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ABSTRACT

Sovereign Default By Argentina: 'Slow Motion Train Crash' or Self-Fulfilling Crisis?*

To check hyperinflation, Argentina pegged the peso at one US dollar in 1991. This stopped inflation in its tracks: but, with the rise of the dollar against the euro and the substantial devaluation of the Brazilian real, the peso became increasingly over-valued leading to a significant country-risk premium on Argentine dollar liabilities as devaluation with 'pesification' was anticipated. Here, we apply the Ozkan and Sutherland (1998) model of over-valuation and currency crisis to analyse three scenarios: (i) that Cavallo unnecessarily delayed devaluation, (ii) that the delay was reasonable, and (iii) Cavallo's view, that the peg should have been preserved but was destroyed by self-fulfilling panic. In conclusion, we argue that, as the costs associated with devaluation and default are largely determined *ex post*, so the appropriate interpretation depends on how the crisis is handled.

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NON-TECHNICAL SUMMARY

The currency board system as it operated in Argentina was very successful in reducing inflation to zero – and below. But, towards the end of the 1990s, domestic interest rates rose decisively above US levels and the economy moved into severe recession. By the third quarter of 2001, the country risk premium was about 1500 basis points. Critics of the currency board (e.g. the authors of the Fenix plan) recommended devaluation and default on the ground that the peso was seriously over-valued against the dollar and the debt burden was unsustainable. Their explanation of high interest rates was that the market took the same view. To others, however, devaluation and default were by no means inevitable: the high interest rates were a sign of panic that would disappear with sufficient confidence in the currency board. Ricardo Hausmann, for example, took this multiple equilibrium view in the middle of 2001.

To encompass these and other interpretations, we adopt the framework of Ozkan and Sutherland (1998) in which the abandonment of a fixed exchange rate regime is triggered by an optimizing policymaker. Their framework is re-interpreted to allow for existence of liabilities in foreign currency (so that spreads reflect a default premium); and modified to recognize that ending the currency board would require a change of policy-maker (as Mr Cavallo would evidently never devalue or default). Starting with the view that there was a genuine crisis of economic fundamentals, the model shows the rise in interest rates and the fall in economic activity as markets forecast Cavallo's downfall, followed devaluation and default. As fundamentals deteriorate, one observes a 'slow motion train crash' – made worse by excessive commitment to the peg. Although there is no explicit treatment of the magnitude of external and internal debt, the model can be calibrated to produce an interest rate run-up and devaluation consistent with what has been observed. If the economic costs of leaving the peg increase with the size of devaluation, however, this allows for the other interpretation, namely that early devaluation and default are too costly to be optimally chosen so the pressures to quit are those of self-fulfilling panic.

In conclusion, we argue that the costs associated with devaluation and default are to large extent policy-determined *ex post*. The 'Fenix view' of fundamental crisis could be borne out if, by financial restructuring and indexation, the current administration can make devaluation and default work. Failure to do this, followed by economic chaos, would support the view that the high interest rates were due to a self-fulfilling crisis that should have been resisted.

1. Introduction and outline

During the eighties, Argentina experienced severe problems of high inflation -- which reached a maximum annual level of more than 5,000% in 1989. In 1991, president Menem, of the Peronist party, launched an economic program called 'Convertibilidad' and Mr Cavallo was the economy minister responsible. The plan involved a currency board where pesos were exchanged with U.S. dollars one-to one; and it operated throughout the 1990s with the support of three successive governments.

The currency board system was very successful in purging the economy of hyperinflation. Inflation fell to zero -- and below. But, towards the end of 1990s, domestic interest rates rose decisively above US levels and the economy moved into severe recession. By the third quarter of 2001 the country risk premium was about 1,500 basis points and by December it rose to 5,000 basis points (i.e. 50 percentage points), see chart below. By the beginning of 2002, the peso had devalued by about 50% and sovereign debts of over $150 billion dollars were in default.

How is one to interpret the high interest rates leading up to the final denouement? Were they a sign that the peg was unsustainable because of adverse **economic fundamentals**? Critics of the Argentine currency board, such as the authors of the Fenix plan (2001), took this view. With the rise in the dollar against the euro and the devaluation of Brazil, the Argentine peso was surely over-valued. But the steep increase in foreign currency debt over the 1990s made devaluation without default impossible. "Dollar liabilities and depreciation are an explosive mix, since they worsen the balance sheets of borrowers and can cause widespread bankruptcies" as Ricardo Hausmann said when he recommended de-dollarisation of foreign debt and floating the peso in October, 2001. [1] Market expectations of both devaluation and default would lead to high interest rates.

