The relation between foreign-exchange and banking crises in emerging countries: information and expectations problems

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The banking system has played a key role in balance-of-payments crises in a number of emerging countries. This article reviews three types of models which analyse the different factors involved in recent foreign-exchange crises. These usually stem at least partly from balance-of-payments problems; financial vulnerability causes the currency to collapse and undermines the banking system, thus generating a vicious circle. This paper shows that financial stability is by no means guaranteed, particularly in a globalized financial system. Emerging countries have to strike a balance between economic and financial stabilization, while maintaining their share of new capital flows. Although a difficult task, this is essential for avoiding a repeat of past crisis episodes, the threat of which apparently cannot be ruled out.

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I

Introduction

The rapid pace of financial and institutional innovation over the last few years has seen markets become internationalized and gradually deregulated. This aspect of globalization entails considerable risks; and, while balance-of-payments crises are nothing new, international financial instability has made them more frequent. This has elicited an outpouring of specialist articles that seek to identify the causes of foreign-exchange crises and thus avoid their effects through early detection.

This article outlines the way economic theory explains the phenomenon of foreign-exchange crises and how such explanations fit reality, focusing on crises that have occurred over the last decade. A bibliographic and empirical summary is also made of the role played by the banking system in the unfolding of such crises, relating the analysis to different generations of balance-of-payments crisis models.

As current theory is better at explaining foreign-exchange and financial-market problems, but does not clearly describe their gestation process, we try to make up for this failing by reviewing recent worldwide experience, and elucidating the feedback process that occurs between balance-of-payments and banking problems, using the tools and theoretical concepts of the economics of information.

A crisis can be defined as a moment of breakdown in the functioning of the system, involving a qualitative change in a positive or negative direction (Bobbio, Matteucci and Pasquino, 1998, p.139). As such, this paper views a foreign-exchange crisis as posing a major problem for a country's monetary authority, by making it potentially impossible to defend a given exchange rate or an explicit exchange-rate regime. In either case, the onset of crisis means that the speculative attack was successful in forcing the exchange rate into a sharp and severe depreciation. A banking crisis, on the other hand, is defined as a lengthy deterioration in the quality of banking assets which raises the likelihood of a suspension of payments by financial entities and forces the government or the central bank to announce and implement a large-scale financial support program (Pavón, 2001).

II

First-generation models:

the Mexican crisis of 1982

First-generation models viewed balance-of-payments crises as arising from lax fiscal and monetary policies that were inconsistent with the fixed exchange rate, thereby creating incentives for speculative attack, given the prospect of an exchange-rate collapse. Accordingly, this was seen as the exclusive responsibility of governments that implemented expansionary economic policies and accumulated public debt which they eventually monetized. This perception of

foreign-exchange crises was encouraging, because, if macroeconomic imbalances could be detected relatively easily, the current models could predict them. Speculative attacks could be anticipated; there was no uncertainty about the time and intensity of the attack; and exogenous shocks were not taken into account.

According to this line of thinking, crises only occurred when the private sector perceived government behaviour to be inconsistent with its commitment to the current exchange-rate regime. As the government's role seemed to be static and did not respond to private-sector actions, it was therefore sufficient to calculate the optimal economic-policy response to prevent a crisis. The banking sector did not participate in the gestation of

the crisis, but subsequently faced difficulties as a result of problems in the foreign-exchange market. The first of this class of models was developed by Krugman (1979), inspired by the work of Salant and Henderson (1978). Subsequently Flood and Garber (1984), Connolly and Taylor (1984), Sachs (1986) and Van Wijnbergen (1988) expanded on the original version.

In some of these models, domestic credit expansion causes a reduction in international reserves leading to a speculative attack on the local currency that forces the current exchange rate to be abandoned. The balance-of-payments crisis was associated with large-scale movements and specifically with the current account deficits recorded in the period leading up to the crisis. The pioneering article in this school of thought was Krugman (1979), which analyses the case of a small open economy producing a single good. Prices and wages are flexible, and production is at its potential level. The trade balance B is equivalent to the current account, with no distinction made between goods, services or transfers: the difference between output, Y, and expenditure is defined as:

$$B=Y-G-C \qquad (1)$$

In the financial assets market, investors can choose between assets denominated in local currency, M, or in foreign currency, F, with the nominal interest rate on both types of asset set at zero. The real wealth of national residents, W, will thus be equal to the sum of their holdings in local currency, M, and foreign currency F:

$$W=M/P+F \qquad (2)$$

The portfolio equilibrium condition establishes that holdings of monetary assets depend on the expected rate of inflation, Π. As the level of domestic prices P corresponds to the exchange rate, s, local-currency asset holdings depend on the expected rate of depreciation of the currency:

$$M/P=L(\Pi)*W \qquad (3)$$

where Π is the expected inflation rate and thus the expected rate of depreciation of the local currency. Under a flexible-exchange-rate regime, an increase in expected inflation produces a rise in the level of domestic prices; whereas, with a fixed exchange rate, an increase in expected inflation alters the composition of residents' wealth in favour of foreign-currency-denominated assets. This causes an offsetting change in international reserves, R, which decrease by the same amount as private residents' foreign-currency asset holdings increase.

