



Note on Currency Crises

Speculative bubbles and the crashes that often follow them have characterized financial markets since ancient Greece. Notable episodes include:¹

- The great Roman monetary crisis of 53BC;
- The tulip bulb mania in Holland, 1636;
- The south sea bubble, 1720;
- The Indian cotton crash of 1865; and
- The Credit Mobilier scandal in Paris in 1868.

While speculative bubbles and crashes have a long history, the frequency of such crises, particularly in currency markets, appears to have increased in the last few decades. MIT economist Paul Krugman notes that, since 1980, a major currency crisis has occurred at “an average rate of one every 19 months.” Despite their frequency, and widespread commentary on their causes and consequences, currency crises are not well understood. Krugman uses the July 2, 1997 devaluation of the Thai baht to illustrate this point:

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 warchest 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.²

This note has two aims. First, it briefly reviews theoretical approaches to understanding why currency crises occur. Second, it reviews efforts to predict the onset of currency crises. It is meant to be used with the Harvard Business School cases *Currency Crises*, (#799-088).

Theoretical Approaches³

Economists have developed two distinct theoretical approaches to understanding currency crises. The first, referred to as the “canonical model,” demonstrates how a mismatch between domestic policies (typically a fiscal deficit) and an attempt to maintain a fixed exchange rate can lead to a

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sudden attack on a country's currency. One shortcoming of this approach is that it does not account for possible changes in government policy. A second group of models attempts to explain policymakers' actions in the face of potential crises. These models are known as "second generation models."

The Canonical Model The canonical model is based on work done in the 1970s on efforts to stabilize commodity prices. Stephen Salant, then with the U.S. Federal Reserve, argued that price stabilization schemes—where an agency promises to buy and sell commodities in order to stabilize prices—were destined to fail on theoretical grounds. His argument was the following:

- (1) speculators will hold a commodity only if they expect its price to rise rapidly enough to offer them a risk adjusted rate of return that equals or exceeds that available on other assets. This means that the *expected* price of the commodity must rise with the rate of interest. If it did not, no one would hold the asset for investment purposes. This establishes an anticipated price path.
- (2) if a price stabilization board announces its willingness to buy or sell the commodity at a fixed price, speculators will sell their holdings only if the target price is above the anticipated price path—i.e. the level that would prevail in the absence of the board. If a board sets the initial price high enough to induce any sales, it will find itself accumulating a large stockpile of the commodity.
- (3) eventually, however, the price that would have prevailed in the absence of the board (the shadow price) will rise above the board's target. At this point, speculators will see the commodity as a desirable investment asset and will begin buying from the board. If the board tries to stabilize the price, speculators will purchase all of its holdings very quickly.

Krugman (1979) and Flood and Garber (1984) used Salant's commodity stabilization model as the basis for first generation models of currency crises.⁴ Krugman (1997) summarizes:

[In these models] the upward trend in the shadow price of foreign exchange—the price that would prevail [if the currency were allowed to float]—was supplied by assuming that the government of the target economy was engaged in a 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...

The logic of currency crises was the same as that of speculative attacks 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 [would] advance the date of the 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.⁵ [emphasis added]

Despite these positive contributions, the canonical model suffered from one major shortcoming. It assumed that the government would keep printing money despite potential warning signs, and that

the central bank would perpetually sell reserves to protect the exchange rate. Because governments in the real world do respond to changing circumstances, theorists developed a “second-generation” of models to explain such behavior.

Second-Generation Models The second generation models endogenized the decisions of governments and central banks. Governments can and do change fiscal policies in response to balance of payments issues. And central banks have tools other than intervention in foreign exchange markets to defend the exchange rate, the most important being the ability to tighten monetary policy. The second generation models recognize these choices, and the costs associated with them. Krugman writes:

So-called second-generation models...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 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...Another possibility is that the country suffers from unemployment...and would like to adopt a more expansionary monetary policy...

Given a motivation 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 of national pride and/or commitment to international cooperation (as in the [EMS]).

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? . . . [Suppose that people come to expect that a fixed currency] 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.⁶

Variations on Second Generation Models

In both the canonical and second-generation models, the crisis is ultimately the result of inconsistency in government policies—for example, a persistent fiscal deficit and a desire to maintain a fixed exchange rate. Krugman refers to such scenarios as driven by “economic fundamentals.” Most countries that are hit with a speculative attack do not share this view. The government often believes that it was prepared to defend the currency peg for a long time and, in fact, may have done so if the cost of defending the fixed rate had not risen sharply because of the speculative attack. Recent research has focused on the possibility that factors other than government policies can influence the timing and probability of a crisis. In particular, this research has focused on (1) whether a crisis can be self-fulfilling; (2) whether a crisis can occur because of “herd behavior;” and (3) whether a crisis can spread via a contagion effect.

