WHY IS 'THE MARKET' SO UNFORGIVING?
Reflections on the *Tequilazo*

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I. Introduction

Mexico's financial debacle and its impact on other emerging markets (the *Tequila* effect) has raised many fundamental questions. Mexico achieved fiscal balance in 1993, undertook several fundamental market-oriented reforms, signed a free trade agreement with a very large market (the NAFTA), became a member of the OECD, and was hailed by international institutions as a paramount example of successful reform. Yet, the December 20, 1994, devaluation brought the economy down like a house of cards. Output fell by more than 7 percent in 1995, the current account deficit sharply swung from about 8 percent of GDP in 1994 to zero, and investors turned their noses away from high-yield Mexican public debt even though the international community had plunked about $50 billion in a rescue package. In addition, Mexican problems quickly spread around the world's emerging markets, including those exhibiting long and enviable track records.

Argentina is even more puzzling than Mexico. Since adopting the Convertibility Program -- which in March 1991 established, *by law*, a fixed exchange rate against the U.S. dollar -- the economy grew by more than 6 percent annually. Fundamental reforms were undertaken that went far beyond those in Mexico, and fiscal imbalance was sharply cut. Contrary to Mexico, Argentina did not devalue the peso and, instead, adopted a significant IMF-sponsored adjustment program. Emergency finance was provided through the IMF and the *Bono Patriótico*, although it amounted to only about one-tenth of the Mexican rescue package. In spite of that, in 1995 output fell by 4.4 percent and unemployment reached 18.5 percent in May, an

unprecedented level.[1]

The paper will discusses several issues that are linked to the above phenomena, and offers a tentative but coherent explanation. Section II discusses current account sustainability, an issue that has received renewed attention after the Mexican debacle. Section III will discuss the seminal paper by Krugman (1979) which laid the foundation for modern balance-of-payments crisis theory. It will be argued that although these approaches offer crucial insights into balance of payments problems, they represent highly incomplete rationalizations of recent events.

Section IV brings to the analysis some key financial considerations and puts forward the conjecture that a Mexican-type crisis could partly be provoked by exogenous or external factors. Among other things, it is argued that financial market 'globalization' could lead investors to move their portfolios around on the basis of flimsy data, disregarding "fundamentals." Section V examines some links between balance-of-payments crises and output collapse. Two channels are identified: (1) price/wage stickiness and (2) supply-side effects associated with pro-cyclical fiscal adjustment. Section VI recapitulates and brings up some general policy issues. Section VII closes the paper.

II. Current Account Sustainability

Shortly after it became obvious that Mexico was about to crash, a number of financial analysts "discovered" that Mexico had been running an *unsustainably* large current account deficit. Thus, the crisis was seen by those analysts as an inevitable "correction" to keep Mexico

[1] Unemployment in Argentina had never been a serious problem. Prior to the Convertibility Program, unemployment had seldom exceeded 6 percent. However, unemployment rose steadily since 1991, reaching about 13 percent prior to the Tequila effect. Hence, the Tequila effect appears to have added from 5 to 6 percentage points to the rate of unemployment.

within its budget constraint. In my view, this assessment is seriously incomplete although, as will be argued in Sections V and VI, current account deficits (especially when they are accompanied by an unusually appreciated currency) could be a sign of impending trouble.

The sustainability literature is based on the budget-constraint equation. To illustrate, let us denote by *b* and *CAD* net international debt and current account deficit (both as a share of GDP), respectively. Then,

$$\dot{b} = CAD - \eta b, \qquad \textbf{(1)}$$

where η is the rate of growth of output. Sustainability analysis focuses on steady states. Thus, setting $\dot{b} = 0$ in equation (1), the steady state -- sustainable -- current account deficit satisfies

$$CAD_{\infty} = \eta b_{\infty}, \qquad \textbf{(2)}$$

where subscript ∞ denotes "steady state." This equation establishes a relationship between steady state debt and current account deficit. If no growth is possible, i.e., $\eta = 0$, then the sustainable current account deficit is necessarily equal to zero. In contrast, with positive growth a sustainable current account deficit is possible.

This analysis is unable to give us a definite answer on CAD_{∞} until we pin down b_{∞}. Recent experience shows that the capital market is reluctant to keep lending to LDCs exhibiting levels of indebtedness that exceed 80 percent of GDP (see Williamson 1993). Hence, this additional piece of information allows us to write the sustainability condition (2) as follows:

$$CAD \leq 0.8\eta. \qquad \textbf{(3)}$$

Thus, a country that can be expected to grow at 4 percent per year, cannot *sustainable* run a current account deficit exceeding 3.2 percent. Since 4 percent was, if anything, an upper bound for Mexico, this analysis would conclude that its 8 to 9 percent current account deficits were grossly unsustainable.[2]

Notice that the current account deficit $CAD = rb - TS$, where TS denotes trade deficit (including non-financial transfers) as a share of GDP, and rb denotes debt service ® is the "international" rate of interest). Therefore, by equation (2),

$$TS_\infty = (r - \eta) b_\infty . \qquad \textbf{(4)}$$

Thus, if again we set the growth rate $\eta = 4$ percent and, in addition, we assume the international interest rate $r = 10$ percent per annum, then, by (4), at steady state the economy must run a trade balance surplus of $0.06 b_\infty$ as a share of GDP. The trade balance surplus increases with the steady state debt/GDP ratio b_∞. In particular, at the upper bound for b_∞ (80 percent) the trade balance surplus would be 4.8 percent of GDP.

Presumably, the reason for capital markets to be unwilling to extend credit to LDCs beyond 80 percent of GDP is that it may become tempting for those countries to renege on their debt obligations. Temptation, in turn, is likely to be related to the sacrifice associated with servicing the debt. Gross sacrifice of servicing the debt can be measured by the associated trade balance surplus. The previous computation suggests that the capital market becomes nervous about a country's willingness to repay when debt service represents only about 5 percent of GDP.

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[2] It should be noted that the same analysis would not single out Argentina as a current account derelict, since its current account deficit was about 3.7 percent of GDP in 1994, and growth exceeded 4 percent.

Notice that the *net* sacrifice from servicing the debt could be much less once one takes into account international penalties from debt delinquency.