Krugman (1979) also analyses the dynamic behaviour of the economy under both regimes. Under a flexible exchange-rate regime, money supply growth is determined by the difference between public expenditure, G, and public income, T:

Under a fixed exchange-rate scheme, the price level, P, is constant, because $P=sP^*$, $P^*=1$ and so $P=s=\Pi$. The private sector can only acquire assets by saving:

$$S=Y-T-C(Y-T,W) \qquad (4)$$

In this case, and given that the price level is constant, the growth of wealth among local agents is equivalent to private sector saving:

$$W=(M/P)+F=S \qquad (5)$$

If the wealth of national residents increases, a proportion of this, L, will be held in local currency $(M/P=L(\Pi)*W)$, while the remaining $1-L$ will be held in foreign-currency-denominated assets. The Government can fund its deficit either by issuing money or by drawing down its international reserves, R. Hence the Government's budget constraint, assuming it adjusts its expenditure to represent a fixed proportion, g, of real money balances, can be written as:

$$M/P+R=G-T=g(M/P) \qquad (6)$$

Thus, as long as the government has to underwrite a fixed parity, it has no way to finance its deficit. If it runs a deficit, fixing the exchange rate is impossible, whatever the initial level of international reserves, and the derived effect of setting the exchange rate will trigger a balance-of-payments crisis.

First-generation models reflected the nature of various foreign-exchange crises that occurred in the 1970s and 1980s, e.g. in Argentina, Thailand, Ghana and Mexico, all of which stemmed originally from the monetization of public-sector deficits. Contemporary crises such as in Chile or the Philippines, however, were already revealing the existence of other factors of vulnerability independent of government policy.

The ideological current underlying first-generation models, which ignored certain constituents of the foreign-exchange crises of that period, such as real-exchange-rate depreciation, was reinforced by the

so-called "Lawson Law", which argued that a current account deficit would not have negative consequences unless it arose from fiscal imbalance (Cline, 1995). Nonetheless, even under this scenario, the financial sector could not isolate itself from a foreign-exchange crisis. A surplus or shortage of liquidity, and interest-rate fluctuations resulting from the monetary policy applied (particularly arising from the monetization of public-sector deficits), compounded by the crowding out generated by government overborrowing, caused problems for the banking system which eventually fed through into the foreign-exchange market.

These conditions were clearly visible in the Mexican crisis of 1982, which is considered empirical evidence supporting this first wave of models. The 1976 peso devaluation caused major distortions in borrowing and lending operations in the banking system. The key factors underlying the process of financial "disintermediation", were the abandonment

of the fixed exchange-rate and price stability, intensive speculation, and a new economic model that involved an increase in public expenditure. Banks gradually became the financial agents of the government. When bank credit finally dried up, the government resorted to printing money, and subsequently external borrowing (Tello, 1984).

In that period, real interest rates were negative, which, in conjunction with growing uncertainty on financial markets, led to a domestic saving contraction. The economic model of the 1970s finally collapsed in 1982. Inflation, excessive public-sector borrowing, and its break with the private sector ended up seriously undermining the banking system, the current account and employment. The government took over the banks, blaming them for the financial collapse (Rubio, 1999). As a result, the neutrality of the banking system in the foreign-exchange crises explained by these early models was by no means clear (Edwards, 2001).

III

Second-generation models: the collapse of the European Monetary System and the 1994 Mexican crisis

The crisis of the European Monetary System (1992-1993) revealed a new set of foreign-exchange-crisis triggers and, in conjunction with the Mexican crisis (1994-1995), gave rise to second-generation models. These analysed the destabilizing effects of globalization and financial liberalization in greater depth.

The European Economic Community (EEC) had created the European Monetary System (EMS) to smooth out fluctuations between its member currencies, with a view to future entry into the future European Monetary Union (EMU). Under this scheme, countries had to keep their currency in a flotation band of +/- 2.25% centred on the target value of other member countries, except for the Italian lira which was allowed a broader band. The German mark became the anchor of the system, backed by its stability and the strength of its central bank (Eichengreen, Rose and Wyplosz, 1994). Nonetheless, German reunification led to an expansionary fiscal policy which the Bundesbank tried to counteract by monetary austerity, resulting in an appreciation of the German mark and driving up

interest rates in other EEC countries. Lastly, in response to a speculative onslaught on the pound sterling in September 1992, the British authorities raised interest rates by a substantial 15%. As this proved unsuccessful, however, Britain decided to withdraw from the band, along with Italy. Spain adjusted its parity twice, but remained in the system, as did France which merely raised interest rates. In August 1993, the EMS flotation bands were widened to 15%.

As in the Mexican crisis two years later, this episode could not be explained by first-generation models and empirically refuted the Lawson Law: in both cases, the public sector was running a financial surplus. Moreover, large current-account deficits induced exchange-rate crises occurring in Chile in the early 1980s, or in several Asian countries in the late 1990s, even though such deficits essentially reflect an imbalance between private saving and investment.

The Mexican crisis (1994-1995) arose out of socio-political uncertainty, in an economy suffering from a large current account deficit, gradual dollarization

through mexican Treasury bonds, and a domestic currency that was overvalued by about 25%. In December 1994, massive capital flight forced the financial authorities to widen the flotation band by 15.2%, and almost immediately afterwards the Mexican peso was allowed to float freely.

The Mexican crisis propagated to other emerging economies, which authors such as Krugman (1999) explained as a contagion effect arising from imperfect information. This leads investors to classify several countries in a single category, irrespective of their specific macroeconomic features, and even without apparent trade links between them. Self-fulfilling expectations spread and were magnified among institutional investors, thus expanding the scale and scope of the crisis.

This episode had different characteristics than the earlier Mexican crises. While the crises of 1976 and 1982 were the result of public-finance deficits, the 1995 crisis stemmed from socio-political uncertainty in a weak economic framework, and bank lending to the private sector that was rendered excessive owing to problems of moral hazard and the operational inefficiency of recently privatized financial institutions (1990). The latter displayed two distinctive features: entities had been acquired by economic agents that were not insiders (brokerage firms), and their valuation had been overstated. Moreover, financial operations would be supervised by an obsolete National Banking and Securities Commission (CNBV), which lacked both suitable tools and staff. The conjunction of these factors and the implicit incentives created by privatization meant that within a few years the local banking system had a large proportion of non-performing loans in its portfolio (Frenkel, 2005).