The position of Mr. Cavallo -- the Finance Minister who had created the currency peg in the first place and was called back to his post in 2001 -- could hardly have been more diametrically opposed. For him, a credible peg offered the prospect of low interest rates and of continued economic growth (Cavallo, 2001a). To advocate devaluation and default was to put at risk all the anti-inflation gains that had been achieved since the currency board had begun: and the high interest rates were stifling the growth that would keep the country solvent. From this perspective, high interest rates were a sign of **market panic**, fed by fears of misguided policy change. Mr. Cavallo was by no means alone in believing that one should stick with the dollar peg. Before he was brought back as Finance Minister in 2001, the government under president de la Rua had actively explored a plan for 'Dollarisation' as an alternative form of precommitment. The plan was rebuffed by the US on the grounds that support might be seen as giving Argentina a vote on the Federal Reserve Board.

Somewhere in between these positions is the view that the collapse of the peg may be driven *either* by adverse fundamentals, *or* by creditor panic forcing a premature exit. Fundamentals in 2001 may have been poor (Ministry of economy, 2001), but with low interest rates the peg might have been sustained. As Ricardo Hausmann put it in May 2001: "There is nothing in the numbers that make a crisis inevitable… There is what economists like to call either self-fulfilling prophesies or multiple equilibria", see Smalhout (2001). So the high interest rates could have been a symptom of a self-

[1] 'A way out for Argentina'. *Financial Times*. London. October 30.

fulfilling crisis, as Sachs et al. (1996) suggest might have been true of the Mexican Peso crisis in 1994/5.

We believe that each of these positions is associated with a different view on how the economy will adjust to a lower exchange rate and how the accompanying sovereign default is handled -- issues which depend largely on political and legal factors very difficult to forecast in advance. For Cavallo, the loss of anti-inflation credibility and market reputation consequent on breaking his promises, together with anticipated chaos in the financial system, clearly over-ruled the benefits of adjusting to a lower exchange rate. At the other end of the spectrum, would be view that leaving the currency board need be no more traumatic for Argentina than leaving the ERM was for Italy or the UK in 1992: it was a straitjacket which had outlived its usefulness and could be shrugged off without great difficulty.

How differing views on the peg may be related to *ex ante* expectations of political and legal factors is indicated in Table 1, where the rows correspond to the three views described above, and the columns indicate different views on the feasibility of *ex post* adjustment, ranging from smooth transition in Column 1 to chaotic adjustment in Column 3.

Table 1. Leaving currency board in the face of external shocks:
ex ante plans and *ex post* politics (zero restrictions shown in parentheses)

Plans\Politics	Good: Smooth transition	Bad: Costly transition	Ugly: Chaotic transition
Double-D (Fenix plan)	**"Devalue early"** *(l = q = 0)*	Probably too early	Far too early
Leave later (Hausmann)	Too late *	**"Devalue later"** *(q = 0)*	Too early
'Dollarisation' plan (de la Rua)	Far too late * 'Slow-motion train crash'	Too late *	**"Never devalue"** *(l = 0)*

* Unless there is a speculative attack.

The cells on the diagonal indicate how perceived costs of adjustment can offset the attractions of devaluation and default. (In brackets are the parameter restrictions imposed on the cost function in the formal model used below.) If the extent of political division and economic disruption is expected to be considerable, for example, it is logical to set one's face against devaluation, as did the government of de la Rua when it formulated the dollarisation plan. See also Calvo (2000) for problems of adjusting to floating. But if devaluation was to be as easy as it was for countries quitting the ERM in 1992/3, devaluation should come much earlier as in the Fenix plan.

The off-diagonal cells show the policy 'errors' that can arise when the perceived costs underlying the policy are not correct. Assume first that a *smooth transition* to floating exchange rate is possible so that the 'early devaluation' associated with the Fenix plan (2001) -- for floating the currency, accompanied by partial default and de-dollarisation -- would be appropriate. [2] Policy-makers who fear a *chaotic transition* will choose 'never devalue', however. The outcome, as indicated in the bottom left

[2] See chapter on ´Política cambiaria y sus condiciones previas´ (Exchange policy and its preconditions) by Hugo Notcheff.

hand corner, would be like a ‘slow motion train crash’: policy-makers would hang onto the peg far too long before the inevitable occurred, and in the meantime interest rates would inflict increasing damage to the economy. Note that, in this case, a speculative attack might advert the delay by achieving an early devaluation anyway! (Policy-makers expecting a *costly transition* will tend to ‘devalue later’, see Row 2 Column 1: here too, this delay might be foreshortened by a ‘self-fulfilling crisis’.)

Now assume that only a *chaotic transition* to floating exchange rate is possible so that devaluation should effectively be ruled out as a policy tool. In these circumstances, following the Fenix plan with a relatively ‘early devaluation’ would be a disaster. (The plan would also seem ill-advised in the case of *costly transition*.) This last column presumably captures the view of Mr. Cavallo[3] who vowed never to devalue or default.

Even when Cavallo was in power in the Ministry of Finance and it was clear to everybody that official policy was to stay on the peg, sovereign spreads on Argentine debt, nevertheless soared well above 1,000 basis points. How could this be? The explanation is presumably that, despite Cavallo’s personal commitment, his tenure office was not guaranteed: bond markets evidently expected[4] him to be replaced with someone who would devalue and/or default – and they were right.

Now that Cavallo had been replaced, the critical issue[5] is how the political and legal aspects of transition are to be resolved.