Self-fulfilling Crises Suppose that there is a strong possibility that a country’s government will change policies before its central bank runs out of foreign currency. If this were the case, an end to the currency peg is not inevitable, but merely a possibility. In this case, the level of confidence that speculators have in the government’s policies plays a crucial role. Krugman writes:

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-fulfilling pessimism, a country [would] be justified in claiming that it suffered an unnecessary crisis.⁷

Although investors may ultimately cause the collapse, it is a lack of confidence in the government's policies that lead investors to early withdrawal. Krugman summarizes the self-fulfilling crisis as follows:

one can think of a range of fundamentals in which a crisis cannot happen, and a range in which it must happen; at most, self-fulfilling crisis models say that there is an intermediate in which a crisis can happen, but need not. It is an empirical question (though not an easy one) how wide this range is.

Herding A related explanation involves herd behavior by investors. As the term implies, herding occurs when investors follow the lead of the other investors, even when no new information has been revealed. Economist Robert Shiller highlighted the role of herd behavior on the part of investors during the 1987 stock market crash. Most could not cite a specific reason for selling, beyond the fact that prices were going down. There is a tendency toward herd behavior when some actors are thought to possess private information. Investors who are not in-the-loop thus monitor others' behavior carefully in an effort to detect signals regarding this information. In such a situation, random fluctuations can cascade into panic selling. Krugman summarizes, "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."⁸

Contagion Currency crises in the 1990s have often occurred in regional waves. These include: the ERM crisis in 1992-1993, the Latin American crisis in 1994-1995, and the Asian financial crisis in 1997-1998. The phenomenon where a crisis in one country leads to crises in other, geographically connected, countries is referred to as contagion. Why might contagion be strongest within a region?

Countries within geographic regions are often closely connected, both in terms of real linkages between their economies and in the minds of investors. Krugman describes the physical link as follows:

One simple explanation of contagion involves real linkages between countries: a currency crisis in country A worsens fundamentals of country B. For example, the southeast Asian countries...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 crisis 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 pressure on the French government to abandon its own commitment to a fixed exchange rate.⁹

Contagion, however, sometimes hits countries that do not appear to have close links between their real economies. A country may be adversely affected simply because it is perceived to be linked to a crisis country through geographic or cultural ties. For example, Argentina has few economic links with Mexico but was perceived to have a cultural link (the "Latin temperament"). Nonetheless, it came under speculative attack shortly after Mexico's 1994 peso crisis. South Korea also appeared to be the victim of contagion, although it is neither physically linked to, nor a major trade partner with, Southeast Asia.

Are currency crises predictable?

Because so much money can be made, or lost, in a speculative attack, there have been numerous studies that attempt to predict the onset of crises. Recent efforts include Credit Suisse First Boston's "Emerging Markets Risk Indicator," J.P. Morgan's "Event Risk Indicator," and Lehman Brothers' "Currency Jump Probability" measure.¹⁰ Several claim that retrospective simulations indicate that their models would have been successful in the past but, as of December 1998, none had yet predicted a crisis in advance.

The classic explanation about why crises occur, which derives from the canonical model, can be summarized as follows:

"a country with a persistent current account deficit and a fixed exchange rate will experience a currency crisis"

While satisfying in its simplicity, this explanation ignores several important factors. First, countries can, and often do, attract investment from abroad for long periods of time. Second, external imbalances (such as a current account deficit) can be resolved by mechanisms other than currency adjustment, for example, domestic price adjustments, wage reductions, and productivity improvements. Many countries choose to fix currencies precisely because a fixed rate forces such adjustments.

The IMF Approach A July 1997 study published by the IMF examined a wide variety of potential indicators in an attempt to determine if any could be used as an early warning system for currency crises. The study, "Leading Indicators of Currency Crises,"¹¹ reviewed 25 empirical studies covering currency crises from the early 1950s to the mid 1990s. It then tested 105 potential indicators, which the authors grouped into six broad categories. These included:

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| (1) the external sector; | (4) public finances; |
| (2) the financial sector; | (5) institutional and structural variables; and, |
| (3) the real sector; | (6) political variables |

The study then evaluated each indicator in terms of how many studies considered it as an indicator and of those, how many found the indicator to be statistically significant. From this, the IMF drew some conclusions:

The comparison of results across the various papers considered does not provide a clear-cut answer concerning the usefulness of each of the potential indicators of currency crises...Despite these difficulties, a number of conclusions can be derived. The first general conclusion is that an effective warning system should consider a broad variety of indicators; currency crises seem to be usually preceded by multiple economic, and sometimes political, problems. The evidence reviewed here points to the presence of both domestic and external imbalances, which span both the real side of the economy and the domestic financial sector.