In 1993, credit risk peaked just as the economy was at a turning point in the business cycle: inadequate loan selection caused the non-performing portfolio to expand. In 1994, financing extended to the public and private sectors grew by 19.7%, and 11.8% respectively in real terms, but this was the last expansionary year in the credit cycle. When interest rates rebounded a large proportion of bank loans became unpayable, making the overdue portfolio unrecoverable, and rendering most of the current portfolio doubtful. Borrowing and lending plummeted by -10.6% and -15.6% respectively. The absence of a reliable supervision system, in conjunction with accounting systems that were not standardized between different financial entities, made it impossible to quantify the true magnitude of the banking crisis, but clearly revealed the feedback that exists between banking problems and the collapse of an exchange-rate regime.

The Mexican crisis, together with that of the EMS, both of them set in a financial liberalization process, fuelled a major debate in the specialist literature and gave rise to second-generation models inspired by the work of Obstfeld (1986). This was expanded on and modified by various authors such as Eichengreen, Rose and Wyplosz (1995), Obstfeld and Rogoff (1995) Krugman (1996) and Obstfeld (1996).

The new literature makes it possible to explain the interaction between agents' expectations and economic policy, in which government actions represent an optimal response to shocks. The public cost of maintaining a fixed parity increases as expectations of a devaluation of the currency are generated, such that government liabilities become unstable, but conditional on the macroeconomic scenario or state of nature. The existence of nominal rigidity in the economy can partly explain why the government may face incentives to abandon its initial commitment to the fixed parity. For example, a rigid labour market leads to high levels of unemployment which can be reduced by an expansionary monetary policy that creates inflationary pressures and erodes the real wage (Díaz Mier and Hinarejos, 2006).

An example of a second-generation model is that of Obstfeld (1996), in which the initial assumption is that when there is uncertainty about the future trend of the exchange rate, the government introduces parity-defending measures that involve implicit costs such as job losses. The public decision to devalue is based on minimizing a loss function that relates the costs of defending the exchange rate, expressed either in terms of lower output or job losses, to the cost of currency devaluation in terms of higher inflation.

$$L=(y–y^*)^2+\beta\varepsilon^2+c(\varepsilon) \qquad (7)$$

where y is actual output, y^* is the government target, ε is the exchange-rate variation, and $c(\varepsilon)$ is the cost to the government of changing the parity, associated with a loss of credibility. Output is determined through an expectations-augmented Phillips curve function:

$$y= \tilde{y} +\alpha(\varepsilon-\varepsilon^e)–\mu \qquad (8)$$

where $\tilde{y}$ is potential output, ε^e are local price expectations, ε, based on lagged information, and μ is an error term with zero mean. The assumption that the government's GDP target, y^*, is greater than potential output generates dynamic inconsistency giving rise

to multiple equilibria, each of which is a function of expectations of devaluation and the country's macroeconomic balances. Hence, the latter, while not directly provoking the crisis, still have a significant influence on their likelihood of occurrence. Of the former, if the cost of devaluation is low and output is sensitive to changes in the use of labour, devaluation aversion and the government's credibility will decrease, which makes an exchange-rate crisis more likely (Obstfeld, 1996).

This class of model stresses the role of stock imbalances (e.g. public debt), and herd behaviour among economic agents (Calvo and Mendoza, 1996); in contrast, flow imbalances (the public-sector deficit) are secondary. This theoretical framework makes it possible to understand the mechanisms through which expectations can fuel difficulties on the foreign exchange market, or generate liquidity problems in the face of a crisis of confidence, even if the economic program is viable in the long term. The more complex second-generation models take account of dynamic behaviour among the public and private sectors in the form of repetitive games in which each reacts to the other's actions. Speculators take their decisions with full knowledge of the non-linear movements of the government and can force it to implement policies that are inconsistent with the exchange-rate regime, regardless of the situation in terms of macroeconomic fundamentals. From this standpoint, devaluation expectations are self-fulfilling.

The attack will happen provided there are incentives to speculate and mechanisms can be mutually coordinated (Welling, 2006).

Second-generation models focus on contagion effects; Masson (1999) provides various reasons why crises can occur in several countries contemporaneously. Firstly, there may be common factors in play, such as a rise in international interest rates. Another possibility, mentioned by Corsetti, Presenti and Proubissi (1999), is that collapse in one country undermines the macroeconomic fundamentals of another. Lastly, contemporaneous crises could reflect factors that cannot be explained through economics, possibly because a change occurs in the market climate (pure contagion).

Nonetheless, the empirical evidence seems to show that in practice pure contagion seldom exists, and banking systems that are affected by shocks display prior vulnerability. Similarly, the effects that cause a crisis in an individual institution that threaten overall systemic stability are more likely in fragile financial structures. As pointed out by Kaminsky and Reinhart (1999), since financial liberalization, banking and monetary crises seem to be closely linked. Usually, the start of banking problems precede foreign-exchange crises.

In the midst of considerations of this type, the foreign exchange and financial crisis of the Southeast Asian countries erupted in 1997, giving rise to another generation of models.