To demonstrate that Cavallo was wrong, for example, it is essential that those who have ousted him find political compromises. If depositors with dollar claims on local banks are given less than full value of dollar deposits (say only 1.4 pesos per dollar), this -- together with some recapitalisation financed by taxation -- could save the banking system. Similar compromises will need to be found to prevent collapse of pension arrangements. By avoiding chaos, the policy of devaluation and default can be shown to be ex post appropriate.

On the other hand, if parties vie for power in the vacuum created by the fall of Cavallo’s currency board, they run the clear risk of proving that he was right after all. If, as Duhalde suggested in his first speech in the Argentinian congress, (Duhalde, 2002) populist politicians were to insist on full settlement of dollar deposits, but not of dollar loans, this could lead to the insolvency of the entire banking system[6], triggering exit by foreign banks and the progressive collapse of the Argentine economy.

In the sections that follow, we adopt the framework of Ozkan and Sutherland (1998) in which the abandonment of a fixed exchange rate regime is triggered by an optimising policymaker. We modify their model to allow for existence of liabilities in

[3] Cavallo, D. (2001b). ‘Queremos evitar que la Argentina entre en el caos’. *La Nacion*. Buenos Aires. December 2.

[4] Smalhout, J. (2001). ‘Cavallo's high-stakes confidence game’. *Euromoney*; London; May 2001.

[5] Wallin, M. and Druckerman, P. (2001) ‘Argentina's Beleaguered Government Collapses --- President de la Rua Resigns, Unable to Quell Violence Fueled by Finance Crisis’ *Wall Street Journal*; New York, N.Y.; Dec 21, 2001.

[6] If loans of under US$100,000 by value are to be converted at one to one: and if the peso is at two to one this will involve losses of approximately half of the US$11 billion stock involved, i.e. a loss of US$ 5.5 billion, which is a third of bank capital of $16.5 billion. If the peso falls to 2.7, losses would rise to US$7 billion (about 40% of bank capital). See The Economist, 19th Jan 2002 p. 73.

foreign currency (so that spreads reflect a default premium) and, by assuming that bonds are effectively long-dated, we obtain results analytically rather than by numerical simulations. We recognise that ending the currency board would require a change of policy-maker (as Mr. Cavallo would evidently never devalue or default) and discuss how this can be included.

2. The determinants of national output

In this paper, we follow Ozkan and Sutherland (1998) – hereafter OS – in their assumption that output is determined by global demand conditions, interest rates and the exchange rates.

Specifically, output is determined as follows:

$$y = \alpha(v - c/r) + x + \gamma s \qquad (1)$$

where y is the output gap in Argentina, x is the global fundamentals, s is the price of a dollar, all in logs (except the first term on the right hand side of (1)). Initially, with one peso to the dollar, s is equal to zero. The first term on the right hand side of (1) measures debt discount and so reflects the ‘country risk premium’. Output is normalised so that, if debt is at par and there are no external shocks (x = 0), there will be no output gap at the pegged exchange rate, i.e. demand will match supply. The size of debt also matters but this is absorbed into the coefficient α.

To determine the country risk premium, assume the amount of Argentine debt in dollars is at a fixed level of D. The coupon on the unit debt is c and the world (the US) interest rate is given exogenously at r. Where the average price of debt is v (which equals the value of the debt V divided by the amount of debt D), the arbitrage condition can be written

$$\frac{E_t dv}{dt} + c = rv \qquad (2)$$

If the coupon payments of c are expected to be honoured at all times, then with US rates constant, the debt price will stand at par (i.e., $v = c/r$); but anticipated reduction of coupon payments (through debt restructuring or default) will lower bond values below par and lead to a country risk premium, measured by v- c/r which affect GNP as bond values are reflected in domestic interest rates.

Under <u>fixed exchange rates</u>, the key exogenous factor driving output is ‘global fundamentals’ as measured the variable x, assumed to follow a Brownian motion:

$$dx_t = \sigma dz \qquad (3)$$

where z is a standard Brownian motion and σ is the instantaneous standard deviation. This variable includes effects of world business cycle and the competitive pressures exerted by trade partners: Argentina, for example, was subject to substantial negative shocks due to the slow-down in Latin America, devaluation of the Brazilian Real and the weakness of Euro.

Under a <u>floating exchange regime</u>, however, it is assumed -- following OS -- that the exchange rates acts so as to off-set external shocks. Thus with the floating exchange rates $s = -x/\gamma$, the last two terms of (1) will cancel out. With x following random walk and interest rates will remain at world levels, so the first term in (1) will be zero. Hence output will remain at full employment, i.e., y = 0.

2.1 Debt valuation when the collapse of the peg is fully anticipated

In this section, we study the behaviour of interest rates and national output given the decision to leave an exchange rate peg when external shocks reach a critical level of x_E, known to the markets. It is assumed that devaluation will be accompanied by partial default as dollar debt is 'pesified', i.e., converted to peso at devalued rate. Later, there follows the 'political economy analysis' where decision to leave is made by optimising policy-makers who cares about output stabilisation, subject to a time consistency constraint. In all cases, we assume that the decision to abandon the fixed rate regime is irreversible and involves a fixed cost. In the last two cases examined, there are in addition state-dependent costs of leaving designed to capture the degree political "dissonance" after the peso-dollar peg has collapsed.

