apparent failure of financial markets to anticipate the crises, or even give any weight to the possibility of a crisis, until very late in the game - in spite of widely circulated warnings by economists that such crises might be brewing. The most striking difference was in the aftermath of crisis. Suppose that one thinks of Britain and France as representing one matched pair - a country that gave in to the pressure, and one that did not - while Mexico and Argentina are another. In the first case the devaluing country actually did very well post-devaluation (leading to some facetious suggestions that a statue of George Soros be erected in Trafalgar Square); the non-devaluing country did less well, but did not suffer any dramatic catastrophe. In the second case both countries suffered almost incredibly severe recessions, but the devaluing country was worse hit, at least initially.

6. Case study 3: Asian crises

The Asian situation is still in flux at the time of writing, information is still incomplete, and no careful economic studies are yet available. So this can only be a brief and provisional summary.

During 1995 a number of economists had begun to wonder whether the countries of Southeast Asia might be vulnerable to a Latin-type crisis. The main objective indicator was the emergence of very large current account deficits. Closer examination also revealed that several of the countries had developed worrying financial weaknesses: heavy investment in highly speculative real estate ventures, financed by borrowing either from poorly informed foreign sources or by credit from underregulated domestic financial institutions. It is now known that during 1996 officials from the IMF and World Bank actually began warning the governments of Thailand, Malaysia, and other countries of the risks posed by their financial situation, and urged corrective policies. However, these warnings were brusquely rejected by those governments.

As in the case of the other regional currency crises, financial markets showed little sign of concern until very late in the game. The extraordinary growth record of the region seems to have convinced many that the usual cautions did not apply. (One pension fund manager described to me a briefing on Indonesian prospects by someone from Moody's. Some members of the audience had expressed worry about the

reliability of the data and the financial reports they had seen. His response was that you should think of it as being like a Javanese shadow puppet show - you couldn't actually see the puppets, but you could see their shadows, and that told the story).

The slide toward crisis began with an export slowdown in the region, partly due to the appreciation of the dollar (to which the target currencies were pegged) against the yen, partly to specific developments in key industries, partly to growing competition from China. With export growth flagging, the overbuilding of real estate - especially in Thailand - became all too apparent. In turn, dropping real estate prices pulled down stock prices and placed the solvency of financial institutions in question.

Up to this point, the developments were mainly a domestic financial crisis, similar in general outline to the bursting of Japan's "bubble economy" in the early 1990s. During the first half of 1997, however, speculators finally began to wonder whether the financial distress of Southeast Asian countries, especially Thailand, might provoke them to devalue in the hope of reflating the economy. The growing suspicion that such a move might be in prospect, despite government insistence that it was not, led to widening interest premia; these in turn increased the pressure, both by adding deflationary impetus and by creating cash flow problems for financially stressed businesses.

On July 2 Thailand gave in to the pressures and floated the baht; as in the other crises, this led to speculation against other regional currencies, and was followed shortly by somewhat smaller devaluations in Malaysia, Indonesia, and the Philippines. The wave of devaluations, and the troubled financial picture revealed by the crisis, shook investor confidence; in an effort to regain that confidence, all of the countries involved have imposed new fiscal austerity. Thailand received an emergency loan from the IMF; part of the conditionality was a cleanup of its financial system.

At this point the real consequences of the crisis are still to be revealed. There seems to be general agreement that Thailand, like Mexico, will suffer an initial blow to its growth. Typical estimates are that it will go from the 9 percent average rates of recent years to roughly zero growth over the next year. The impact on neighboring economies is a subject of considerable dispute, with the IMF predicting only a small impact while many private economists predict much more severe slowdowns.

At this point it remains unclear how far the contagion will spread. South Korea is the most interesting case: it has severe internal financial problems and a massive current account deficit, but has few real linkages to the Southeast Asian economies. At the time of writing there does not seem to have been any pressure on China, even though the giant nation is reported to have massive quantities of bad internal debt.

An interesting counterpoint to the Latin experience is provided by Hong Kong, which like Argentina has a currency board and is pegged to the U.S. dollar (and intends to remain that way, even though it is politically now part of China). After a brief probing, financial markets seem to have decided that the HK dollar is not at risk, and what is now the Special Administrative Region thus seems to have insulated itself from the crisis.

The most peculiar aspect of the Asian crisis has been the reaction of some of the region's leaders. Malaysia's Prime Minister, Mahathir bin Mohamed, has taken the lead, blaming the crisis on the conspiratorial activities of George Soros (whom he has described as a "moron"), prompted by U.S. government officials. Unless new evidence surfaces, this claim is even odder than it sounds: as far as market participants are aware, Soros was not even a player in this crisis, and indeed seems to have guessed wrong, buying Malaysian ringgit. Mahathir temporarily imposed limits on stock trading intended to stop the alleged conspiracy, and has made public calls for an end to currency trading that have made financial markets understandably nervous that he might try to impose capital controls.

7. Macroeconomic questions

Although the currency crises of the 90s have inspired a good deal of research, one area remains neglected. What are the macroeconomic impacts of crisis, and why in particular have they differed so much between episodes?

The quick review of the main episodes in the decade to date indicates pretty clearly that crises in the 90s are best described by "second-generation" models - that is, the motives for devaluation lie in the perceived need for more expansionary monetary policies rather than in budget deficits and inflation. One might therefore suppose that when a country gives in to temptation it would receive a reward - that whatever the cost in political capital or long-term inflation credibility, there would at least be a payoff in terms of short-run economic expansion. And this was exactly what happened in the European crises; indeed, those countries that abandoned their principles seem to have gone completely unpunished.