IV

Third-generation models:

the Southeast Asian countries

The specifics of the Southeast Asian crisis revealed the limitations of the balance-of-payments crisis models that were in vogue at that time. The crisis erupted in 1997, when the Central Bank of Thailand floated the baht, thereby triggering massive sales of the other Southeast Asian currencies and that of the Republic of Korea. The Philippines and Indonesia liberalized their foreign-exchange market, while the Republic of Korea widened the won flotation band from 2.3% to 10%, before eliminating the bands altogether. All of this contributed to a crisis of confidence in the region and fuelled massive capital flight. Apart from describing

the crisis, however, the aspect that is relevant to this article is its gestation process.

From the mid-1980s until 1990, the Southeast Asian economy grew at an average rate of 6% per year, fuelled by foreign direct investment (FDI) from Japan, which in the second half of that decade amounted to US$15 billion (Agénor, Miller and others, 1999). Interest rates in the industrialized world in the early 1990s promoted speculative capital inflows into Southeast Asia, whose high yields, dollar-anchored exchange rates, financial liberalization and favourable macroeconomic performance made it extremely attractive (IMF, 2007).

But those same yields and their effects on the real exchange rate steadily undermined export competitiveness and curtailed lending to local enterprises. In the first half of the 1990s, the Philippine peso appreciated by 40%, and the ringgit, baht and rupee all rose by nearly 20%. Thailand posted a large current account deficit and Malaysia moved from surplus to deficit. Capital flowed into these countries partly in the form of loans, and from 1995 until one year before the crisis, short-term obligations accounted for 58.5% of the total debt (García and Olivié, 1999).

In a setting involving foreign capital flows, excess leverage and deregulation, banks borrowed in foreign currency while lending in local currency, thus accentuating exchange-rate risk.

They also faced a major disparity between borrowing and lending maturities, and loans for high-risk and unproductive investments such as real estate and shares. All of that fuelled an increase in the non-performing portfolio, which grew to 15% of the total portfolio in Thailand, Indonesia, the Republic of Korea and Malaysia even before the crisis, compounded by a real-estate and stock-market bubble that culminated in exchange-rate and financial collapse across the region.

An analysis of the gestation of the Southeast Asian crisis shows that, like Mexico or the EMS, the countries in question were not suffering from public finance problems or loss of international reserves, thus contradicting the first generation balance-of-payments crisis models. Second-generation models, however, also were unable to explain the Asian case in terms of the factors that triggered expectations of devaluation: there was no public deficit or economic stagnation. In particular, doubts were raised as to the origin of the balance-of-payments pressures and their linkage with the financial system, where the direction of causality was less clear and suggested a feedback process. Nonetheless, the current models did consider that the incremental cost of maintaining the parity could entail higher expectations of devaluation, as could also be said about currency appreciation, low returns on investment projects and the maturity structure of private-sector debt. The Asian countries had a number of structural shortcomings, but these would not have affected the rest of the economy without a feedback process between domestic problems, external shocks and expectations. Contagion may have helped propagate the Asian crisis, because highly dissimilar economies, such as the Philippines and the Republic of Korea, succumbed to speculative attacks.

These considerations were extended to the Mexican crisis of 1994, and gave rise to an entire literature on information problems in the banking system and their consequences in terms of moral hazard and adverse selection in financial institutions' asset portfolios (De Juan, 2005).

This line of thought give rise to third-generation models, which actually share several elements in common with the previous approaches. Firstly, they draw on a number of arguments used in the initial models on exchange-rate crises, because in the presence of moral hazard a debt will ultimately be assumed by the government even if it originates in the private sector. Crisis in the foreign exchange market then arises from an implicit public deficit which makes it necessary to abandon a fixed exchange rate. This hypothesis is favoured by several authors such as McKinnon and Pill (1999) and Corsetti, Presenti and Proubissi (1999).

This third class of models also draws on second-generation ones by recognizing that government behaviour depends on the macroeconomic climate; but the difference is that the government reaction responds not only to the action of speculators but also to the trend of macroeconomic fundamentals. The existence of implicit guarantees and moral hazard is the basis of these new models for explaining the "games" played between the public and private sectors.

A third-generation model *par excellence* is that of Corsetti, Presenti and Proubissi (1999). This assumes a small economy specializing in the production of a tradable good, Y, with a constant-returns-to-scale Cobb-Douglas production function, and a stochastic technology parameter, At, with two equiprobable values: $(A+\sigma)$ or $(A-\sigma)$. Capital markets are incomplete and segmented. A fraction, β, of domestic economic agents (the elite or ELI) has free access to capital markets, whereas the rest of the population, ROC (domestic agents not belonging to the elite), can only acquire domestic assets.

Initial capital is financed through foreign borrowing; ELI obtains foreign credit, D, and lends K to foreign ELI at a constant interest rate of r. The budget constraint facing ELI is:

$$K_{t+1}-K_t-(D_{t+1}-D_t)(\varepsilon_t/P_t)=Y_t-W_t-r(\varepsilon_t/P_t)$$
$$D_t-C_t^{ELI}-T_t^{ELI}-(M_t^{ELI}-M_{t-1}^{ELI})/P_t \qquad (9)$$

where W are the real wages of ELI, C its consumption, T its net tax payment, M its money holdings, P the domestic price level and ε_t the exchange rate. Labour incomes are the only source of income for ROC; and,

as there is no capital market enabling them to borrow against future incomes, their budget constraint is:

$$W_t = C_t^{ROC} + T_t^{ROC} + (M_t^{ROC} - M_{t-1}^{ROC})/P_t \qquad (10)$$

The government implements fiscal policy and manages international reserves R. Prior to a crisis its budget is:

$$T_t + (M_t - M_{t-1}/P_t) + (r\varepsilon_t/P_t)R_t = (\varepsilon_t/P_t)(R_{t+1} - R_t) \quad (11)$$