Thus, one criticism of current account sustainability computations is that they are highly sensitive to the definition of sustainable debt/GDP ratios. Besides, the above example shows that the implied critical sacrifice levels are low when compared to other capital market transactions. For example, mortgages in the U.S. are easy for a household to get if total mortgage payments are less than 25 percent of the household's income. Thus, if this ratio were also relevant for countries' debt then, using the above parameters, the critical steady state debt/GDP ratio would be 4.16 (= 0.25/(r - η), where r - η = 0.06). Therefore, recalling equation (2), a country growing at 4 percent per year could run a sustainable current account deficit of more than 16 percent of GDP! Of course, countries are not mere households because they are protected by sovereignty clauses. However, prior to crisis Mexico had given very clear signals that it wanted to belong to the *First World* and signed treaties that would have made it very costly to engage in strategic repudiation of international debt (or any debt, for that matter).

Another even more fundamental criticism of standard current account sustainability analysis is that it is constrained to steady states. Why should these measures be of any relevance for a reforming economy like Mexico and Argentina? The budget constraint equation underlying the above steady state analysis (but also applying to non-steady-state paths) is

$$b_0 - \int_0^{\infty} TS_t e^{-(r-\eta)t} dt = 0, \qquad \textbf{(5)}$$

where subscript t denotes calendar time, and *present* time is normalized to 0. Thus, budget

equation (5) would allow very large trade deficits if they were expected to be eventually followed by equally large trade surpluses (in present discounted). As a result, steady state sustainability computations may have little to say about the economy's *solvency*, captured by equation (5), which is, or should be, the fundamental issue addressed by this literature.

However, it may still be the case that large current account deficits in the short run may quickly call for unsustainable future trade surpluses. The following example, will address this issue. Suppose the country's net international indebtedness is 50 percent of GDP. Consider the case in which the country runs a trade balance deficit that will result in increasing the debt/GDP ratio to 80 percent in 7 years. (The trade deficit as a proportion of GDP will be held constant over the first seven years.) Assuming, again, that the international interest rate is 10 percent and output grows at 4 percent, per year, one can show that the trade deficit as a share of GDP during the first 7 years will be about 1 percent. Thus, since the initial debt/GDP ratio is 50 percent, the debt service amounts to 5 percent of GDP, implying that the current account deficit at the start will be about 6 percent of GDP. Similarly, recalling that after 7 years the debt/GDP ratio is 80 percent, it follows that the current account deficit will be rising over time to reach about 9 percent of GDP during the 7th year. Consequently, this economy would be able to run current account deficits that are much larger than the 3.2 percent sustainability benchmark for an extended period of time (7 years) before hitting the supposedly critical high debt level (80 percent).

Finally, suppose for the sake of the argument that Mexico was trying to run an unsustainable large current account deficit and, realizing this, the capital market refused to extend any more credit to Mexico. Why would this result in a balance-of-payments crisis?

A BOP crisis takes place when international reserves held by the official sector (normally at the central bank) threaten to fall below some minimum tolerable level. It should be recalled that as a matter of accounting, under fixed exchange rates, for example, international reserves are lost or accumulated if the demand for money falls or increases, respectively. Thus, to the extent that refusal to extend further credit to a given country does not affect the demand for money then, under fixed exchange rates, the stock of reserves will be intact and no BOP crisis will take place. Consequently, there is no obvious causal relationship going from current account sustainability difficulties to BOP crises.

To summarize, usual current account sustainability computations apply to steady state and could be very misleading, especially for reforming or transition economies. Furthermore, there is no obvious link between current account sustainability and BOP problems.[3]

III. Krugman's Model

The balance-of-payments crises literature has developed along different lines. The classical example is Krugman (1979), which studies the sustainability of a fixed exchange rate regime, implicitly assuming that the government has no access to international credit and, thus, once reserves threaten to go below their minimum tolerable level, there is no option for government but to abandon the peg. Therefore, this model goes to the heart of the kind of difficulties that forced Mexico to abandon its stabilization program but leaves unexplained why government is unable to tap international capital markets.

Government's inability to borrow further in international markets could be the result of

[3] Thus, it is not surprising that the empirical literature has found no significant relationship between current account deficits and BOP crises. See, for instance, Frankel and Rose (1996), Kaminsky and Reinhart (1996) and Sachs, Tornell and Velasco (1996).

sustainability considerations of the sort discussed in previous section, or of other considerations that we will collect under the rubric "liquidity constraints." If the former considerations are relevant, then Krugman (1979) provides the missing link explaining BOP crises in the context of a current account sustainability model. However, this would make the present model liable to most of the criticisms raised against the sustainability approach. Fortunately, there is nothing in Krugman (1979) that requires the country to be running unsustainable large current account deficits. As will be seen as we discuss the formal model below, a key parameter is the fiscal deficit, which is only one component of the current account deficit (the other one being the excess of *private sector* investment over savings, i.e., the private sector's current account deficit). I will now turn to describe the model in greater detail.

The exchange rate is assumed to be fixed if there are enough reserves to sustain the value of the domestic currency (i.e., if reserves are above or at their "critical" or minimum tolerable level, which we assume to be zero); otherwise, the exchange rate is allowed to float freely. Furthermore, the government is assumed to run a fiscal deficit which is fully monetized. Assuming perfect capital mobility (for the private sector), no uncertainty, and perfect foresight, the domestic interest rate is equal to the international one during the fixed-rates phase, and to the international interest rate *plus* the rate of devaluation, during the floating-rates phase.

Let the demand for real monetary balances be denoted by $L(i)$, $L'(i) < 0$, where i is the domestic nominal interest rate. Assuming PPP and no international inflation, we can identify the domestic price level with the exchange rate E. Let the government run a fiscal deficit which is fully financed by the central bank. Denoting the deficit in real terms by d, and the stock of

international reserves at the central bank by *R*, we have:[4]

$$\dot{R}_t = -d, \qquad \textbf{(6)}$$

during the fixed-rates regime. This is so because the demand for money (monetary base in the present example) in real terms is constant at level $L(i^*)$, where i^* denotes the international interest rate. Equation (6) states that credit to government will result in reserves losses because the additional flows of domestic money that it entails are not demanded by the public. Given PPP, excess money supply cannot result in higher prices. Thus, there is no *internal* mechanism to get rid of excess money supply at equilibrium. But there exists an *external* mechanism, i.e., exchanging excess money for international reserves--which is the implication of equation (6).[5]

Equation (6) is an important building block in Krugman's model but not its "clincher," which actually is showing that the loss of reserves will take a steep plunge down to their critical level exactly at the time the system switches from fixed to floating exchange rates (hereon referred to as "switch time"). This is so for the following reasons.

