European Research Studies
Volume IV, Iss. (1-2), 2001, pp.
27-60

What Exchange – Rate System For Emerging Countries?

Patrick Artus*

Abstract

In this study, we will compare dollarisation, currency boards and exchange-rate flexibility from various points of view. They include the possibility of stabilising the dynamics of the external debt, in dollars or in national currency; the possibility of using fiscal policy freely; the cost of disinflation; weathering various shocks — e.g. on dollar interest rates and devaluation of trade competitors. We draw the conclusion, inter alia, that one should reject the idea of a currency board as soon as it is not totally credible.

JEL classification: F31, F33, F34.

Introducion

The recent trend is to suggest to emerging countries that they should adopt extreme exchange-rate regimes, the so-called "corner solutions" (cf. Frankel [1999]): absolute fixity, as with a currency board, or pure flexibility, to the expense of intermediate systems such as controlled flexible exchange rates or fixed exchange rates with realignments.

Actually, the number of countries with an intermediate system has dwindled sharply (Fischer-Sahay [2000]), perhaps because of the pressures exerted by the IMF and the US Treasury (Williamson [2000]). Fischer [2001] softens the argument: quite a large number of exchange rate systems are possible, with the exception of "soft" pegs that are unsustainable. The only solution to save soft pegs would be to introduce capital controls, but such a move would ex-

* Directeur des Etudes Economiques CDCIXIS, Caisse des Dépôts et Consignations, 56 rue de Lille, 75007 Paris, Tel. : 01-40-49.50.60, Email : partus@cdc.marches.fr.

clude the countries that made this choice from the global capital market (Edwards [1999], Mussa *et al* [2000], Fischer [1998]).

Meanwhile, changing over to pure flexibility suffers from drawbacks: excessive exchange-rate fluctuations (Calvo-Reinhart [2000]), problems met in terms of stabilising prices and a change in the value in the national currency of debts denominated in foreign currencies (Aghion-Bacchetta-Banerjee [2000], Chang-Velasco [1999], Burnside-Eichenbaum-Rebelo [2001]).

However, pure fixity also has drawbacks. Many studies (Alesina-Barro [2000] and Bayoumi-Eichgreen [1998], for example) suggest that fixity wipes out the economy's capacity to absorb shocks with flexible exchange rates, and this point had already been made by Mundell [1961].

Moreover, fixity or dollarisation prevent the central bank from implementing a policy of lender of last resort in the event of a banking crisis, since the monetary base cannot be increased (Calomiris-Powell [2000], Ghosh-Gulde, Wolf [2000]). The risk of this situation is therefore financial instability; the advantage lies in the disappearance of the moral hazard linked to the anticipation of the move by the lender of last resort.

The recent case of Argentina confirms that a risk premium can be added to interest rates. Such a premium is not a currency risk premium but a default risk premium due to the deterioration in the economic situation (Atkeson-Rios Rull [1995], Calvo-Mendoza [1996], Eichengreen-Fishlow [1996], Cespedes-Chang-Velasso [2000]). We can see also that despite the currency board, a currency risk premium can subsist, i.e. the currency board may not be completely credible. Such a point leads some authors to suggest dollarisation as a way to reduce interest rates, since currency risk premia vanish if there is dollarisation (Aizenman-Hausman [2000], Mendoza [2000], Calvo-Mendoza [2000] and Calvo-Reinhart [2001]). This argument overlooks the fact, however, that in several cases — such as in Argentina today — as debt is primarily denominated in foreign currencies and not in nation-

al currency, the premiums that are added to interest rates cannot be exchange-rate premiums, but only default risk premia (Artus [2001] and Sims [2001]). If this is the case, restrictive domestic policies, budgetary policies notably, which are often recommended to these countries to reduce their public-sector borrowing requirements, are highly counter-productive since they lead to a further worsening in the economic situation and increase default risk among borrowers.

