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# Self-Fulfilling Expectations, Speculative Attacks and Capital Controls

Dellas, Harris and Alan C. Stockman

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ABSTRACT

This paper examines the endogenous implementation of capital controls in the context of a fixed exchange rate regime. It is shown that if there exists a non-zero probability that the policymaker's response to a speculative attack on official foreign reserves will be the introduction of controls, such an attack may occur even when current and expected monetary policy is consistent with a permanently viable, control-free fixed exchange rate regime. Consequently, capital controls may be the outcome of self-fulfilling expectations rather than the result of imprudent economic policies.

Harris Dellas
Department of Economics
Vanderbilt University
Nashville, TN 37235
(615) 385-0174

Alan Stockman
Department of Economics
University of Rochester
Rochester, NY 14627
(716) 275-7214

## INTRODUCTION

The last few years have witnessed a revival of interest in the removal of economic restrictions that are so extensively being used in most developing countries. The presence of such controls is considered to be one of the main obstacles to achieving sustained economic growth. A voluminous literature on economic liberalization now exists which deals with a wide variety of issues, like the optimal order of liberalization of the foreign accounts, its relation to domestic stabilization policies, etc. (for a survey of some of these issues as well as references, see Edwards, 1983). However, despite widespread agreement on the merits of economic liberalization, few such attempts have so far been undertaken. Moreover, most of these attempts failed at one stage or another, which led to the complete abandonment of economic reform.

The reason for the failure of liberalization experiments can be traced either to the adoption of economic policies which proved inconsistent with the permanent removal of controls; or to the lack of credibility of government policy. In the first case it is the current behaviour of the policymakers that undermines the viability of the reform. In the latter case, reform failure is the result of the ("destabilizing") behaviour of the public which acts on expectations of future policy reversals (even when current policies seem prudent).

In this paper we deal with the second source of failure in the context of the choice of the exchange rate system. We analyze how the choice of the exchange rate regime influences the probability of success of a balance-of-payments liberalization attempt. We argue that if <u>current</u> economic (monetary) policy is <u>identical</u> across alternative exchange systems, a fixed regime is more likely to lead to a reimposition of controls even when monetary authorities behave responsibly; that is even when monetary policy is consistent[1] with the permanent maintenance of a control-free environment. What lies behind this result is the fact that, in general, pegged and flexible exchange rates are expected to be associated with different future economic policies.[2] Pegged exchange rate systems are subject to possible balance-of-payments crises that involve endogenous speculation against a currency and associated capital flows. If people expect that, as a result of a speculative run, governments will impose capital controls to maintain the fixed regime, self-fulfilling expectations may cause such an attack to take place and the subsequent failure of the liberalization experiment. Note that the behaviour of individuals is absolutely rational as their expectations are validated by subsequent policy actions.

We also argue that if a third party (like the IMF) stood willing to lend foreign reserves to the domestic policymaker at a fixed rate in the case of a speculative run, on the condition that "responsible" monetary policy is maintained, no runs occur and a fixed exchange rate regime without capital controls is viable (and no actual loans are made).

Our analysis is applicable not only to the choice of the exchange rate regime during a liberalization attempt but also to other policy situations. For instance, it can explain why the effects of policy threats may be diametrically opposite from their intended objectives. As demonstrated in the paper, the threat of capital controls ignites speculative attacks instead of serving to deter them. A similar analysis can be applied to issues such as the effects of a variable investment tax credit on investment and output fluctuations.

## THE MODEL

We employ a variant of the standard balance-of-payments--crisis model (see Flood and Garber, 1984, Obstfeld, 1986) to analyze the case of a small open economy. During a liberalization experiment, domestic residents can hold domestic money, domestic bonds, foreign money and foreign bonds. Foreign money is not held because its return is dominated by the return on bonds. Domestic money pays no interest but it is held because of the existence of trading frictions (such as a cash-in-advance constraint). If capital controls are imposed, domestic residents can no longer legally transact in foreign assets. Under a fixed regime, the domestic government has a stock of foreign reserves that is used to support the fixed exchange rate.

The following assumptions describe the behaviour of policy:

(a) Actual and expected domestic monetary policy is the same across different exchange rate regimes; it does not change following the occurrence of a speculative run;[3] and is such that if a speculative attack did not cause the introduction of capital controls, the fixed regime could be viable indefinitely. Hence, only runs induced by the expectation of future controls can cause the collapse of the fixed regime.

(b) If official reserves are brought below a certain critical value by a speculative attack, then the government imposes capital controls (to be described shortly).