First, after reserves are exhausted the mechanism implied by equation (6) will not be available. Thus, the *external* mechanism for getting rid of excess money will no longer be operative. However, since the exchange rate is allowed to float, prices will now be able to rise in line with currency devaluation. Let the inflation rate (equal the rate of devaluation, due to PPP)

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[4] In what follows, it is assumed, for simplicity, that output growth rate $\eta = 0$, and that either international reserves earn no interest or that the deficit *d* is net of interest on reserves.

[5] Individuals may want to invest these funds in the capital market or increase their expenditure depending on factors that the present discussion need not be specific about.

be denoted by π. Then, during the floating-rates phase, we have:[6]

$$\pi L(i^* + \pi) = d. \qquad \textbf{(7)}$$

In other words, flow seigniorage from money creation is used to finance the fiscal deficit which, of course, requires the inflation rate to be positive, implying an abrupt jump in the domestic nominal interest rate at switch time. Hence, as the economy switches to the floating-rates regime, the demand for money takes a precipitous fall.

Krugman argues (in the continuous-time version of the model) that under perfect foresight the exchange rate cannot jump at any time because, if it did, individuals would be able to reap unbounded arbitrage profits (recall the assumption of perfect capital mobility). Thus, at switch time the exchange rate exhibits no appreciation or depreciation.

Therefore, at switch time--which sooner or later has to arrive given the constant drain on reserves implied by equation (6)--we have:

$$\textit{loss of reserves at switch time} \equiv \Delta R = L(i^*) - L(i^* + \pi) > 0. \qquad \textbf{(8)}$$

A typical Krugman balance-of-payments crisis is depicted in Figure 1. Reserves are steadily lost during the period from 0 to T when reserves reach level ΔR. At that point in time, there is a run against domestic money and reserves fall down to zero (i.e., a balance of payments crisis takes place). After time T, reserves remain at zero and inflation is positive (and constant,

[6] In case the following equation has more than one solution, we will assume that the economy settles to the one exhibiting the lowest π. We assume that the economy follows a steady state equilibrium path because, in line with the rational expectations literature, we rule out explosive perfect foresight paths.

due to our steady-state assumptions).

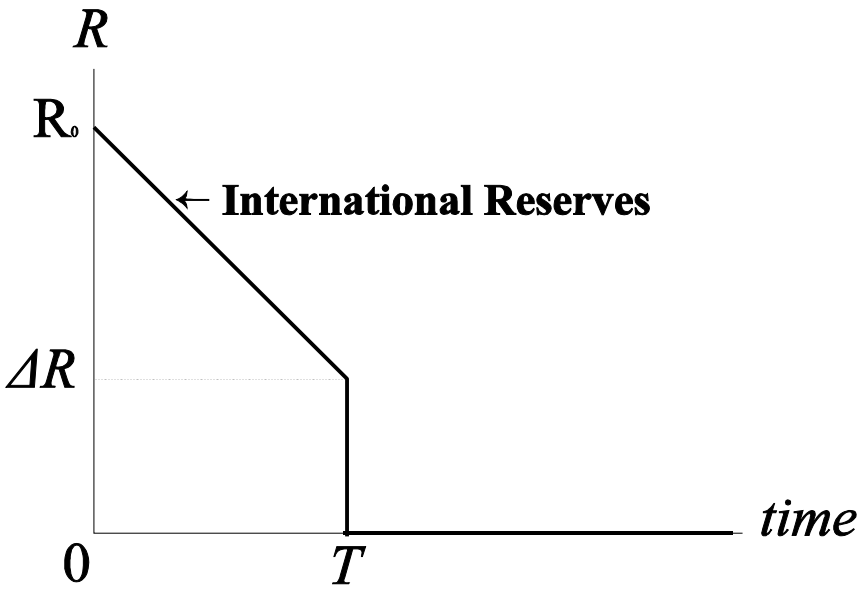

Figure 1. Krugman Crisis

The most remarkable feature of a Krugman crisis is the sudden loss of reserves at time *T* even though individuals have perfect foresight and, thus, nobody is taken by surprise. Therefore, the model has the ability of rationalizing, in a perfect-foresight context, an often-observed feature about balance of payments crises, namely, a speculative attack on the currency leading to the abandonment of fixed exchange rates. This was also a feature in Mexico where international

reserves fell by US$ 4 billion in two days preceding the crisis (see IMF (1995)).[7]

Notice that the current account deficit is not a key factor in this model. Of greater significance is the fiscal deficit and, in fact, it is the rigidity of the latter that lies at the heart of the model--and helps to rationalize why this government would be unable to finance its deficit in a non-inflationary way. In other words, liquidity constraints in Krugman's model stem from the government's inability to cut the fiscal deficit *even after the BOP crisis takes place.*

Fiscal deficit rigidity is not explained by the model and is, undoubtedly, a very strong assumption. If, instead, the government was assumed to be committed to operate within its basic budget constraint (like equation (5) above but involving only fiscal variables) then deficit finance would in principle be available to head off a BOP crisis, unless physical constraints impeded generating the corresponding future surpluses in a noninflationary context. Thus, Krugman's example--as rendered above--is of limited interest for countries that express a clear desire to achieve noninflationary fiscal equilibrium, as Argentina and Mexico before the recent crises.

An alternative interpretation of Krugman's model is that the crisis calls for a draconian fiscal adjustment and/or a fall in aggregate demand which results in significant output loss and, as a consequence, the government is physically unable to lower the deficit *given the new circumstances*. More precisely, the assumption would be that the crisis lowers fiscal revenue to such an extent that prevents lowering the fiscal deficit (although government expenditure may exhibit a significant cut) and, thus, requires the use of seigniorage to avoid bankruptcy. Thus, in this interpretation, the crisis is explained by sustainability considerations of the type discussed in

[7] However, as discussed in Calvo and Mendoza (1996) and Flood, Garber and Kramer (1996) monetary aggregates did not collapse as predicted by the theory. This is further discussed in Section V below.

the previous section (except that here they apply to the government sector). However, the crisis itself plays an active role in generating the conditions under which sustainability considerations force the government to resort to higher inflation.