To take account of international arbitrage and fulfil purchasing power parity, $P_t = \varepsilon_t$ and adding the foregoing budget constraints, the following function is obtained for the current account:

$$-(D_{t+1} - R_{t+1}) + (D_t - R_t) = Y_t - r(D_t - R_t) - C_t - (K_{t+1} - K_t) \quad (12)$$

ELI is risk-neutral, and its inter-temporal preference rate is equivalent to the interest rate, r. Its expected utility, assuming real money balances provide liquidity services, is:

$$Et \sum_{s=t}^{\omega} \frac{1}{(1+r)^{s-t}} \Big[C_s^{ELI} + \chi ln(M_s^{ELI}/P_s) \Big] \qquad (13)$$

Each agent of the elite maximizes this expression with respect to capital and money holdings, subject to the respective budget constraint (equation 10). The optimal choice of capital equalizes its expected marginal return with the cost of funds. In this case, investment decisions affect net revenue, T^{ELI}, in subsequent periods.

ROC, unlike *ELI*, cannot trade assets across time, so its demand for money is inelastic with respect to the interest-rate and determined by the following constraint:

$$M_{t-1}^{ROC} = P_t C_t^{ROC} \qquad (14)$$

In this model, a financial crisis arises when the liabilities of *ELI* exceed capital, and the essence of the treatment of moral hazard is that, once the crisis erupts, agents correctly assume that the government will support them, such that the optimal choice of capital depends on expectations relating to future taxes or transfers.

As agents rationally anticipate this monetary support from the government in the event of a crisis, moral hazard can be modelled as a non-negative transfer, θ, contingent on the occurrence of A. If the

realization is negative, $\tilde{A} = A - \sigma$, agents expect to receive public transfers equivalent to the difference between the non-performing portfolio and the cost of funds. In contrast, if the realization of the shock is positive $(\tilde{A} = A + \sigma)$, nothing will be received.

It is easy to show that the desired level of capital, K, is greater than the efficiency level, $\tilde{K}$, so there is excess investment:

$$K = \left[\left(a(A+\sigma)/r \right)^{1/(1-a)} > \tilde{K} = a\left[A/r \right]^{1/(1-a)} \right] \quad (15)$$

Moral hazard generates excess foreign borrowing, because, as all capital is leveraged, *ELI* has to increase its external liabilities to finance its excess investment. Unless it receives government support, *ELI* will cover losses with growing external borrowing. The total external debt, D, is also expressed as

$$D_{t+1} = K_{t+1} + F_{t+1} \qquad (16)$$

Where the level of capital is constant at K, and F is the cumulative level of external borrowing since the initial period (in the model this is also called *"evergreening"*): F will be greater the more serious the shock and excess capital. This model also shows that financial liberalization magnifies these effects. The private sector can refinance its external debt provided reserves, R, exceed a certain threshold, γF, below which international creditors not only halt the flow of fresh funds, but also refuse to maintain existing debt. The authors represent this constraint as:

$$R_{tc+1} = \gamma F_{tc+1} \qquad 0 < \gamma < 1 \qquad (17)$$

where t_c is the initial period. When this constraint is breached, financial crisis begins –*ELI* presents the bill to the government which supports it; and government solvency encounters the inter-temporal constraint. "Natural collapse" is defined as a situation in which the attack on the currency only occurs when $F/R = \gamma$, for which there are two scenarios. In one case, the government obtains tax revenues to avoid monetary issuance and foreign-exchange crisis; and in the other, the money supply must grow at an average positive rate, the steady-state demand for money is constant, and both prices and the exchange rate rise at a rate of μ. Although natural collapse seems to coincide with abandonment of the exchange-rate parity, this does not surprise economic agents who understand the dynamics of the debt and international reserves. Hence

natural collapse cannot be an equilibrium state under rational expectations, since in that case the parity would collapse at an earlier stage.

Third-generation models attempt to reconcile the two previous models by taking into account non-linear government behaviour, self-fulfilling expectations and the existence of multiple equilibria; but also incorporating innovative aspects such as implicit public guarantees, financial fragility and asset imbalances that stem from problems relating to information and macroeconomic fundamentals. The interdependence between financial and exchange-rate crises becomes important and shows the potential danger implicit in fragile and poorly regulated banking systems.

V

Recent crises and third-generation models:

the case of Russia, Brazil, Turkey and Argentina

The Mexican and Asian crises revealed the importance of the banking system in balance-of-payments crises. In the Asian case, financial fragility preceded the monetary attack, and was one of its key motivations; whereas in Mexico, the direction of causality between the financial and exchange-rate crisis was never entirely clear, because the banking system displayed serious problems prior to the parity adjustment, which the latter merely highlighted and aggravated. The simultaneous crises in Russia and Brazil, and a few years later in Turkey and Argentina, provides complementary evidence.

In the case of the **Russian crisis (1997)**, in that year President Yeltsin had introduced tax reform, controls over monopolies and business cronyism, and a market-based economic and financial model that would enable the country to grow temporarily. Nonetheless, problems persisted in terms of corruption, lack of contractual and property rights, prevalence of oligarchies (in financial conglomerates), and fragile banking and tax systems. Two external shocks triggered the exchange-rate collapse: a slide in oil and other commodity prices; and contagion from the Asian crisis, which triggered capital flight and stock market collapse. In late 1998, payments were suspended and the rouble was devalued. The setting for the Russian crisis was consistent with third-generation models but also involved new elements, such as a lack of international financial support, or problems in establishing a market system and strengthening institutions in transition countries that were almost "violently" immersed in globalization.