To make the problem analytically tractable, we only look at symmetric cases. So devaluation occurs at a pre-determined external shock trigger at $-x_E$, and revaluation happens at x_E. Assume further that after the collapse of the peg, the dollar debt is converted into peso one. In the event of devaluation, let η indicate the reduction in the par value of the debt, since after the devaluation $s = x_E / \gamma$ then the reduction in the par value of the debt is simply $\eta = x_E / \gamma$. (In the event of revaluation, η indicates the increase in the par value of debt.)

Let debt price be a function of global fundamentals, x. Applying Ito's lemma to (2) yields the following 2^{nd} order ordinary differential equation for the arbitrage equation

$$\frac{1}{2}\sigma^2 v''(x) + c = rv(x) \tag{4}$$

The general symmetric solution to (4) is

$$v(x) = \frac{c}{r} + A\sinh(\varsigma x) \tag{5}$$

where $\sinh(\cdot)$ is a hyperbolic sine function, $\varsigma = \sqrt{2r/\sigma^2}$ and A is an arbitrary constant to be determined later.

Let the devaluation occur at $-x_E$ and revaluation at x_E. The value matching condition for the price of the debt at the revaluation trigger implies

$$v(x_E) = (1+\eta)\frac{c}{r} \tag{6}$$

Applying (6) to (5) yields

$$v(x) = \frac{c}{r}\left(1 + \eta\frac{\sinh(\varsigma x)}{\sinh(\varsigma x_E)}\right). \tag{7}$$

When the devaluation (revaluation) trigger is given, the debt valuation function derived above is shown as an inverted S-shape curve SS in Figure 1 where x is measured on the horizontal axis. As x falls below zero, the 'country risk premium' increases sharply. At the point of devaluation (and revaluation), value matching conditions apply. So dollar bonds which are to be 'pesified' at a rate of 2 peso to dollar on devaluation, for example, will fall to half their par value as x approaches x_E.

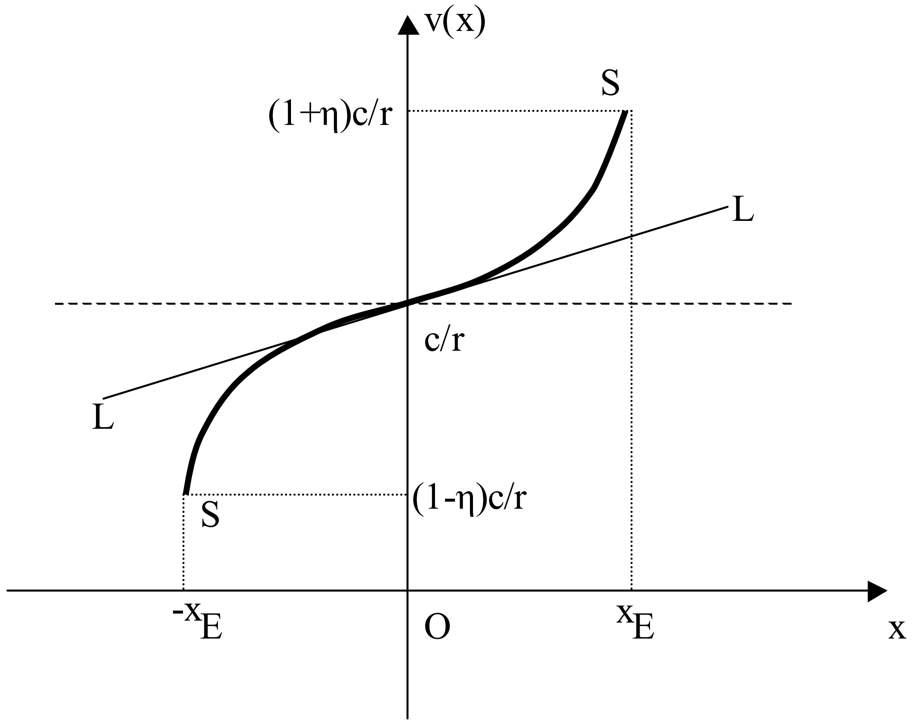

Figure 1. Country risk premium / discount

To simplify the later calculation of devaluation trigger $-x_E$, we linearise the debt valuation function around the origin, so that the country risk premium varies linearly with x (see line LL in the figure). The first order approximation

$$v^L(x) = \frac{c}{r}\left(1+\eta\frac{\varsigma x}{\sinh(\varsigma x_E)}\right) = \frac{c}{r}\left(1+\frac{\varsigma x_E}{\gamma\sinh(\varsigma x_E)}x\right). \tag{8}$$