Furthermore, empirical studies (Edwards [2001]) show that effectively dollarised countries, if they have less inflation than others, have enjoyed less growth — and this can increase default risk — and as many shocks affecting their current-account balance.

The purpose of this article is to compare three exchange-rate regimes: dollarisation, currency board and pure flexibility. The above discussion leads us to analyse the case where fiscal policy can be freely chosen, and the case where it is constrained, or becomes constrained because it has been used to an excessive extent; and also to draw a distinction between the case of debt in national currency and that of debt in foreign currencies.

The criteria to draw upon to make a choice between the three exchange-rate regimes that we will use are as follows:

- possibility that the dynamics of the external debt may be stable, i.e. that the external debt should not grow (or decrease) steadily after a shock;
- possibility to react to an inflationary shock, i.e. to ensure its impact on domestic inflation vanishes; the literature (Calvo-Vegh [1999], Calvo-Reinhart-Vegh [1995], Fischer [1986], Montiel-Ostry [1991], Dornbusch-Goldfajn-Valdes [1995], Easterly [1996], Fischer-Sahay-Vegh [1996], Rebelo-Vegh [1995], Vegh [1992], Obstfeld-Rogoff [1995] and Sachs-Tornell-Velasco [1995]) suggests that basing disinflation on exchange rate fixity, i.e. on a real appreciation after the initial shock, without an adjustment in monetary policy, or with major nominal inertia (Calvo-Vegh [1994]) leads to a balance of payments crisis after

a first period of an economics upturn due to the decline in interest rates with exchange-rate fixity. We will see that effectively an inflationary shock leads to a divergence in the debt, but, normally, if there is dollarisation, a sharp increase in the debt does not entail consequences, given the lack of currency risk. Dollarisation is sometimes seen only as the way for the country's central bank to import the credibility of the United States free of charge and free itself from local inflationary institutions, and, consequently, reduce the inflationary bias (Cooper-Kempf [2001] for example). This argument (already used in the case of the euro zone) is less decisive in our opinion than the implementation of nominal pegging;

- capacity to absorb shocks (Schmitt-Grohe, Uribe [2001] study the capacity of dollarised economies to respond to asymmetrical shocks); we will study two types of shock, which have played an important role in economic trends in emerging countries: a rise in the dollar interest rate; a depreciation against the dollar in currencies of rival countries or trading partners — e.g. the case of Brazil in 1999 relative to Argentina.

Obviously, we cannot cover the entire debate about dollarisation that includes the loss of seigniorage (Schmitt-Grohe, Uribe [1999]), the capacity of playing the role of lender of last resort (Caprio-Dooley-Leipziger-Walsh [1996] and Calvo [2001]), the reduction in credit rationing, which can stem from the fact that, if the collateral backing of the credit is specified in terms of traded goods and consists in non-traded goods, the risk of a devaluation is also a risk of loss of value in the collateral (Calvo-Mendoza [2000] and Mendoza [2001]).

1. The model

1.1. The real economy

Demand for goods (equal to output in the short run) y_t decreases with the real interest rate on the domestic debt, calculated with expected inflation, and grows with the public sector deficit and with competitiveness:

$$(1)\quad y_t = -\alpha(r_t - \Pi_t^a) + \beta g_t + \gamma_0(e_t - p_t) + \gamma_1(e_t - f_t - p_t)$$

y stands for output, r the country's nominal interest rate, Π^a expected inflation, g the public sector deficit, p the logarithm of the price level.

We draw a distinction between:

- net exports to the dollar zone: $\gamma_0(e_t - p_t)$; e_t is the logarithm of the country's exchange rate against the dollar (a rise in e_t means a depreciation in the country's currency);
- the country's net exports outside the dollar zone: $\gamma_1(e_t - f_t - p_t)$, f_t is the logarithm of the exchange rate of countries outside the dollar zone against the dollar, $e - f$ that of the country's exchange rate considered in relation to these countries outside the dollar zone.