In the case of **Brazil (1999)**, the crisis gestation process had aspects in common with those of Mexico in 1994. Following lengthy periods of high inflation, in 1994 Brazil implemented the Real Plan (a stabilization scheme anchored on the nominal exchange rate). It also promoted trade and financial liberalization and the restoration of public finances by reducing transfers to the municipalities and increasing income tax. Monetary policy became increasingly restrictive, and the real fluctuated within periodically adjusted bands (1995-1999). The plan succeeded in stabilizing the economy, although the currency steadily became overvalued. The Russian crisis in 1998 had aggravated nervousness among investors regarding the stability of emerging countries; and, as capital flight gathered pace, widespread expectations of a devaluation took hold. This, compounded by budget adjustment problems and a loss of international reserves, made exchange-rate collapse imminent, forcing the Central Bank of Brazil to widen the band and then put the exchange rate into free float. Within a few days, the currency had lost over 30% of its value.

The crisis in **Turkey (2001)** also fits the exchange-rate crisis models studied above. Its key feature was an effort to control the country's large deficit (12% of GDP in 2000) and public debt (about 90% of GDP in 2001). The implementation of flotation bands in 1999, to anchor the inflationary process, elicited heavy capital inflows and a substantial increase in foreign currency debt held by the banking system. In early 2001, disagreements between the President and his Prime Minister increased tensions on financial markets and triggered capital flight amounting to US$5 billion in 24 hours, along with a stock market crash, a large-scale banking crisis and the abandonment of the fixed exchange rate. The Turkish lira lost 36% of its value in 2001.

Given its real and financial dimensions and its impact in current economic literature, the **Argentine**

crisis in 2002 is, along with the Mexican episode of 1995, the most severe economic, exchange-rate, and financial collapse of the last few years. This was preceded, as in the majority of recent exchange-rate crises, by large inflows of foreign capital under pre-established exchange-rate regimes. As occurred in Brazil (1999), Mexico (1994) and Russia (1998), a previous stabilization plan based on the 1991 Convertibility Law had enabled Argentina to shake off hyperinflation and overcome a difficult socioeconomic situation. As years passed, however, this became a straitjacket that restricted competitiveness and overvalued the Argentine peso,[1] leading to a gradual decline in the population's purchasing power. The strength of the dollar, depreciation of the Brazilian real, and the drop in agricultural prices fuelled the deterioration of the current account. The shocks and lack of competitiveness caused a deep recession in the country from 1999 onwards, which aggravated its fiscal problems still further by reducing tax revenues (IMF, 2005).

Although the causes of the Argentine crisis have been widely debated, there seems to be a consensus that it was the result of an interaction between elements of domestic fragility, in both real and financial markets, and external shocks and self-fulfilling expectations. This crisis is thus consistent with third-generation exchange-rate crisis models.

Elements of domestic vulnerability included incompatibility between the exchange-rate regime and a lax fiscal policy, compounded by economic slowdown and an increasingly fragile banking system (Bustelo, 2004). Another ingredient of the crisis, pointed out by Galiani, Heymann and Tommasi (2002), was that excessive private expenditure in the 1990s fuelled by "irrational" expectations –as seen earlier in countries such as Mexico– confused an upswing in the business cycle with a positive change of trend. Accordingly, the public and private sectors borrowed in uncovered foreign currencies (Caprio, Klingebiel and others, 2005).

With regard to external shocks, a key element was that the contraction in capital markets following the Russian crisis (Calvo, Izquierdo and Talvi, 2002), with the interruption of IMF assistance changed perceptions and generated considerable nervousness among international investors, causing the flow of funds to emerging countries to dwindle. Although, as claimed by Haussman and Velasco (2002), Argentina suffered no more than other nations in the region from the contraction on international capital markets, the collapse was the outcome of a conjunction of its rigid exchange-rate regime, lack of fiscal discipline, and the vulnerability of a banking system immersed in a process of deregulation and "foreignization", in an international setting of more constrained monetary flows.

Arriazu (2003) and Schenone (2007) mention additional pressure factors, including expectations that the exchange-rate regime would prove unsustainable; the international rise in the relative prices of nontradable goods, and social tensions caused by a deterioration of social welfare, which made the government unwilling to accept the conditions imposed by international organizations. In January 2002, the Convertibility Plan was abandoned, and Argentina entered a period of instability (Mussa, 2002). The country faced genuine economic, financial and political collapse, since the *"corralito"* (a restriction imposed by the government to curb an imminent run on the banking system) and the *"corralón"* (which set limits on time deposit withdrawals) were perceived as a violation of depositors' property rights, and, in conjunction with the collapse of the payments system, undermined the credibility of the financial system and institutions (Ocampo, 2002).

The collapse of the payments system led to the proliferation of barter, fairs, and monetary issuance by organizations and provinces. Several banks announced their closure, and the government implemented measures to support others to stave off bankruptcy. The law provided for a scaled repayment of deposits, without taking account of the major devaluation that was on the horizon, thus setting off a rapid recovery process (Chudnovsky, López and Pupato, 2003).

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[1] In the context of our research it is worth asking whether or not this overvaluation of the Argentine peso, estimated at 20% by the IMF (2005), was perceived by economic agents. This is where the hypothesis of asymmetric information in the gestation of balance of payments crises becomes relevant.

VI

Gestation of a crisis from the economics of information standpoint

Third-generation models are better at explaining the most recent crises but not their gestation. In first-generation models, crisis was triggered by a sharp reduction in international reserves caused by the monetization of the public deficit; and in second-generation models the key factor was a speculative attack fuelled by widespread negative expectations. Third-generation models suggest that the main cause of exchange-rate crises is excessive foreign borrowing by the financial system stemming from incentives problems, and that the mechanism of collapse is similar to that described by second-generation models: asset imbalance (Calvo and Mendoza, 1996) or breach of a given borrowing threshold (Sargent and Wallace, 1981).