In the Latin crisis, however, and at least as far as we can tell in the Asian crises, the decision to devalue seems to have led to serious adverse short-run consequences on all fronts. Instead of permitting reflation, the devaluations seem to have led to even more severe contraction. Why? And why has the experience been so different?

Systematic attempts to answer these questions are still lacking (although papers prepared for the NBER's conference on currency crises, taking place this February, may supply some answers). A quick conjecture is that the key difference was how

well informed markets were about the policy environment in the respective sets of countries. A British devaluation, while it may have shattered the credibility of the current Chancellor of the Exchequer, did not shake confidence in British institutions in general; markets still had full confidence that the government of the UK would continue to allow free markets to function, that it would honor its debts, that the Bank of England would continue to worry about inflation, and so on. Thus once the pound had depreciated substantially, markets were prepared to believe that investment in Britain was actually a good bet.

In Mexico, by contrast, the devaluation made markets question the whole premise that the country was now run by reliable, reformist technocrats. As the crisis deepened, so did concerns that a backlash against the reformers would lead to a return to dirigiste policies - and these concerns, by promoting further capital flight, deepened the crisis. One might summarize Mexico's situation in 1995 as one in which the country had to offer very high interest rates to offset the nervousness of investors about the country's *political* future - and in which that nervousness was largely the result of concern about the political damage inflicted by high interest rates. The rescue package organized by the U.S. may be seen as an attempt to break this vicious circle.

The Asian crisis, like that in Latin America, seems to have shaken basic confidence in the countries much more than the crisis in Europe. Investors are now emphasizing weaknesses in the political and institutional environment - lax bank regulation, widespread corruption, grandiose policies - that were obvious even to casual observers before this year, but which were brushed off as minor blemishes on the Asian miracle until that miracle hit a speed bump.

At this point, however, this is merely loose speculation. More careful analyses are badly needed.

8. *Can currency crises be prevented?*

A world in which major currency crises occur at an average rate of one every 19 months is not a very comfortable one for economic policymakers. What, if anything, can be done to prevent them, or at least to keep them from happening so often?

One possibility would be to return to the world of the early 1960s, an era in which extensive capital controls prevented the massive flows of hot money that now drive crises. Something like this seems to be what Mahathir is proposing, but nothing along these lines seems likely in the near future.

Another possibility would simply be for countries to follow sound and consistent policies, so that they are not attacked by speculators. There is a lot to be said for this;

many crises do seem to be the result of obvious inconsistencies between the domestic policies of a country and its exchange regime. However, the main point of second-generation models may be stated this way: the real cause of currency crises is not so much what you are actually doing, as what the financial markets suspect you might *want* to do. Britain's monetary policy as a member of the ERM was impeccably correct; but Soros and others correctly suspected that when push came to shove the government would choose employment over the exchange rate. In order to have prevented such an attack, the British government would have had to change not its policies, but its preferences.

This point also explains why institutional arrangements like currency boards do not offer secure protection against speculative attack. A currency fully backed by reserves means that one cannot be mechanically forced to devalue; but it does nothing to prevent you from choosing to devalue, even if you have insisted that you will not and have up until now pursued policies consistent with a fixed rate.

Incidentally, these considerations have considerable bearing on European prospects. It now appears very likely that a core group of European countries will formally enter European Monetary Union at the beginning of 1999, and they may well lock the parities as early as May 1998. However, actual euro notes will not replace national currencies for several years. As a growing number of commentators have noticed, this means that it will still be technically quite possible for a country to drop out of EMU during this interim period - which means that currency crises are quite possible *after* EMU supposedly has gone into effect.

How can a country ensure that it will not give in to speculative attack? It can attempt to raise the stakes, by placing the prestige of the government on the line; it can sign solemn treaties; and so on. The only absolutely sure-fire way not to have one's currency speculated against, however, is not to have an independent currency. True monetary union is one answer to the problem of currency crisis.

The other answer is simply not to offer speculators an easy target, by refusing to defend any particular exchange rate in the first place. Once a country has a floating exchange rate, any speculative concerns about its future policies will already be reflected in the exchange rate. Thus anyone betting against the currency will face a real risk, rather than the one-way option in speculating against a fixed rate.

Reasoning along these lines has convinced a number of economists working on currency crises that the ultimate lesson of the crisis-ridden 90s is that countries should avoid halfway houses. They should either float their currencies, or join currency unions. It remains to be seen whether this stark recommendation will survive closer scrutiny.

REFERENCES

- Dornbusch, R. (1993) "Mexico: stabilization, reform, and no growth" *Brookings Papers on Economic Activity*
- Drazen, A. (1997) "Contagious currency crises", mimeo
- Drucker, P. (1997) "The global economy and the nation-state", *Foreign Affairs*, Sept./Oct.
- Eichengreen, B., Rose, A. and Wyplosz, C. (1995) "Exchange market mayhem: the antecedents and aftermath of speculative attacks", *Economic Policy* 21:249-312.
- Flood, R. and Garber, P. (1984) "Collapsing exchange rate regimes: some linear examples", *Journal of International Economics* 17:1-13
- Krugman, P. (1979) "A model of balance of payments crises", *Journal of Money, Credit, and Banking* 11: 311-325
- Krugman, P. (1996) "Are currency crises self-fulfilling?", *NBER Macroeconomics Annual*
- Obstfeld, M. (1984) "The logic of currency crises", *Cahiers Economiques et Monetaires* 43:189-213.
- Rose, A. and Svensson, L. (1994) "European exchange rate credibility before the fall", *European Economic Review* 38:1185-1216
- Salant, S. and Henderson, D. (1978) "Market anticipation of government policy and the price of gold", *Journal of Political Economy* 86:627-648.
- Shiller, R. (1989) *Market Volatility* Cambridge: MIT Press.