The supply of goods z is simply supposed exogenous. Inflation Π_t depends on the excess demand for goods:

$$(2)\quad \Pi_t = p_{t+1} - p_t = \theta(y_t - z)$$

Expected inflation Π_t^a is inert relative to actual inflation:

$$(3)\quad \Pi_t^a = \varphi\Pi_{t-1}^a + (1-\varphi)\Pi_t$$

Equations (1) to (3) lead to:

$$(4)\quad p_{t+1} = p_t\left(1 - \frac{\theta}{1-\theta\alpha(1-\varphi)}(\gamma_0+\gamma_1)\right) - \frac{\alpha\theta}{1-\theta\alpha(1-\varphi)} r_t + \frac{\theta\alpha\varphi}{1-\theta\alpha(1-\varphi)}\Pi_{t-1}^a + \frac{\theta\beta}{1-\theta\alpha(1-\varphi)} g_t + \frac{\theta}{1-\theta\alpha(1-\varphi)}\left(\gamma_0 e_t + \gamma_1(e_t - f_t)\right) - \frac{\theta z}{1-\theta\alpha(1-\varphi)}$$

The characteristic polynomial of (3) (4) is:

$$(5)\quad Q(x) = x^2 - x\left(1 - \frac{\theta(\gamma_0+\gamma_1)}{1-\theta\alpha(1-\varphi)} + \frac{\varphi}{1-\theta\alpha(1-\varphi)}\right) + \frac{\varphi\left(1-\theta(\gamma_0+\gamma_1)\right)}{1-\theta\alpha(1-\varphi)}$$

$$\begin{cases} Q(1) = \dfrac{\theta(\gamma_0 + \gamma_1)}{1 - \theta\alpha(1-\varphi)}(1-\varphi) > 0 \\ Q'(1) = 1 + \dfrac{\theta(\gamma_0 + \gamma_1)}{1 - \theta\alpha(1-\varphi)} - \dfrac{\varphi}{1 - \theta\alpha(1-\varphi)} \end{cases}$$

If $\varphi'(1) > 0$ (which means that expected inflation is not too inert, φ quite small; that the effect of competitiveness on demand is quite strong, $\gamma_0 + \gamma_1$ quite significant), without ambiguity the system (3) (4) is stable.

The inertia of inflation expectations (the fact that $\varphi > 0$) reduces the reaction by inflation to anti-inflationary policies. Demand for goods grows with expected inflation Π^a therefore actual inflation grows with expected inflation. An inflationary past (high Π^a) increases therefore current inflation especially as inflation expectations are inert.

1.2. Balance of payments

We denote d the country's external debt, supposed here to be denominated in the country's currency [1]. Demand for debt among investors in the rest of the world (dollar zone) is written:

$$(6) \quad d_t = D_0\left[(r_t - r^*) - D_1(e_{t+1} - e_t) - D_2(y^* - y_t)\right]$$

d_t stands for the date outside period t, $r*$ the dollar interest rate; $e_{t+1} - e_t$ the (perfectly anticipated) depreciation in the country's exchange rate against the dollar; $D_1(e_{t+1} - e_t)$ therefore represents the premium that is added to the interest rate because of risk of a depreciation in the currency (exchange-rate premium). $y^* - y_t$ represents the shortfall in output y_t in relation to normal production or full employment y^*. $D_2(y^* - y_t)$ stands therefore for the default risk premium of borrowers because of the weakness of real activity (default premium).

---

[1] We will analyse below the case of external debt denominated in foreign currencies.

The supply of debt comes from:

$$(7) \quad d_{t+1} - d_t = r_t d_t - \varepsilon_0(e_t - p_t) - \varepsilon_1(e_t - f_t - p_t)$$

The external debt grows with the interest payments on the debt and decreases with net exports, to the dollar zone and other countries.