From an analytical standpoint, it is possible to describe a gestation process that shows, in a defined chronological order, the diversity of schemes whereby financial systems and exchange-rate regimes are set up and operate.

The seeds of crisis are sown in the upswing of the business cycle, where collective illusion sucks in resources from abroad, thereby exacerbating optimism and fuelling growth in consumption, investment and borrowing. In this phase, the local currency gradually appreciates, thus eroding the country's competitiveness and raising credit risk. In a overheated economy, there are strong incentives for agents to take on excessive and even unknown risks, beyond the absorption capacity of their capital and explicit safety nets. The greatest risk also stems from an increasing degree of currency- and maturity-mismatch between assets and liabilities, which accentuates systemic vulnerability to any shock, thereby encouraging a speculative attack driven by the characteristic herd behaviour of institutional investors.

Moreover, in a rapidly changing global environment such as the present one, emerging economies are subject to shocks (including corrections in financial-asset, real-estate or raw-materials prices, interest-rate fluctuations, economic slowdown and socio-political instability) which can change the scenario and the expectations of economic agents possessing different levels of information. Once the country is hit by these shocks, the distortions in risk-taking incentives intensify as the non-performing portfolio eats into bank capital. As managers start to perceive their jobs at risk unless the business shows profits, risky transactions become more widespread. Banks also start to act more aggressively, particularly if they anticipate government support in the event of a crisis. This phase sees the start of a silent withdrawal of funds and increasing redistribution of risk by well-informed customers, thereby revealing the information asymmetries that exist between agents in the financial system.

When the shock occurs, collective deception magnifies the crisis. Lack of vision can exacerbate adverse financial conditions, because just after the episode it is easy to imagine it occurring, which increases the subjective likelihood of it occurring way beyond its real probability. This results in heavy credit rationing, halting of investment and foreign credit, a "flight to quality" and an upturn in profits, which in turn heightens adverse selection in granting loans. This nervousness can lead to bank runs in the absence of an adequate safety net.

Nonetheless, as the safety net simultaneously enables already insolvent banks to continue operating, losses then become explicit and lead to a crisis of confidence which is reflected in the financial and foreign-exchange markets. Customers may find access to their bank accounts restricted, and the dispute over the distribution of the losses enters the political domain. There are two symptoms that characterize the transition from the second phase to the third: the media start to warn of exorbitant interest rates and bank runs; and the authorities initiate an open debate on possible bank closures, mergers or acquisitions. Exchange-rate and financial collapse is now a reality.

The gestation process described above clearly shows that foreign capital inflows exacerbate the business cycle in emerging countries, when market euphoria arising from a successful model is followed by a flight to quality. This provokes a massive withdrawal of foreign financing, largely caused by the herd behaviour of institutional investors worldwide, and even the denial of support from international organizations –precisely as predicted by second– and third-generation models of balance-of-payments crises.

This is particularly true when a liberalized but poorly regulated banking system, with moral hazard arising from unlimited safety nets, turns such capital inflows into a surge of lending, which is almost inevitably followed by a credit crunch that further undermines the vulnerability of the banking sector (McKinnon and Pill, 1999). The crisis thus combines a deterioration in certain domestic macroeconomic fundamentals with speculation and herd behaviour in the international financial market (Bustelo, 2004; Hale and Arteta, 2007).

VII

The creation of "rational" inter-temporal expectations

The foregoing analysis confirms the claim made by Herring (1998) that a prolonged period of calm usually precedes major shocks that trigger exchange-rate and financial crises. Although, once the shock happens, it becomes clear that the agents involved had taken on excessive risk, the important thing is to understand why. There seem to be two possible answers: either agents underestimated the likelihood of the shock occurring; or else they perceived it correctly but still overexposed themselves to risk, because they considered it profitable to do so.

The profitability of higher risk is common in banking crises and basically reflects certainty among the customers and managers of banks that government support will be forthcoming. In other words, unlimited safety nets promote moral hazard and erode the soundness of the system, by raising the privately optimal level of risk above the socially optimal level.

Underestimating the likelihood of a shock depends on an ability to calibrate the corresponding probability. This is a function of the frequency of the shocks, compared to the frequency of changes in the structure of the underlying causality, together with the level of understanding of the structure of that causality.

Additional elements (Tversky and Kahneman, 1982) can show that in decision-making situations, subjective probabilities are formulated on the basis of the ease with which an individual can visualize the event in question. If the subjective probability of a crisis decreases, even when the real probabilities remain constant or increase, economic agents assume greater risk exposure and therefore increase their vulnerability.

This lack of vision propagates itself, because risk exposure systems are established on a relative basis and provoke the herd behaviour seen among institutional investors. Keynes foresaw this situation clearly when he stated that *"a sound banker is not one who foresees danger and avoids it, but one who, when he is ruined, is ruined in a conventional and orthodox way along with his fellows, so that no one can really blame him."* (Keynes, 1931, p. 176).

The second reason that people assign a low probability to the occurrence of a negative event is that people have unrealistically high expectations of themselves and their country. As described by Naranjo (1996, p.8), there is an ubiquitous propensity towards unfounded optimism based on human biological characteristics.

Another related cause of errors of appreciation is cognitive dissonance, i.e. a tendency to form judgments based on wishes and in defiance of the evidence. From the economic standpoint, people have preferences for their economic expectations in the macroeconomic environment; they have some power to change them; and those chosen persist.