So the output in the fixed rates under such approximation is given by

$$y^L(x) = \left(1+\frac{\alpha\varsigma x_E}{\gamma\sinh(\varsigma x_E)}\right)x \equiv x\psi(x_E). \tag{9}$$

2.2 Time consistent devaluation

a) A general cost function and the method of solution

Assume that the government's objective is to minimise squared deviations of output from full employment, and that a cost of $F(x)$ is incurred if the government decide to devalue (revalue). To capture various different 'costs of devaluation and default', we assume that $F(x)$ is quadratic, in particular

$$F(x) = Z + \ell|x| + qx^2, \quad \ell \ge 0, q \ge 0.$$

Thus if perceived devaluation costs are relatively small, we use only the fixed cost Z specified above. (This corresponds to the Fenix plan discussed in the introduction.) The last two terms capture the cases where ex post costs of devaluation may be state-dependent, indicating perhaps the difficulties of reaching political consensus and legal agreement after the devaluation. (Adding the linear term will generate multiple equilibria discussed by Ricardo Hausmann; the quadratic term captures the preference for Dollarisation expressed by de la Rua.)

Since the floating rate regime is assumed to restore output to its full employment level, the output losses after devaluation will be zero. Under these conditions, the loss function of the government is specified as

$$W(x) = \min_{\tau} E_0\{ \int_0^{\tau}[y^L(x_t)]^2 e^{-\rho t}dt + e^{-\rho\tau}F(x_{\tau})\} \tag{10}$$

where x indicates the initial shocks, τ the time for devaluation (revaluation), ρ the government's time preferences and E_0 the expectations operator conditional on time zero. Solutions we describe below are formally similar to those derived in Miller and Zhang (1996) in a different context.

Using Feynman-Kac formula, the value function in (10) is a solution to the following ODE

$$\frac{1}{2}\sigma^2 W''(x) + [y^L(x_t)]^2 = \rho W(x) \tag{11}$$

Since both the flow costs and the fixed cost are symmetric (with respect to x), we only need to consider symmetric solutions to (11). In particular, the symmetric solution to (11) is given by

$$W(x) = B\cosh(\xi x) + W^L(x; x_E) \tag{12}$$

where $\xi = \sqrt{2\rho/\sigma^2}$, $\cosh(\cdot)$ is a hyperbolic cosine function, B is an arbitrary constant and $W^L(x)$ is a particular solution to (11) given by

$$W^L(x; x_E) = \left(\frac{1}{\rho}x^2 + \frac{\sigma^2}{\rho^2}\right)\psi^2(x_E). \tag{13}$$

The optimal timing of devaluation (revaluation) is determined by the boundary conditions

$$W(x_Q) = F(x_Q) \tag{14}$$

$$W'(x_Q) = F'(x_Q) \tag{15}$$

Equation (14) is the value matching condition, and the smooth pasting condition (15) reflects that the devaluation (revaluation) trigger x_Q is chosen optimally.

Substituting (12) into (14) and (15) and removing B yields an equation for x_Q,

$$\xi \tanh(\xi x_Q) = \frac{W_1^L(x_Q; x_E) - F'(x_Q)}{W^L(x_Q; x_E) - F(x_Q)} \tag{16}$$

where subscript 1 in W^L indicates partial derivative with respect to the first variable. The above is the government best response function conditioned on given public expectations of devaluation (revaluation) at x_E. The public's response function is simply given by the following rational expectations

$$x_E = x_Q \tag{17}$$

Imposing (17) to (16), one can obtain the time consistent devaluation (revaluation) trigger of x_E^T.

For the two main cases of interest, we can summarise the key results in the following proposition.

Proposition 1.

1. *For* $\;=0$, $q=0$ *and* $Z>0$ *there is a unique solution to (16). The government reaction function is upward sloping and bounded by* $x_Q^L \le x_Q \le x_Q^U$.
2. *When* $q=0$, *for some appropriate* $\;>0$ *and* $Z>0$, *there are two solutions to (16).*

Proof: see Appendix 1 (not attached).

We consider the two cases in the sections that follow.

b) The Fenix plan: Devaluation and default

Assume that the policy-maker is reasonably optimistic about a smooth transition to floating exchange rate. In this case, we set $l = q = 0$ so devaluation costs are fixed at Z independent of x, see Column 1 of Table 1. This is designed to represent the beliefs of those, like the authors of the Fenix plan, endorsing the double-D strategy of devaluation and default.

The time consistent solution with fixed cost Z is shown in Figure 2 where horizontal axis represents external shocks x and the vertical the value function. The convex curve SS indicates the losses without the option to float. This is represented by the quadratic function in (13). Given the fixed cost moving to a float, Z (shown as the horizontal line ZZ), it would be appropriate for the government to abandon the existing peg when external shocks are larger than the point of intersections between SS and ZZ. Floating will reduce output losses, but as the float is irreversible and incurs the cost Z, so it pays to delay exercise. (When the exit is determined optimally conditional on given x_E, the trigger is chosen such that the value function CC both value matches and smooth pastes the horizontal line ZZ, If the chosen x_Q turns out to be the same as x_E, then the solution is time consistent.)