The model is built around the following equations:

$$M_t^d/P_t = a - b \cdot i \tag{1}$$

$$M_t^s = R_t + D_t \tag{2}$$

$$D_t = \bar{D} + u_t \tag{3}$$

$$Eu_t = 0, \; Eu_t^2 = \sigma^2 \tag{4}$$

$$P_t = S_t P_t^* \tag{5}$$

$$i = i^* + \underset{t}{E} \, [(S_{t+1} | S_t) - 1] \tag{6}$$

where $M_t^d$, $M_t^s$, $D_t$, $R_t$, $S_t$, $P_t$ and $i_t$ are the domestic nominal demand for money, supply of money, domestic credit, foreign reserve holdings, exchange rate, price level and nominal interest rate respectively; an asterisk indicates "foreign"; and E is the expectations operator (we assume rational expectations). To simplify the exposition, we set $P_t^* = 1$ and $i^* = 0$.

We will assume that there are two critical values of $R_t$, $\bar{R}$ and $\bar{\bar{R}}$. As long as official reserves exceed $\bar{R}$, there are no restrictions on transactions involving foreign assets. If, however, $R_t$ slips below $\bar{R}$, a tax is imposed on purchases of foreign assets by domestic residents. When the level of reserves hits $\bar{\bar{R}}$, then the government withdraws from the foreign exchange market and lets the exchange rate float. One can justify this specification by arguing that the domestic government faces a perfectly elastic foreign supply of reserves up to $\bar{R}$, an upward sloping curve from $\bar{R}$ to $\bar{\bar{R}}$ and a perfectly inelastic one from $\bar{\bar{R}}$ and on. The fixed exchange rate is subject to capital controls in the interval $(\bar{R}, \bar{\bar{R}})$. An alternative specification could have been to have assumed that once reserves reach $\bar{R}$, the government imposes strict quantitative capital controls that prohibit domestic residents from acquiring new foreign assets; the demand for foreign assets is then satisfied in the black market at a price that includes a premium.

To ensure that capital controls are not the outcome of excessive monetary expansion, but rather the result of self-fulfilling expectations about controls we will restrict the permissible behaviour of domestic credit. We will require that, if the policymaker announced that no capital controls would ever be imposed, monetary policy is such that no run ever takes place and foreign reserves suffice to maintain the fixed regime indefinitely. The required restriction $R_t > \bar{R}$ implies that $u_t$ is such that

$$\text{Prob}\ (u_t < a\bar{S} - \bar{D} - \bar{R}) = 1 \qquad (7)$$

where $\bar{S}$ is the fixed exchange rate.

To highlight the interaction between self-fulfilling expectations and future possible policies we will consider two alternative policy scenarios. Under the first, the government announces that she will abandon the fixed regime when a balance-of-payments crisis occurs (reserves decline below $\bar{R}$) and will let the exchange rate float freely. It is easy to show[4] that under this policy, a speculative attack will lead to an exchange rate appreciation. Consequently, people who participate in the attack--and exchange domestic for foreign assets--will experience a capital loss. As participation in an attack violates individual rationality, no run takes place.

Under the second option, the domestic government threatens (credibly) that she will impose a tax, r, on acquisition of foreign assets if a run against the domestic currency causes foreign reserves to sink below $\bar{R}$. We will now demonstrate that the existence of this threat makes a speculative run a non-zero probability event, and that the likelihood of a run depends on the interest elasticity of the demand for money and the probability distribution of the shock to domestic credit ($u_t$). What makes an attack possible is the fact that while the domestic credit shock is not sufficient to wipe reserves out on its own (condition 7), a substantial drop in foreign reserves becomes possible when one includes the effect of the change in the domestic nominal interest rate on the demand for money. The interest rate changes because the threat of capital controls leads to an expected (implicit) currency devaluation which requires that the nominal interest rate rise to compensate holders of domestic currency denominates assets for potential capital losses.

The expected exchange rate for period t+1 as of period t is

$$\underset{t}{E}S_{t+1} = q(1+r)\bar{S} + (1-q)\bar{S} = (1+qr)\bar{S} > \bar{S}. \tag{8}$$

where q is the probability that $u_t$ exceeds some critical level u, and u is determined by

$$u = (a-b\cdot i)\bar{S} - \bar{D} - \bar{R} \tag{9}$$

(8) says that the expected exchange rate is the weighted sum of the fixed exchange rate that will prevail if no run takes place and the fixed cum tax rate if a run takes place. In (9) any $u_t > u$ causes an excess supply of money which cannot be satisfied with an outflow of reserves (given $\bar{R}$) but requires an exchange rate depreciation. Hence for any $u_t > u$ a speculative attack occurs and capital controls are imposed.