I believe the above twist to Krugman's story is relevant for understanding Mexico and Argentina. However, before going any deeper into this issue I will first discuss other types of financial aspects that, in my view, played a crucial role in recent times.

IV. Financial Considerations

1. Volatility of Monetary Aggregates.

The above model focuses on fiscal deficits as the key factor for reserves losses. However, even in the absence of domestic credit expansion, in a regime of fixed exchange rates reserves rise or fall as a consequences of fluctuations in the demand for money. This is not a minor consideration for LDCs since some of them exhibit substantially higher fluctuations in their demands for money than advanced industrial countries. To illustrate the significance of these considerations, let us examine the case in which the (log) demand for money follows a random walk and, to abstract from the effects highlighted in Krugman's model, let us assume that the demand for money is totally inelastic with respect to the nominal interest rate, and that there is fiscal balance, i.e., $d = 0$. To simplify the exposition, we will continue making the assumption that domestic prices equal the nominal exchange rate, which is kept constant unless there is a BOP crisis.

Letting m denote the demand for real monetary balances then we postulate (in discrete time) that

$$\log m_{t+1} = \log m_t + \varepsilon_t, \qquad \textbf{(9)}$$

where *m* stands for real monetary balances and ε is an i.i.d. random variable. Under these circumstances, the demand for money can fall and create a BOP crisis even though there is no fiscal deficit. If ε exhibits a mean-zero normal distribution, then the larger its variance, the larger will be the probability of a BOP crisis given an initial level of international reserves. I have estimated the variance of ε under the above assumptions. Mexico, for instance, comes out with a relatively high standard deviation (about 4 percent per month), while a country like Austria that has successfully pegged to the Deutsche Mark for about 15 years shows a standard deviation which is only about 1 percent per month (see Calvo (1996 b)). The main point being that BOP crises could be entirely due to financial considerations irrespective of fiscal performance.[8]

In addition, problems could be exacerbated by external factors. For example, Calvo and Mendoza (1996) shows that there is a significant effect from U.S. short-term interest rates on Mexico's demand for money (specifically, M2). This was reflected in a sizable fall in the demand for money during 1994 and, I suspect, lied at the heart of the Mexican difficulties at the end of the year. I will further elaborate on this in what follows.

Mexico and other Latin American countries experienced sizable capital inflows in the first half of the 1990s. As argued by Calvo, Leiderman and Reinhart (1993), about 50 percent of these flows stem from external factors, among which U.S. interest rates hold a prominent role. Capital inflows gave rise to an expansion in consumption and investment which, in turn,

[8] The government could, in principle, prevent a BOP crisis by borrowing international reserves. This issue, however, will be postponed to later sections in the paper in which financial and wage/price stickiness considerations are spelled out.

increased monetary aggregates. Thus, the above-mentioned link between domestic monetary aggregates and external rates of interest may stem from direct opportunity-cost or indirect absorption type considerations. Experience in several countries, and most notably in Mexico, suggests that the fluctuations in monetary aggregates provoked by external factors--and more specifically, by capital flows--could be substantial (see Calvo and Mendoza (1996), and Calvo, Leiderman and Reinhart (1996)).

An equation like (9), enhanced by taking explicit account of external factors, would be needed to assess the implication of different reserve levels. To illustrate, consider the simple case in which external factors are fully captured by the random term in equation (9). We proceed as follows. Let $\nu_t = m_t/R_t$, where R stands for international reserves, and let m be interpreted as the monetary base. Hence, a BOP crisis in period $t + 1$ will take place if $m_t - m_{t+1} < R_t$. Or, equivalently, if

$$\log\frac{m_{t+1}}{m_t} = \varepsilon_{t+1} < \log\frac{\nu_t - 1}{\nu_t}. \qquad \textbf{(10)}$$

Clearly, the probability of a BOP crisis is an increasing function of ν. Notice that this "vulnerability" index is totally independent of the popular index of reserves/one-month worth of imports. The latter hails back to periods in which reserves were held to ensure smooth trade, while the index developed here is associated with the probability of a BOP crisis as a result of financial fluctuations.

In the above example there exists a direct connection between m and R because we assume m stands for base money (i.e., monetary liabilities of the central bank). If instead m stood for M2, the connection is more indirect and depends on how the central bank reacts to shocks in

the larger monetary aggregates.

If the central bank is not responsible for banking problems but defends the exchange rate parity by intervening and swapping base money for international reserves, then the same analysis developed above is applicable, except that one has to derive the demand for base money from the M2 equation (9), minimum reserve requirements, and an equation describing the demand for banks' excess liquidity.

In turn, if the central bank is responsible for ensuring adequate banks' liquidity, then it may expand domestic credit whenever M2 falls. In the extreme case in which banks are fully insulated from any liquidity loss as a consequence of a fall in M2, then M2 is equivalent to base money and the first example in this section is fully applicable. It is worth noting, however, that in practice M2 is much larger than money base and, hence, the probability of a BOP crisis, given international reserves, is likely to be higher than in the first example (unless the volatility of M2 is substantially lower than that of base money).

However, by providing liquidity to offset the fall in M2 the central bank does not prevent M2 from falling. Thus, if a central bank is keen on not letting monetary aggregates fall, then it will increase domestic credit even more and provoke a large loss of reserves after just a small contraction in monetary aggregates. This seems to have been the case in Mexico during 1994. As noted above, Calvo and Mendoza (1996) shows that the demand for M2 fell in 1994. Since banks held sizable domestic public debt in their portfolios, rolling back private debt could have been prevented simply by an open market operation that lowered domestic public debt in banks'

portfolios by an amount equal to the fall in M2.[9] However, the central bank went beyond that and prior to crisis succeeded in stabilizing the level of M2. This meant a sizable expansion of banks' credit to the private sector (more than 40 percent from January to December 1994). This is quite remarkable given that these measures were undertaken as the country was suffering from a sizable loss of international reserves. Why was the central bank not content with stabilizing credit to the private sector?