(6) and (7) suppose implicitly that the interest rate on the external debt increases:

- with the risk of a depreciation in the country's currency; this applies to the share of the debt that is in national currency. If the country has the greater part of its debt in dollars, D_1 is small;
- with the default risk, for the debt denominated in dollars as well as the debt in national currency.

1.3. The three exchange-rate regimes

(a) dollarisation

When there is dollarisation, the exchange rate against the dollar remains fixed $(e_t = \bar{e})$; there is no longer the risk of a depreciation in the country's currency $(e_{t+1} - e_t = 0)$. There is perfect mobility of capital between the country and the rest of the world (dollar zone) since the country belongs to the dollar zone; however, the default risk of borrowers can still lead to the appearance of premiums that are added to the interest rate. We therefore have (since $D_0 = +\infty$ and $e_{t+1} - e_t = 0$):

$$(8) \quad r_t = r^* + D_2(y^* - y_t)$$

The level of external debt is indifferent since the country belongs to the dollar zone: there is no currency risk.

Obviously a default risk subsists, but it is of a very different nature from currency risk: the first is microeconomic (it depends on each borrower), the second macroeconomic; we suppose that the lenders control default risk better (they analyse the situation of borrowers) than currency risk (which depends on economic policy

decisions). We suppose therefore that, if there is no currency risk (in the case of dollarisation), capital is very mobile, and default risk simply adds a premium to the interest rate. If default risk reduces the mobility of capital, a term linked to the level of the debt is added to (8), and dollarisation is virtually no longer different from the currency board.

(b) currency board

With a currency board, the exchange rate remains fixed against the dollar $(e_t = \overline{e})$, but there can be a problem of credibility in the currency board that lets an anticipation of depreciation subsist $(e_{t+1} - e_t = A)$; the more credible the currency board is, the smaller A is. The possible persistence of a currency risk implies that demand for external debt is not perfectly elastic to the interest rate.

The currency board is usually presented as an exchange-rate regime where the central bank fixes the interest rate in order to stabilise the official reserves. In fact, this simply means that the interest rate is at a level such as enough foreign capital as needed to finance the possible external deficit flows into the country. Therefore (6) is verified ((6) means that the interest rate is such that there is equilibrium in the market of external debt without a change in official reserves). We therefore have with a currency board:

$$(9) \quad \begin{cases} r_t = r^* + D_1 A + D_2 (y^* - y_t) + \dfrac{1}{D_0} d_t \\ d_{t+1} - d_t = r_t d_t - \varepsilon_0 (\overline{e} - p_t) - \varepsilon_1 (\overline{\varepsilon} - f_t - p_t) \end{cases}$$

D_0 is all the higher as the credibility of the currency board is high, therefore international capital mobility is strong. A wholly credible currency board $(A = 0, D_0 = +\infty)$ is similar to dollarisation.

(c) Flexible exchange rates

With flexible exchange rates, the exchange rate balances the market of external debt. Interest rates can be set freely. We therefore have:

$$(10)\quad \begin{cases} r_t = r^* + D_1(e_{t+1} - e_t) + D_2(y^* - y_t) + \dfrac{d}{D_0} \\ d_{t+1} - d_t = r_t d_t - \varepsilon_0(e - p_t) - \varepsilon_1(e_t - f_t - p_t) \end{cases}$$

If the currency risk is high, D_0 is small, therefore the level of external debt influences the equilibrium of the debt market significantly.

1.4. Shocks, targets and instruments

The emerging countries we have in mind are hit by the following shocks:

- changes in the US interest rate r^* ;
- changes in parities of countries with which they trade outside the dollar zone (changes in f_t) ;
- an inflationary past that implies high inherited inflation expectations (Π_{t-1}^a) .

The **instruments** of economic policy are:

- the public sector deficit g_t ;
- exclusively in flexible exchange rates, the interest rate r_t .

The targets of economic policy are:

- price stability $(\Pi_t = 0)$;
- full employment $(y_t = y^*)$.