Second, those individual variables that receive ample support as useful indicators of currency crises include international reserves, the real exchange rate, credit growth, credit to the public sector, and domestic inflation. The results also provide support for the trade balance, export performance, money growth, M2/international reserves, real GDP growth, and the fiscal deficit...

[Third], the variables associated with the external debt profile did not fare well. Also, contrary to expectations, *the current account balance did not receive much support as a useful indicator of crises* ..[emphasis added]

[Fourth], market variables, such as exchange rate expectations and interest rate differentials, do not do well in predicting currency crises...

Dornbusch and Werner Several economists have also developed models that attempt to predict crises. Perhaps the most famous was the prediction in early 1994 by MIT economists Rudiger Dornbusch and Alejandro Werner that a Mexican currency collapse was inevitable. Writing a year later, Dornbusch summarizes, "a situation of [currency] overvaluation is deeply unstable because, in a deregulated financial environment, it creates mechanisms that amplify the excess and exacerbate the subsequent financial distress and decline in real activity."¹² He also asserts that inflation has been overemphasized as a policy target and that, while fixed-rate systems sometimes serve a temporary purpose, they inevitably break down.

Sachs and Radelet Harvard economists Jeffrey Sachs and Steven Radelet, writing in the wake of the Asian financial crisis, do not accept that crises are inevitable. These authors downplay the role of economic fundamentals, which in Asia were strong, and instead emphasize the role of massive capital inflows caused by over-optimism, as well as "policy missteps and hasty reactions by governments, [and the role of] the international community and market participants [who] can turn a moderate adjustment into a financial panic and deep crisis." Their main goal is to "emphasize the role of financial panic as an essential element of the Asian crisis."¹³ Sachs and Radelet develop a prediction

model that relies on financial indicators such as the ratio of short-term foreign debt to foreign currency reserves and domestic credit expansion.

Do prediction systems work? Few attempts to predict currency crises in advance have been successful. None of the major investment banks or economic consulting firms forecast the onset or severity of the Asian financial crisis. Financial markets appeared to be predicting a collapse in Brazil for much of 1998, but the collapse never came. However, economists have been similarly unsuccessful (which is perhaps why they remain economists). A July 1997 IMF working paper looked at three widely-cited academic models created before the Asian crisis. The study concluded the models are of little use."

References

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- ¹ Pidcock, Dick, "The A-Z of Crashes," *Applied Derivatives Trading*, March 1997 Feature. <http://www.adtrading.com/adt12/crashaz.hts>.
 - ² Krugman, Paul. "Currency Crises." p. 13. <http://web.mit.edu/krugman/www/crises.html>.
 - ³ This section draws extensively from Krugman, Paul, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>.
 - ⁴ See Krugman, P., 1979, "A Model of Balance of Payments Crises," *Journal of Money, Credit, and Banking*, 11: 311-325, and Flood, R. and P. Garber, 1984, "Collapsing Exchange Rate Regimes: Some Linear Examples," *Journal of International Economics*, 17: 1-13.
 - ⁵ Paul Krugman, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>, pages 2-3.
 - ⁶ Paul Krugman, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>, page 5.
 - ⁷ Paul Krugman, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>, page 5.
 - ⁸ Paul Krugman, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>, page 6.
 - ⁹ Paul Krugman, 1997, "Currency Crises," <http://web.mit.edu/krugman/www/crises.html>, pages 6-7.
 - ¹⁰ The Economist, "The Perils of Prediction," August 1, 1998, page 61.
 - ¹¹ Kaminsky, Graciela, Saul Lizondo and Carmen M. Reinhart. "Leading Indicators of Currency Crises." *International Monetary Fund Working Paper*, WP/97/79. July 1997, p. 4.
 - ¹² Dornbusch, Goldfajn, and Valdes, "Currency Crises and Collapses," *Brookings Papers on Economic Activity*, v. 2: 1995.
 - ¹³ Sachs and Radelet, "The Onset of the East Asian Financial Crisis," HIIID working paper, March 1998.
 - ¹⁴ Andrew Berg and Catherine Patillo, "Are Currency Crisis Predictable? A Test," IMF working paper, July 1997.