A possible explanation for this phenomenon is that Mexico tried to keep the peso rate of interest within (what it deemed) reasonable levels (see Calvo and Mendoza (1996)). This was hard to achieve given that the market expected the incumbent administration to devalue, keeping with Mexico's history of presidential transitions. Under these circumstances, the misalignment between expectations and the target interest rate likely led firms to repay foreign currency loans and borrow in domestic currency, putting an upward pressure on the peso-denominated lending and borrowing rates. This led banks to run down their stocks of peso-denominated public debt (CETEs) and substitute them with loans to the private sector. However, if one relies on the Calvo-Mendoza estimates, this situation was unsustainable because the demand for M2 was bound to fall. This is an interesting case because it shows that *if the government attempts to stabilize monetary aggregates, then no level of international reserves can prevent a BOP crisis once the demand for monetary aggregates take a plunge.*

2. Short-Maturity Debt.

The BOP crisis literature has on the whole ignored the role of domestic debt, and

[9] This is essentially what Argentina did as M2 fell by about 18 percent in the first quarter of 1995.

followed Krugman (1979) in assuming that fiscal deficits are fully monetized. However, the assumption that fiscal deficits are fully monetized is becoming increasingly unrealistic as governments have started to have access to the international capital market. It has, thus, become increasingly possible to finance fiscal deficits by floating domestic or international public debt. The maturity structure of this debt varies across countries but it is perhaps fair to say that emerging-markets' governments are likely to exhibit a debt maturity structure slanted towards the short end of the spectrum. Mexico again shows an extreme case in this respect, since in December 1994 about US$10 billion domestic debt was due to mature in January, and about US$30 billion during 1995 (these are large numbers compared to the US$6 billion stock of international reserves held by Mexico prior to crisis).

As argued in Calvo (1995) the demand for emerging markets' assets (including public debt) could be highly volatile for two basic reasons. In the first place, the effective rate of return on these assets depends on policy--like everywhere else, but with the added complexity that policy in emerging markets is itself highly volatile, reflecting imperfect knowledge of structural parameters and, most importantly, relatively unstable political equilibria. The instability of the latter has likely increased after the breakdown of communism. Therefore, assessing the "state of nature" in an emerging market could be quite costly. It is not enough to know the particulars of the investment project since, in general, its profitability will depend on government regulations. Thus, a project could be very lucrative and yet be unattractive to foreign investors if, for instance, profits are expected to be subject to high taxes (either directly or through the imposition of, for example, foreign exchange controls). Consequently, *assessing the state of nature in a given emerging market is likely to entail large "fixed" costs*.

The second basic ingredient for high volatility of demand for emerging markets' assets is the so-called "globalization" phenomenon, which is characterized by the fact that investors diversify their portfolios across a large number of emerging markets. Portfolio diversification, in the absence of Tequila or contagion effects, helps to lower portfolio risk. Interestingly, however, the benefit from portfolio diversification does not depend on specific knowledge about the actual state of nature in these economies. For risk hedging the return on the different assets across countries should not perfectly correlated. Thus, for instance, by the law of large numbers, risk could become very low if the different investment projects were stochastically mutually independent.

It is intuitive, and can be rigorously shown in a canonical example (Calvo (1995)), that under the above circumstances (i.e., high information costs and globalization) investors will be (1) very sensitive to "news" about expected returns and, furthermore, (2) their incentives to learn about the state of nature in each emerging market will eventually decrease as the number of emerging markets rises. Consequently, it is likely that in a globalized capital market, investment in emerging markets' assets be highly sensitive to rumors and relatively unresponsive to "fundamentals."

The above-mentioned volatility poses no direct threat of a BOP crisis to the extent that it only involves fluctuations in stock market prices. However, if a large chunk of domestic debt is coming due in the short run, adverse changes in investors' sentiments about a given emerging market may cause a BOP crisis, particularly if the exchange rate is held fixed. The only policy available under those circumstances (short of devaluing) is to raise interest rates on newly-issued domestic debt. Unfortunately, since investors are ill-informed about fundamentals, the interest

rate hike could possibly be taken as a sign of weakness and not of strength, since they may feel that higher interest rates are due to the "market" being aware of serious difficulties. Furthermore, even though investors were not so much ill-informed, I will later argue (in Sections V and VI) that this bonds-attack phenomenon could lead to socially costly crises (along the same lines mentioned at the end of the previous section).

3. Domestic Debt and Credibility.

In addition, the existence of domestic-currency denominated public debt can generate BOP difficulties if the exchange rate policy is not fully credible. Suppose the government announces fixed exchange rates but the public believes that the currency will be devalued next period by factor ε with probability p. Then, if investors are risk neutral (in terms of foreign currency) the nominal interest rate satisfies:

$$\frac{1 + i_t}{1 + \varepsilon} p + (1 + i_t)(1 - p) = 1 + i^*, \qquad \textbf{(11)}$$

where i and i^* are the domestic and international one-period interest rates, respectively. Clearly, if ε and p are positive numbers, then the domestic interest rate will exceed the international one. This phenomenon is called the "peso problem" and is a common characteristic of exchange-rate based stabilization programs.

Suppose the government has a fixed debt level b and the primary fiscal surplus is equal to interest on domestic public debt *if the exchange rate peg was fully credible,* i.e., if $\varepsilon = 0$. Thus, under full credibility the fiscal deficit (which we called d in equation (6)) would be zero. Assuming, for simplicity, that fiscal deficits are fully monetized, it follows that the discrete version of equation (6) becomes:

$$R_{t+1} - R_t = (i^* - i_t)b, \qquad \textbf{(12)}$$

if the currency is not devalued. Hence, the peso problem may put into motion Krugman's BOP-crisis machinery. In this fashion, lack of credibility may result in an unsustainable balance of payments even though "fundamentals" could be fully in line with a sustainable situation.

4. Credibility, the Demand for Money and Fiscal Deficit.

Credibility problems may be reflected through other more subtle, but equally important phenomena. For example, there is general consensus that lack of credibility may lead to a consumption boom during the early stages of an exchange-rate-based stabilization program (see, for instance, Calvo and Végh (1993) and Kiguel and Liviatan (1992)). Therefore, the demand for money will contain a cyclical component associated with the stabilization program. Higher monetization at the start of the program may give the impression to policymakers that the program enjoys a high degree of credibility. An argument one commonly hears from policymakers is that higher monetization reflects the return of flight capital due to the higher confidence inspired by the stabilization plan. While this is partially true, policymakers may wrongly conclude that the higher stock of real monetary balances is a permanent positive shock. However, if monetization is provoked by the expectation that the program will be abandoned in the non-too-distant future, then the real stock of money will eventually collapse, possibly generating a BOP crisis.