We represent the above by the loss function:

$$(11)\quad L_t = \Pi_t^2 + E(y^* - y_t)^2$$

where E is the relative weight of the full employment target.

2. Dollarisation

The model that describes trends in the economy in this case is as follows:

$$(12)\quad \begin{cases} y_t = -\alpha(r_t - \Pi_t^a) + \beta g_t + \gamma_0(\overline{e} - p_t) + \gamma_1(\overline{e} - f_t - p_t) \\ \Pi_t^a = \varphi\Pi_{t-1}^a + (1-\varphi)\Pi_t \\ \Pi_t = \theta(y_t - z) \\ r_t = r^* + D_2(y^* - y_t) \end{cases}$$

Let us look first at the long-term stationary equilibrium (without shocks), where we have:

$$\Pi^a = \Pi = 0;\ y = z;\ r = r^* + D_2(y^* - z)$$

This implies:

$$(13)\quad p(\gamma_0 + \gamma_1) = -\alpha\left(r^* + D_2(y^* - z)\right) + \beta g + (\gamma_0 + \gamma_1)\overline{e} - \gamma_1 f$$

where we suppose that in the long term the general government deficit g and the exchange rate against the dollar of other countries f are constant. Welfare, which depends on Π and g, is not affected by any of the shocks mentioned above (change in r^*, f, Π^a): the level of prices p absorbs all these shocks.

We therefore have to look at the short-term equilibrium. Starting from (12), it is written:

$$(14)\quad \begin{cases} y_t(1 - \alpha D_2 - \alpha(1-\varphi)\theta) = -\alpha r^* - \alpha D_2 y^* + \alpha\varphi\Pi_{t-1}^a - \alpha(1-\varphi)\theta z + \beta g_t \\ + (\gamma_0 + \gamma_1)(\overline{e} - p_t) - \gamma_1 f_t \\ \Pi_t(1 - \alpha D_2 - \alpha(1-\varphi)\theta) = -\alpha\theta r^* - \alpha\theta D_2 y^* + \alpha\theta\varphi\Pi_{t-1}^a + \beta\theta g_t \\ + (\gamma_0 + \gamma_1)\theta(\overline{e} - p_t) - \gamma_1\theta f_t - \theta(1 - \alpha D_2)z \end{cases}$$

When there is dollarisation, the only instrument of economic policy is the general government deficit g_t. The deficit that minimises L_t given by (11) is:

$$(15)\quad g_t(\beta\theta^2+E\beta)=\alpha r^*(\theta^2+E)+y^*\left(\alpha\theta^2D_2+E(1-\alpha(1-\varphi)\theta)\right)$$
$$-\alpha\varphi(\theta^2+E)\Pi^a_{t-1}+\left(\theta^2(1-\alpha D_2)+E\alpha(1-\varphi)\theta\right)z-(\theta^2+E)u_t$$
$$-(\gamma_0+\gamma_1)(\theta^2+E)(\overline{e}-p_t)+\gamma_1(\theta^2+E)\,f_t$$

A rise in the dollar interest rate naturally leads to a rise in the public sector deficit, just like a decline in inherited expected inflation, which reduces current inflation, and a depreciation in the exchange rate of countries outside the dollar zone (rise in f_t) results in a deterioration in foreign trade.

Lastly, we obtain:

$$(16)\quad \begin{cases} y(\theta^2+E)=Ey^*+\theta^2 z \\ \Pi_t(\theta^2+E)=E\theta(y^*-z) \end{cases}$$

Changes in:

- the dollar interest rate r_t ;
- inherited expected inflation Π^a_{t-1} ;
- the exchange rate of countries outside the dollar zone f_t are offset by the reaction in the general government deficit, since inflation and output are affected in the same way by these changes (we have $\Pi_t=\theta(y_t-z)$).