(8) and (6) imply that i = qr and substituting into (9) we have that q satisfies the condition

$$q = \text{prob } (u_t > u) = \text{prob } [u_t > (a-bqr)\bar{S} - \bar{D} - \bar{R}] \tag{10}$$

We can think of q as the probability of a balance-of-payments crisis. Since $u_t$ is an i.i.d. random variable and the nominal interest rate is a constant, the probability of an attack is the same for all time periods.[5] Capital controls are imposed the first time $u_t$ exceeds $\bar{u}$. Notice that if the interest elasticity of the demand for money were zero, expression (10) would reduce to (7) with $q = 0$, that is no attack would ever occur.

Up to this point we have assumed that controls are known to be imposed with certainty when reserves slip below $\bar{R}$. Our analysis, however, can be extended to deal with situations in which the policy-maker's response to a speculative attack is uncertain. For instance, suppose that the public believes that, following a run, controls will (will not) be imposed with probability y (1-y). Then the expected exchange rate is

$$
\begin{aligned}
E_t S_{t+1} = \bar{q}[y\cdot(1+r)\bar{S} + (1-y)[a^{-1}(\bar{R} + \bar{D}) + (a + b)^{-1} u_t] \\
+ (1-\bar{q})\bar{S} \qquad (11)
\end{aligned}
$$

where $\bar{q}$ is the probability that $u_t$ exceeds a new[6] critical level $\bar{u}$. If $E_t S_{t+1} < \bar{S}$ no attack ever takes place. If, however, the exchange rate is expected to depreciate following a run ($E_t S_{t+1} > \bar{S}$), a run may take place if the realization of $u_t$ is sufficiently high. The probability of an attack is lower now and it depends on the probability distribution of the domestic credit shock ($\bar{q}$), the probability the public attacks to government intentions to impose capital controls (y), the interest elasticity of the demand for money and on the level of reserves, domestic credit and the exchange rate. Note that if the policymaker could credibly choose the probability of imposing controls (which depends on things like the--publicly perceived--importance she attaches to a fixed regime relative to a flexible), the optimal choice involves setting $y = 0$. If, however, announcements of future policies are not credible, and no precommitment technology is available, then the public will assess the value of $y$ by evaluating the policymaker's objective function under the two policy options. The higher $y$, the higher the possibility that a run will take place.

Before concluding this paper it is worthwhile making one remark that seems to have relevance for real world liberalization reforms. If an outside party (like the IMF) credibly promises to provide loans at a fixed rate, conditioned on the domestic policymaker's following responsible monetary policies (which the policymaker does in our model because of condition 7), then the fixed regime could be maintained indefinitely with no attacks and capital controls. In such a case the choice of the exchange rate regime is of no consequence for the probability of success of an economic liberalization attempt. Moreover, in equilibrium, no actual loans need to be made. Whether such an IMF policy would be welfare-improving, or even feasible, is a more difficult issue that we do not address here.

## Notes

[1]Proponents of a fixed exchange system believe that a fixed regime imposes discipline on the behaviour of monetary authorities (by endogenizing the money supply). In our case we assume that policymakers are already disciplined, and that the choice of exchange systems does not matter for the domestic credit component of the money supply.

[2]Stockman (1988) has emphasized the importance of these issues in the context of the behaviour of relative prices across exchange rate systems.

[3]If it did, it could fuel crisis expectations as it does in Obstfeld (1986).

[4]If, as a result of a speculative attack, the government switches to a floating exchange rate regime, the exchange rate will be determined by the following stochastic difference equations (which is derived by combining equations (1), (2), (5) and (6)):

$$-b\,{}_tES_{t+1} + (a+b)S_t = \bar{R} + D_t \tag{A1}$$

which can be solved for $S_t$ and when combined with equation (4) gives

$$S_t = a^{-1}(\bar{R} + \bar{D}) + (a+b)^{-1}u_t \tag{A2}$$

(A2) and condition (8) imply that $S_t < \bar{S}$, i.e., the exchange rate appreciates.

[5]It could vary over time if $u_t$ was an autocorrelated stochastic process.

[6]$\bar{u}$ is defined in a way similar to u in (9). The only difference is that the nominal interest rate will now be calculated using (11)

rather than (8). Notice that $\bar{q} \leq q$, so a run is more likely to occur when controls are expected to be imposed with certainty.

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