In a recent study Talvi (1996) shows that if tax revenue is an increasing function of consumption, then prior to crisis the fiscal deficit could shrink, giving the false impression that the fiscal house is in order. In an example, Talvi (1996) shows that the fiscal deficit is nil before

the crisis, only to literally explode afterwards. This pattern of the fiscal deficit is understandably quite confusing to the average policymaker. It is not unusual for the initial slackening of the fiscal constraint to be read as an indication that tax evasion has fallen and, hence, that the higher fiscal revenue has a significant permanent component. As a result, considerable political pressure is built up for more government spending. Unfortunately, if imperfect credibility is the key reason for the initial consumption boom and policymakers give in to pressures to increase government expenditure, then after-crisis fiscal deficits could reach dangerously high levels -- which will become apparent only after a crisis erupts and policymakers have little room to maneuver.

V. Output Collapse

The paper argued that the usual current-account sustainability algebra has a lot to be desired, and receives little empirical support. Furthermore, it discussed the mechanics of a BOP crisis in a model that focuses on fiscal sustainability (a close relative of current account sustainability). The latter approach was argued to be closer to the mark as an explanation for BOP crises, and extensions showed that the model can accommodate a set of highly relevant features related to capital market globalization. However, none of those models is capable of explaining the sharp output collapse in Argentina and Mexico. For that, we need to develop some links going from BOP crisis to output collapse.

In this section I will examine two such links: (1) Keynesian price/wage stickiness, and (2) supply-side effects.

1. Price Stickiness.

As background let us take the BOP crises scenarios discussed in Section III and IV. In

addition, we will assume that the price level is downward inflexible in the short run. First, consider an anticipated BOP crisis as in the simple Krugman model. As argued in Section III, the exchange rate will not jump when crisis hits and, afterwards, it will show an upward trend. Thus, at first blush, the crisis does not seem to call for downward nominal flexibility. However, this intuitive reasoning ignores the complexities of a sticky-prices world.

Consider, for example, the case in which there are tradable and nontradable goods. If prices are perfectly flexible then Calvo (1987) shows -- in a cash-in-advance, perfect-foresight world -- that the relative price of nontradables with respect to tradables will exhibit a one-step rise before crisis, and a collapse to a lower plateau afterwards.[10] This is so because inflation is expected to rise in the future which, as argued earlier, gives rise to a consumption boom. Since the supply of nontradables is less than perfectly elastic, their equilibrium relative price must rise. However, perfect price flexibility ensures that the economy will always be on its full-employment transformation frontier and, thus, the model is not enough to rationalize the fall in output observed in Argentina and Mexico.

One can extend the above model to allow for price stickiness. For example, let us assume that tradable goods exhibit perfectly flexible prices while nontradable goods prices are set in advance in a staggered fashion.[11] In this setup one can show that, prior to crisis, prices of nontradable goods will be higher than their after-crisis equilibrium level. This is so because the forces discussed in the perfectly-flexible prices case are still at work. Although price setters take

[10] This holds under the Krugman (1979) assumption of a constant deficit which is fully monetized.

[11] This matches the model developed in Calvo and Végh (1993).

into account after-crisis conditions (calling for lower prices for nontradables), they take advantage of booming circumstances prior to crisis and set prices higher than their after-crisis full-capacity-utilization equilibrium level. Thus, when crisis erupts the nontradable sector will go into a state of excess capacity and GDP will fall for Keynesian reasons.

In a Keynesian-type world, governments can offset the fall in GDP by printing money and triggering a currency devaluation. However, as noted in Section III, this would be inconsistent with perfect foresight. If governments were expected to resort to this type of expansionary policy after a BOP crisis, then no crisis-prone fixed exchange rate system would be sustainable under perfect foresight.[12]

Since governments are always tempted to resort to expansionary policies and, in practice, BOP crises are accompanied by sharp currency devaluations then, by the above considerations, the Keynesian scenario is likely to be more relevant in cases in which BOP crises contains an important *unanticipated* component.[13]

Let us consider a Tesobono-type unanticipated attack in which short-term foreign-currency denominated public bonds holders refuse to roll over their bonds and cause a sudden loss of international reserves. Under these circumstances, if remaining reserves are not sufficient to accommodate the Krugman-type fall in the demand for money, the currency will have to depreciate. Prior to depreciation, the relative price of nontradables will be too high to ensure full

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[12] This argument is parallel, although far from equivalent, to the one developed in Flood, Garber and Kramer (1996) according to which no crisis-prone fixed exchange rate regime is sustainable under rational expectations if individuals expect the government to insulate money supply from changes in international reserves (i.e., full sterilization).

[13] Another reason for the relevance of unanticipated shocks is that price stickiness would be hard to justify if the timing of the BOP crisis was accurately predicted by the public.

capacity utilization. However, currency depreciation will help to move it towards full-capacity utilization. In addition, if government can accurately assess the situation, it can control domestic credit to lock the economy into full capacity utilization, and GDP need not fall!

Therefore, according to the above point of view the Mexican and Argentinean downturn are the consequence of *insufficient devaluation* after mostly-unanticipated shocks. If the exchange rate had devalued further no output loss would have taken place.

The last corollary sounds highly unrealistic. Nontradables are not just one type of good but a wide variety of goods. Thus, in more realistic circumstances the exchange rate cannot solve the excess-capacity problem for all sectors, unless it generates overheating in the whole economy. Overheating is not a solution because it substitutes one problem for another. However, even in the more realistic restatement of the Keynesian model (allowing for a variety of nontradable goods), the large output loss in Mexico was probably excessive and could have been avoided by a more lax monetary policy.[14]

The implication that emerges from the Keynesian approach is that appropriate monetary policy could prevent major output losses after BOP crises. Furthermore, if the government is solvent, appropriate monetary policy could stave off major crises. Small hiccups could be unavoidable, but major debacles should be on the whole fully preventable.