Let us look at the default risk (the term $D_2(y^*-y_t)$). If D_2 rises, a rise in r^* (dollar interest rate) or f (devaluation by trading partners) has a more significant impact on output and inflation, but this is also the case for the general government deficit, hence the fact that these effects are eliminated although fiscal policy needs to be adjusted to a greater extent.

This leads us to draw a distinction between two groups of countries:

- those that can use fiscal policy freely in response to shocks; in these countries, if they have chosen dollarisation, the equilibrium is given by (15) (16) above;

- those where fiscal policy is constrained, because of solvency constraints bearing on public finances. The equilibrium is then given by (14), with $g_t = \overline{g}$.

Let us look at the most favourable case (g_t chosen freely). The dynamics of the external debt stems from:

$$(17)\quad \begin{cases} d_{t+1} - d_t = r_t d_t - \varepsilon_0(\overline{e} - p_t) - \varepsilon_1(\overline{e} - f - p_t) \\ r_t = r^* + D_2(y^* - y_t) \\ y_t(\theta^2 + E) = Ey^* + \theta^2 z \\ \Pi_t(\theta^2 + E) = E\theta(y^* - z) \end{cases}$$

where f (exchange rate of trading partners) is supposed to be constant.

If $y^* > z$ (actual output exceeds the supply of goods), the country has positive inflation ($\Pi_t > 0$). This means that it has an indefinitely (and ever more) increasing external debt, since the dynamics of the debt is unstable. However, with dollarisation, this normally does not entail consequence since there is perfect mobility of capital between the country and the rest of the world, as the country has the dollar as a currency.

In the unfavourable case (g_t is constrained), let us start from a situation where it was possible to choose the general government deficit optimally to achieve (16) and look at the effects of the shocks mentioned above: $dr^* > 0$ (rise in dollar interest rate); $d\Pi^a_{t-1}$ (rise in inherited inflation); $df > 0$ (depreciation in trading partners' currency against the dollar). We obtain:

$$(18)\quad \begin{cases} y_t = \dfrac{z\theta^2 + Ey^*}{\theta^2 + E} + \dfrac{(-\alpha dr^* + \alpha\varphi d\Pi^a_{t-1} - \gamma df) - (\gamma_0 + \gamma_1)dp_t}{1 - \alpha D_2 - \alpha(1-\varphi)\theta} \\ \Pi_t = \dfrac{E\theta(y^* - z)}{\theta^2 + E} + \dfrac{(-\alpha\theta dr^* + \alpha\varphi\theta d\Pi^a_{t-1} - \gamma_1\theta df) - \theta(\gamma_0 + \gamma_1)dp_t}{1 - \alpha D_2 - \alpha(1-\varphi)\theta} \end{cases}$$

The last term in the right-hand member stands for the (initially nil) impact of the gradual change in the price on output and inflation.

Shocks have contradictory effects on the dynamics of the external debt. Let us take for example a depreciation in the exchange rate of trading partners $(df > 0)$. Since it reduces output, it reduces inflation. This can be enough to result in the level of prices p_t decreasing $(\Pi_t < 0)$ instead of rising $(\Pi_t > 0)$. As a result, there is an improvement in competitiveness which, in the long term, will lead to the disappearance of the external debt and lifts output back to its initial level. At first, however, while we have $e-(f+df)-p_t<0$, the increase in the debt is accelerated further by the rise in the interest rate r_t that results from the rise in the default risk premium $D_2(y^*-y_t)$ with the initial decline in output. Once more, with dollarisation, this increase in the debt must be possible, as long as the corresponding default premium is paid.

When fiscal policy is constrained, the dynamics of the debt is written (when restricted to endogenous variables):

$$(17') \quad \begin{cases} d_{t+1} = d_t(1+r^*+D_2(y^*-y_t))+(\varepsilon_0+\varepsilon_1)p_t \\ y_t = -\dfrac{\gamma_0+\gamma_1}{\Delta}p_t \\ p_{t+1}-p_t = -\dfrac{\theta(\gamma_0+\gamma_1)}{\Delta}p_t \end{cases}$$

with $\Delta = 1-\alpha D_2 - \alpha(1-\varphi)\theta$.