Whatever the cause, this lack of vision which some authors refer to as "disaster myopia" (Herring, 1998) and others call "collective illusion", also affects the government and financial system regulators who relax just when they should be taking steps to fight growing vulnerability: they suffer from the same perception bias as other economic agents. Institutional factors can strengthen collective illusion and excessive risk-taking. Argentina provided a clear example of the perverse effects of disaster myopia, for the crisis in that country was clearly exacerbated by the existence of collective illusion: most market participants did not have a contingency plan in the event of a collapse of the convertibility system, which was nonetheless feasible.

VIII

Final thoughts

This article has provided a brief theoretical and empirical review of recent balance-of-payments crises.

In the 1980s, in response to the evidence of those years, first-generation models were developed that explained the crises in terms of government policies that were incompatible with the prevailing exchange-rate regime. Nonetheless, the crises in the European Monetary System (1992) and Mexico (1994) highlighted another factor triggering a speculative attack on the foreign-exchange market and the fact that this could still exist in conjunction with disciplined public finances: namely the generation of self-fulfilling expectations in a setting of asymmetric information. They also demonstrated the presence of financial contagion fuelled at least partly by the herd behaviour of institutional investors. These two elements formed the core of second-generation models, which ignored the macroeconomic fundamentals of the country in question. Nonetheless, the specifics of the Southeast Asian crisis in the late 1990s, and the subsequent crises in Russia, Brazil, Turkey and Argentina, suggested that there was interaction between the variables considered in the two types of model.

The resulting third-generation models drew on elements of the initial models, because, particularly when moral hazard is in play, any debt in a country will ultimately become a public debt and sooner or later make the prevailing exchange-rate regime unsustainable. The new models also draw on their second-generation predecessors by highlighting the importance of expectations in the process by which crises develop and propagate. In fact, what makes these latter models valid is the fact that they are sufficiently inclusive to incorporate relevant factors that have emerged from the most recent crisis episodes, such as interaction between real and domestic financial fragility, the occurrence of a shock, and weaknesses in the design or execution of the banking regulation and supervision framework. All of this occurs in a setting of uncertainty and growing international financial interaction.

A deterioration in a country's financial situation usually precedes a balance-of-payments crisis. This deterioration stems from asymmetric information which, in the presence of unlimited safety nets and inadequate supervision and regulation, create adverse-selection and moral-hazard problems. The financial vulnerability that precedes a foreign-exchange-market crisis, specifically in the banking sector, stems from the profitability of excessive risk-taking and the collective illusion displayed by economic agents. Nonetheless, the causality link is not one-way, because currency collapse further aggravates the deterioration of the banking situation, thus activating a vicious circle. A banking crisis generally occurs following the collapse of the currency, as a result of high interest rates that make the current portfolio doubtful or unrecoverable.

Thus, in the latest generation of balance-of-payments crisis models, the government no longer bears exclusive responsibility for speculative attacks, and the blame must partly be transferred to the private sector in a setting of uncertainty. Crises arise from the system's growing vulnerability prior to the occurrence of a major shock, which suggests that stability on the foreign exchange market is not guaranteed even in the presence of fiscal and monetary discipline –an implication that contradicts the first-generation models. The complexity of the international schemes under which foreign-exchange crises are formed, makes it hard to generalize and design a single prevention model; but, if recent literature has contributed anything, it is by clearly showing that crises can be caused by a very wide variety of factors. The task that remains, therefore, is simply to strengthen regulation and supervision, in conjunction with appropriate management of economic policy that maintains consistency between stocks and flows, supported by stability on the foreign-exchange market.

Although the hypothesis of collective illusion is hard to detect *ex ante*, since it is impossible to demonstrate excessive exposure to the risk of shocks of unknown probability, it is feasible to identify the conditions that lead to it. These characteristics of expectations formation could be included in the new balance of payments mathematical models, with a lesser or greater degree of complexity. In their simplest version, it would be sufficient to incorporate a component in the expectations formation function that assigned an intertemporal updating factor to the latest reported crisis episode, whether of the country in question, and/or the group of countries in the same category for the purposes of institutional investment (e.g. on the basis of the risk-

rating assigned by international agencies). This would bring theoretical rationality closer to human rationality which makes intertemporal perception errors.

In any event, to alleviate the risk of an exchange-rate and financial crisis, liberalization of the banking sector must clearly be accompanied by simultaneous construction of an adequate supervision and regulation system. Even then, unless progress is made in creating a new international financial architecture, which in fact, is encountering increasing obstacles, emerging economies will remain vulnerable to financial globalization in its current form. Accordingly, a consistent set of prevention measures need to be designed that are accessible to such countries, to stabilize their economies and protect them from international financial volatility, but without ignoring capital inflows –a difficult but essential task in this new millennium. Emerging economies cannot allow themselves to believe that financial stability is guaranteed, and once again fall into a collective illusion that has been so costly over the last 50 years

and recently seems to have re-emerged in a number of countries in the region. This is reinforced by the alternative of Bretton Woods II and the phenomenon of "decoupling" stemming from the current crisis in the sub-prime mortgage market in the United States (Russell-Walling, 2008). Whether or not one is in favour of decoupling (i.e. making finer distinctions within categories), it is clear that this phenomenon also occurs among emerging economies, which today cannot be classified in a single category given the coexistence of some fast growing countries alongside others that are stagnating. Asia and Eastern Europe are the fastest-growing emerging regions, while Latin American indicators are generally disappointing in terms of global integration and economic growth, and several African countries have remained virtually excluded from modernity. In short, the category "emerging country" no longer says very much about the individual country in question.

(Original: Spanish)

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