In practice, after a major debacle like in Mexico, policymakers become wary to resort to expansionary policies. A dominant concern is that the initial devaluation will be followed by a price-wage-exchange-rate spiral. Although this is a legitimate concern, in my opinion the

[14] According to this perspective, Argentina's policy was even more excessive because the exchange rate was pegged to the U.S. dollar.

inflationary spiral is partly, if not largely, the consequence of lack of understanding on the part of the country's key players (policymakers, trade unions, etc.). For example, it is not unusual that in order to avoid falling into a high-inflation mode, nominal wages (especially in the public sector) are used as a nominal anchor. This leads to below-equilibrium real wages, labor unrest, etc, which cause supply-side negative output shocks, a decline in the demand for money, and higher inflationary pressures. Furthermore, this lopsided devaluation is likely to result in a real (over) depreciation of the currency, thus hurting trading partners. Mexico, for example, had recently joined the NAFTA and a large devaluation (not accompanied by an equi-proportional rise in wages) would have strained the relationships between Mexico and the U.S. (in particular) -- especially if the lopsided devaluation was seen as a conscious policy decision on the part of Mexican authorities.

So far we have taken the Tesobono attack as fully exogenous. However, if solvency is not at stake, the country should have been able to regain access to international capital markets, undoing the negative effects of the initial attack. Thus, although this is a useful piece of analysis it is not enough to explain deep recession after crisis. The next subsection will deal with this issue.

2. Supply-Side Effects.

In this subsection I will explore two possible channels: (a) credit, and (b) fiscal adjustment. In both cases, the driving force will be an unanticipated shock in the capital account of the balance of payments based on negative expectations that, in equilibrium, turn out to be confirmed. (Hence, the reader should be warned that he/she is entering the world of self-fulfilling prophesies.)

Suppose a country is running a current account deficit financed by a surplus in the capital account. Consider the case in which rumors circulate about the country's inability or unwillingness to service its debt (domestic or international). In line with the comments in Section IV about the high-sensitivity of investors with respect to "news," we further assume that the negative rumors lead to a sudden drying-up of new funds to the country. The latter calls for an abrupt adjustment in the current account of the balance of payments, and a fall in the relative price of nontradables with respect to tradables (i.e., a real depreciation). Since the shock is unanticipated, real depreciation implies that some outstanding loans are likely to become nonperforming, and bankruptcies will rise. More importantly, in a complex industrial economy in which firms are linked, directly or indirectly, by an interenterprise-credit network, even those firms that have not been directly unfavorably hit by the relative price change could stop being creditworthy. Consequently, output will fall for direct reasons (e.g., bankruptcies, litigation costs), and for indirect ones (e.g., losing access to bank overdraft facilities due to rise in systemic risk).[15] In the end, both borrowers and lenders may decide that it is optimal to stop the flow of new funds to the country, validating expectations. Notice that this example does not require the existence of rationing in the final equilibrium, since everybody will be content with the lower flow of funds. Moreover, the crisis need not be prompted by the realization of any kind of current account or fiscal deficit unsustainability. And, finally, the fall in domestic profitability need not be considered permanent for it to bring a sudden stop in capital inflows. If investment decisions have some degree of "irreversibility" -- as recently highlighted by Dixit and Pindyck

[15] Needless to say, none of these repercussion would exist in an Arrow-Debreu world of complete markets with contingent debt contracts. Thus, the present discussion is especially relevant to emerging market economies.

(1994) -- the associated increase in the variance of relative prices may induce potential investors and lenders to wait a little longer until the "dust" settles, bringing the flow of funds to a screeching stop.

The second channel (i.e., fiscal adjustment) is akin to the Tesobono crisis in Mexico. Suppose investors refuse to roll over maturing public debt. A solution is to find a new set of investors that would fill up the vacuum. However, if the shock was unanticipated, information problems may hinder finding new investors because they might take the refusal of the previous set of investors as a signal that bad news is afoot. Consequently, in the short run the government would be forced to finance the principal of maturing bonds by engaging in sharp cuts in government expenditure or by resorting to tax surcharges that can be easily collected. In practice government expenditure is difficult to cut. Recent experience shows that cuts often fall on public investment -- having eventual deleterious effect on output -- or real public sector wages -- having present negative output effects by causing labor strikes, etc. Furthermore, taxes which are effective in raising revenue in the short run tend to be highly distorting, e.g., import tariffs, gasoline taxes, etc. Even when authorities react by raising a homogeneous V.A.T. rate, the policy is likely to be distorting because compliance is highly uneven. As a result, the strong fiscal adjustment may have negative effects on present and/or future output, lowering the marginal productivity of capital. Thus, for reasons similar to the ones raised in connection with the previous example, net capital inflows may fall, validating expectations.

Does price/wage stickiness exacerbate or ameliorate the effect of the above capital account shocks? This is a difficult question which is unlikely to have an unambiguous answer. It is worth pointing out, however, that if supply effects are dominant, a devaluation could make

things worse, because the resulting change in relative prices may exacerbate the bad-loans problem.[16]

VI. Recapitulation. Policy Issues

The current-account approach applies to situations in which *solvency* is the key problem behind BOP crises. However, none of the countries involved in the Tequila episode fall clearly in that category. On the other hand, the seminal model in Krugman (1979) refers to *unrepentant* governments that persist running unsustainable fiscal deficits even after a BOP crisis takes place. This approach is not very appealing when countries are keen on eliminating fiscal deficits. However, our discussion has extended Krugman (1979) by bringing financial, Keynesian and supply-side considerations to the discussion, increasing the empirical relevance of the model. The major conjecture suggested by the analysis is that *unanticipated* shocks seem crucial for rationalizing recent crises, and that the large output fall reveals the existence of multiple equilibria. Under this interpretation, Argentina and Mexico were pushed from a "good" to a "bad" equilibrium. In this section I will discuss some issues linked to this viewpoint.

Good policy advice requires a thorough understanding of equilibrium-multiplicity models. A key question in this respect is, Why would the economy settle on one particular equilibrium? In my opinion, there is no plausible answer to the question *in the context of an equilibrium-multiplicity model*. However, it is easy to append an equilibrium-multiplicity model with additional relevant equations that help to pin down a unique equilibrium. As argued in Calvo (1996 a, Introduction to Part II), however, these models yield equilibria that, although unique, are highly sensitive to parameter changes. This outcome is in line with the recent

[16] This is an area in great need of further theoretical analysis.

Tequila episode. Economies that had equilibrium-multiplicity conditions in their "cores" were badly hit (Argentina, Mexico), while those that did not, quickly returned to their prior-Tequila conditions (Chile, Hong-Kong).