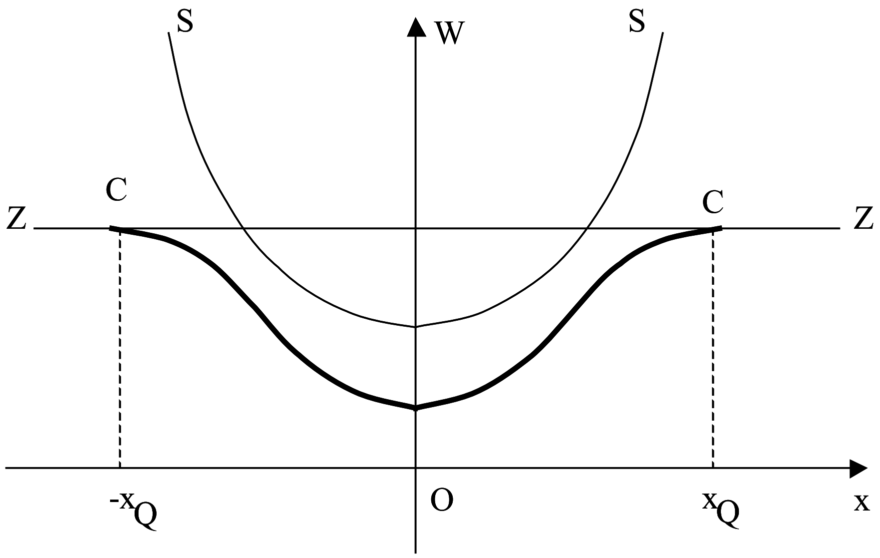

Figure 2. Time consistent solution.

A useful way of illustrating this solution is by plotting the government reaction function, as in OS. This is done in Figure 3, where the horizontal axis represents public's expected devaluation trigger x_E and the vertical axis shows government's chose trigger which depends on x_E. The upward-sloping curve $x_Q = f(x_E)$ shows the government's best response function which asymptotically tends toward a given upper bound. (Given rational expectations, the outcome must lie on the 45-degree line where $x_E = x_Q$ which represents the public response function.) The time consistent (Nash) equilibrium is shown as the intersection of the two response functions at T.

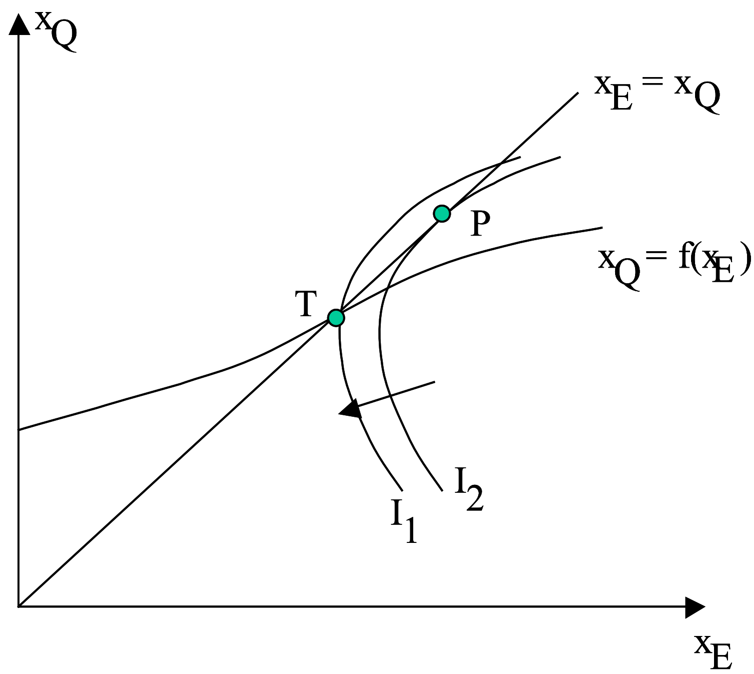

Figure 3. Time consistent and optimal solutions: Fixed cost case.

The best outcome for the government is to fool people by denying the possibility of devaluation (revaluation) before it is actually done. This will reduce the country risk premium to zero (effectively it generates public expected trigger x_E of infinity). When the economy is hit by a large negative external shock, however, the government would then devalue (as shown by the asymptotic part of the government's response function). But, with rational expectations, such policy is not credible. (In the Annex, it is shown that the optimal policy with pre-commitment will be to devalue somewhat later as shown by the point P in figure 3.)

c) The concept of 'immaculate default'

With fully anticipated default at a known trigger point, creditors can hardly complain that they are being taken by surprise. But are they suffering unrequited losses? Assuming that the debt was sold when x = 0, the price A includes the discount appropriate for the risk of default at x*. If debt was sold at that price, creditors should not complain - this is the case of immaculate default, where the default has been paid for ex ante. But if the debt had been sold at par, creditors can complain that they are suffering losses not priced into the market.

d) Multiple equilibrium: Hausmann's conjecture

Earlier we cited the conjecture of Ricardo Hausmann, chief economist at the Inter-American Development Bank until the year 2000 that the Argentine crisis could have been a self-fulfilling prophecy. His successor at the IADB, Guillermo Calvo expressed some sympathy of this view in August 2000. Can the model capture this conjecture?