In the present interpretation, a key lesson is that policymakers should avoid creating conditions that are conducive to multiple equilibria. Factors that may help create those conditions are, for example: (1) large short-term public debt, particularly if held by "pure" investors (i.e., deriving no liquidity services from those assets), (2) a large expansion of monetary aggregates relative to international reserves, (3) large expansion of bank credit coupled with insufficient supervision, (4) existence of a mostly local banking industry with little support from the international financial community, (5) maturity mismatch between deposits and loans, and (6) large current account and/or fiscal deficits relative to international reserves (net of the amounts needed to repay short-term public debt and bail out the banking system in case of a run). Points (1) to (5) are straightforward implications of previous discussion (see also Calvo(1996 b)). However, point (6) requires some further elaboration.

Point (6) is an implication of previous section's discussion. It bears some resemblance to the current-account approach examined in Section II but it does not rely on that approach's arithmetic. Large current account deficits, for example, could be undesirable even though the country is solvent. A drastic cut in internationally-financed consumption accompanied by supply-side effects, for example, may bring about a situation in which consumers and investors feel that it is optimal for them to lower or, at least, not to increase their total indebtedness, making the initial cut consistent with no-quantity-rationing equilibrium. If government has enough reserves, it can implement counter-cyclical policy that offsets the initial credit cut.

However, international reserves must be large enough to cover other short-run government obligations. Otherwise, the government could substantially increase its vulnerability to a BOP crisis. For that reason, a key piece of information for gauging how large is the current account deficit is the level of reserves net of short-run government obligations (e.g., stock of bonds maturing in the short run, implicit or explicit government's commitment to help banks in case of a liquidity crunch, etc).

1. Current Account Deficit, Openness and Output Contraction.

The size of the current account deficit must be normalized by some index of trade openness. The same current account deficit as a share of GDP may have radically different implications depending on the share of tradable goods in GDP. To illustrate this point, consider the simple case in which there is no capital accumulation and, thus, expenditure takes the form of consumption only. There are two types of goods: tradables and nontradables. Intertemporal utility is time-separable, and the instantaneous utility index is homothetic. Hence, given the real exchange rate (i.e., the relative price of tradables in terms of nontradables), these two types of goods are consumed in constant proportions.[17] Let us normalize prices and exchange rate to unity. We denote by c^T, c^{NT}, y^T, and y^{NT} the consumption and production of tradables (*T*) and nontradables (*NT*), respectively. Output of tradables is exogenous, while output of nontradables is demand determined, i.e., $y^{NT} = c^{NT}$. Therefore, GDP = $y^T + c^{NT}$, and the current account deficit as a share of GDP satisfies (ignoring transfers and factor payments):

[17] In a cash-in-advance economy this real-economy implication also holds true. See Calvo and Végh (1993).

$$CAD = \frac{c^T - y^T}{y^T + c^{NT}}. \qquad \textbf{(13)}$$

Let us denote

$$\gamma = \frac{c^T}{c^{NT}}, \qquad \textbf{(14)}$$

and consider the case in which the current account deficit shrinks to zero. Hence, by (13) and (14), and given the real exchange rate, we have

$$\frac{\Delta \text{GDP}}{\text{GDP}} = -\frac{1}{\gamma} CAD. \qquad \textbf{(15)}$$

Consequently, if we measure a country's openness by γ, then the impact on GDP of a sudden shrinkage of the current account deficit is inversely proportional to openness. Openness, γ, is affected by the real exchange rate and, ceteris paribus, γ declines as the currency exhibits real appreciation. Therefore, output contraction associated with an elimination of the current account deficit increases, the larger are the real currency appreciation, and the initial expansion of the nontradable sector.

2. General Policy Implications.

Elimination of equilibrium-multiplicity conditions is costly. For example, it may call for an enormous accumulation of net international reserves. Therefore, in general, economies are likely to exhibit some vulnerability to exogenous shocks. However, what is large for an individual country could be small for, say, its trading partners that have a stake in that country's stability. Thus, it could be to everybody's advantage to set up a contingency fund to prevent BOP crises. This is of course an old idea that dates back to the creation of the Bretton Woods

institutions. However, as was seen in the case of Mexico, available sums from international financial institutions could be small relative to the size of capital account crises. The Mexican rescue package necessitated concerted action on the part of the IMF, U.S. Treasury and the G10. In the Bretton Woods world international funds were necessary to cover trade balance deficits. In the new world of fluid capital mobility, funds could be necessary to avoid a massive collapse of the banking system. Six-months worth of imports hardly exceed 20 percent of GDP, while M2 can easily surpass 40 percent of GDP.[18]

Nevertheless, in the near future emerging markets are likely to be vulnerable to exogenous shocks. It has now become clear to professional investors that vulnerabilities exist independently of how well-designed are certain structural reforms. This is likely to imply that investors have become much more sensitized, and will be closely watching vulnerability indicators. Thus, countries that exhibit stock vulnerabilities (e.g., large M2/Reserves ratios) will be kept in the list of suspects even though they exhibit healthy flow statistics, like fiscal or current account surpluses.

VII. Final Words

The short answer to the question raised in the title of this paper is that 'the market' is unforgiving because a crisis may set in motion negative factors that sharply change the country's economic outlook. However, the power of 'the market' to modify a country's equilibrium is a function of how vulnerable the country is to self-fulfilling prophesies. Mexico, for example, had exposed itself to self-fulfilling prophesies by creating a large maturity mismatch between its liabilities and assets, dollarizing its liabilities and placing them in the hands of pure investors.

[18] For an extended discussion of these issues, see Calvo and Goldstein (1996).

Argentina had a longer maturity bond structure and could, therefore, “ride the storm” from a financial point of view. However, in both cases the crisis brought about a sharp reduction in the current account deficit which generated Keynesian and supply side effects (partly associated with the pro-cyclical fiscal policy in the IMF-sponsored adjustment programs). Therefore, ‘the market’ is unforgiving because the initial turmoil -- which ‘the market’ is largely responsible for, but which could have been avoided had countries paid more attention to controlling their vulnerabilities -- generates conditions that make it incentive-incompatible for the former “good” equilibrium to be revived.

The Tequila effect has shown how relevant the factors discussed in the present paper are for a world of high capital mobility. Improving this world will take for countries to be more watchful of stock and flow vulnerabilities, and for the financial community to attain a much higher level of international cooperation. This cooperation will not only have to involve significantly larger funds, but also their much more automatic availability.

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