We find that, if the cost of transition depends partly on how large the devaluation is, one can generate two equilibria. Specifically, when cost of devaluation is proportional to x, Figure 4 sketches two possible time consistent equilibria where the concave government's reaction function intersects the 45-degree line at T_1 and T_2. It is clear from the figure that equilibrium T_1 is unstable while that at T_2 is. So a small perturbation to T_1 would make the system converge at T_2, i.e., after the government fends off the speculative attack at T_1, the economy is relatively tranquil for some time until the devaluation point T_2 is reached.

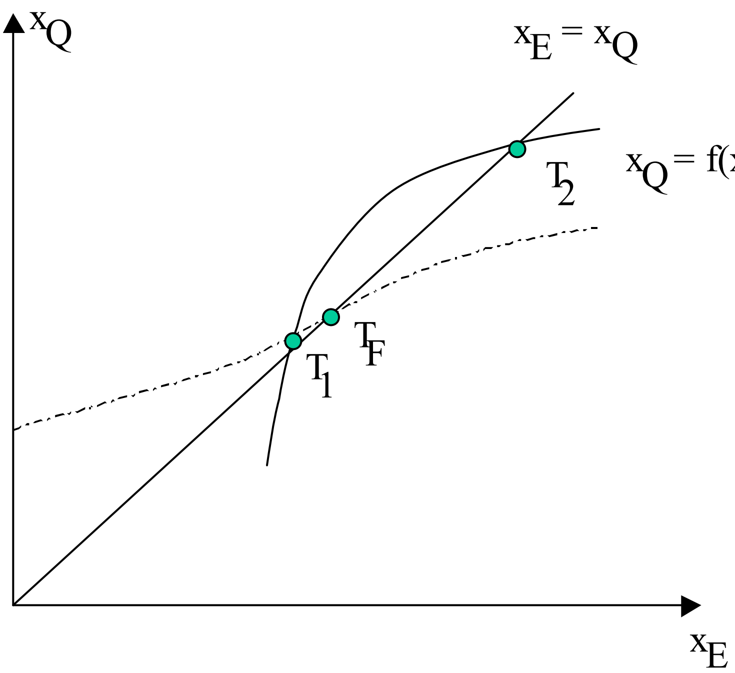

Figure 4. Time consistent equilibria: proportional cost case.

e) Problems of "observational equivalence"

It may be difficult to discriminate between the unique equilibrium of the Fenix plan and the self-fulfilling crisis described by Hausmann. Imagine the situation shown in Figure 4 where the unique equilibrium of the Fenix plan (with fixed cost Z) is at T_F, quite close to T_1, the point of speculative attack in the model where devaluation is more costly. But, if the devaluation costs are not observable until they are incurred, when T_1 is reached, those who believe in smooth transition would advocate immediate devaluation while those who believe in more costly transition would like to maintain the status quo -- arguing that this will cut interest rates and restore confidence -- at least until the other trigger is reached.

f) President de la Rua and Dollarisation

The case where there is a substantial quadratic element in the cost of devaluation, i.e. $q >> 0$ can generate result that it is never optimal to devalue. Nevertheless, there may be speculative attack equilibria. This may serve to describe the perception of President de la Rua and his choice of Dollarisation as the appropriate policy, as indicated in Table 3.

g) Mr. Cavallo: credible and crippled

We have not discussed how to analyse Mr Cavallo's choice of trigger for devaluation. The reason is obvious: he would never choose to do so. Effectively, for him, Z tends to infinity. Nevertheless, the behaviour of the risk premium implies that the market anticipated the double-D policy. How do they think he would go? that is the issue.

Two ways of doing this are explored in Fronti (2002). First that he would be forced to leave when public opinion would turn decisively against him at a critical value of x greater than the optimal precommitment point (and so greater than the time consistent choice of the Fenix plan). The other is that beyond some critical value of x, say x_E^P, Cavallo would be subject to the hazard of losing office represented by πdt.[7] This would capture the idea that Mr. Cavallo represented excessive pre-commitment.

3. Conclusion

Before summarising results, we note that the model used is optimistic in two respects. First of all, there are no liquidity crises driven by problem of creditor co-ordination. Second, apart from transition costs, floating is treated as a desirable policy environment. But Calvo (2000) has warned that this may not be true.

Starting with the view that there was a genuine **crisis of economic fundamentals**, the model shows interest rates will rise and economic activity will fall as markets forecast devaluation and default. With Mr. Cavallo in office, the double-D policy advocated by the Fenix plan was likely to be severely delayed. So as fundamentals deteriorated, one would observe a 'slow motion train crash' -- made worse by excessive commitment to the peg. Although there is no explicit treatment of the magnitude of external and internal debt, the model can be calibrated to produce an interest rate run-up and devaluation consistent with what has been observed.

If the economic costs of leaving the peg increase linearly with the size of devaluation, however, this allows for the other interpretation, namely that the high interest rates triggering devaluation and default could have been a **self-fulfilling panic** to be resisted until fundamentals deteriorate a good deal further.

[7] As this is a reversible switch - until devaluation occurs - the boundary condition at $x = x_{opt}$ will involve smooth pasting and value matching to a process with risk of a crash to the free float with hazard rate πdt.

It is worth emphasising that the costs associated with devaluation and default are not in fact exogenous but are themselves policy-determined. The "Fenix view" of fundamental crisis will be borne out if, by financial restructuring and indexation, the current administration can make devaluation and default work. Failure to do this, followed by economic chaos, would support the view that the high interest rates were due to a self-fulfilling crisis which should have been resisted at least for a while.

References

Calvo, Guillermo (2000). “Capital markets and the exchange rate with special reference to the dollarization debate in Latin America”. Mimeo, April. Available on line at http://www.bsos.umd.edu/econ/ciecalvo.htm.

Cavallo, D. (2001a) "An Open Letter to the Market" April 12, 2001 was in http://www.infoarg.org/PDF/open.PDF at May 2001.

Cavallo, D. (2001b) "Queremos evitar que la Argentina entre en el caos". *La Nacion*. Buenos Aires. December 2.

Duhalde, E. (2002) ‘El discurso de asunción de Eduardo Duhalde’. La Nación. Buenos Aires. Jan. 1.

Fenix Plan (2001) *Hacia el Plan Fenix: Diagnostico y propuestas. Una estrategia de reconstrucción de la economía argentina para el desarrollo con equidad. Enoikos* N.19. Buenos Aires: Universidad de Buenos Aires. Available on line : http://www.econ.uba.ar/www/destacados/deuda.htm

Fronti, Javier I. G. (2002). “Could a country with a policymaker completely committed to a fixed exchange regime devalue? The case of Argentinean crisis 2001.” Mimeo, University of Warwick.

Hausmann, R. (2001) ‘A way out for Argentina’. *Financial Times.* London.October 30.

Miller, Marcus and Lei Zhang (1996) “Optimal target zones”, *Journal of Economics, Dynamics, and Control.* (20) pp.1641-1660.

Ministry of economy (2001). *Información económica,* Ministerio de economía de Argentina, Avaliable on line: http://www2.mecon.gov.ar/infoeco/.

Ozkan, Gulcin and Alan Sutherland (1998) “A currency crisis model with an optimising policymaker” *Journal of International Economics* (44) pp.339-364.

Sachs, J. A. Tornell and A Velasco (1996) “The Mexican peso crisis: sudden death or death foretold?” Journal of International Economics, Symposium, 41,265-283.

Smalhout, J. (2001) ‘Cavallo's high-stakes confidence game’. *Euromoney*, London; May 2001.

Wallin, M. and Druckerman, P. (2001). ‘Argentina's Beleaguered Government Collapses --- President de la Rua Resigns, Unable to Quell Violence Fueled by Finance Crisis’ *Wall Street Journal*; New York, N.Y.; Dec 21, 2001.

Annex: Optimal devaluation under fixed cost

The time consistent solution is obtained under the assumption that the government cannot pre-commit to a particular devaluation trigger. With credible pre-commitment, such discretionary equilibrium can certainly be improved.

As the loss at the origin captures the global property of the loss function, we assume the government minimise the expected losses at $x = 0$ by choosing an appropriate credible pre-committed trigger x_E, the objective function in (10) is then replaced by

$$\min_{x_E} W(0) \tag{18}$$

subject to the value matching condition (14), i.e.,

$$W(x_E) = F(x_E). \tag{14'}$$

Substitution of (14') into (18) gives

$$\min_{x_E} \left\{ \frac{W^L(x_E; x_E) - F(x_E)}{\cosh(\xi x_E)} + W^L(0; x_E) \right\} \tag{19}$$

Proposition A. *For* $\ell = q = 0$, *the optimal devaluation trigger* x_E^P *is greater than the time consistent one,* x_E^T.

Proof: See Appendix 3 (not attached)

The optimal solution under fixed devaluation cost is illustrated in Figure 3. It is shown at the point P where the iso-loss contour is tangent to the 45-degree line. As the government in this case is assume to be able to pre-commit, it can internalise the expectations effect and so the resulting losses turn out to be smaller.

Appendices

Available upon request.

Argentina in Numbers

Population: 37 million (2000)

GDP: US$ 277 billion (2000)
GDP Growth Rate
-3.4% (1999)
-0.5% (2000)
-4.0% (2001 Est.)
GDP Per Capita: US$ 7,500 (2000)

Inflation: -1% (2000)
Unemployment: 18% (2001)

Total Imports: US$ 25 billion (CIF, 2000)
Total Exports:US$ 26 billion (FOB, 2000)
External Debt:US$ 145 billion (2001)

Argentina Country Risk. From Oct/2001 to Mar/2002