Let us denote $\hat{y}$ and $\hat{d}$ the linearisation points of y_t and d_t. The dynamics of the debt is rewritten:

$$(17'') \quad d_{t+1} = d_t\left(1+r^*+D_2(y^*-\hat{y})\right)+\left(\frac{D_2\hat{d}}{\Delta}(\gamma_0+\gamma_1)+(\varepsilon_0+\varepsilon_1)\right)p_t$$

and is necessarily unstable.

3. Currency board

The model that describes trends in the economy in this case is as follows:

$$(19)\quad \begin{cases} y_t = -\alpha(r_t - \Pi_t^a) + \beta g_t + \gamma_0(\bar{e} - p_t) + \gamma_1(\bar{e} - f_t - p_t) \\ \Pi_t^a = \varphi\Pi_{t-1}^a + (1-\varphi)\Pi_t \\ \Pi_t = \theta(y_t - z) \\ r_t = r^* + D_1 A + D_2(y^* - y_t) + \dfrac{1}{D_0} d_t \\ d_{t+1} - d_t = r_t d_t - \varepsilon_0(\bar{e} - p_t) - \varepsilon_1(\bar{e} - f_t - p_t) \end{cases}$$

As we have already seen above, a wholly credible currency board $(A = 0, D_0 = +\infty)$ is identical to dollarisation. We therefore look into the case of a currency board with the risk of withdrawal from exchange-rate fixity. Like previously, we will draw a distinction between the case of free fiscal policy and constrained fiscal policy.

a) free fiscal policy

As in the case of dollarisation, the choice of the public sector deficit g_t leads to (16) for output and inflation.

The dynamics of the external debt is written:

$$(20)\quad d_{t+1} = d_t\left(1 + r^* + D_1 A + D_2(y^* - y_t) + \frac{1}{D_0} d_t\right) - (\varepsilon_0 + \varepsilon_1)\bar{e} + \varepsilon_1 f_t + (\varepsilon_0 + \varepsilon_1) p_t$$

with, from (16):

$$\begin{cases} y^* - y_t = \dfrac{\theta^2(y^* - z)}{\theta^2 + E} \\ p_{t+1} - p_t = \dfrac{\theta E(y^* - z)}{\theta^2 + E} \end{cases}$$

and, since:

$$(21)\quad y_t = \frac{1}{D_2}\left[\alpha(1 - \varphi)\theta\Pi_{t-1}^a + \alpha(r^* + D_1 A - D_2 y^*) - d_t\frac{\alpha}{D_0}\alpha\varphi + \right.$$

$$\left. -\alpha(1-\varphi)\theta z + \beta g_t + (\gamma_0 + \gamma_1)\bar{e} - \gamma_1 f_t - (\gamma_0 + \gamma_1) p_t\right]$$

a public sector deficit given by (21) with y_t and Π_t given by (16).

This shows that, as soon as $y^* > z$ (supply of goods fails to ensure full employment or prevent corporate defaults), the situation of the country is very difficult:

- the shortfall in output increases the interest rate, and this leads to an increased accumulation of external debt and, reducing *ex ante* output, entails a higher public sector deficit;
- inflation is positive; price rises reflect the shortfall in competitiveness that fuels the accumulation of external debt, hence two additional causes of a higher public sector deficit.

As g_t increases in line with d_t (the external debt) and p_t (prices) to ensure the optimal value of output, and d_t and p_t increase steadily ($y^* > z$ and the dynamics of the external debt is unstable), the public sector deficit must grow steadily and increasingly; therefore the constraint of a limit to the public sector deficit $g_t \le \overline{g}$ eventually bites in.

(20) and (21) are rewritten:

$$(20') \quad \begin{cases} d_{t+1} = d_t\left(1 + r^* + D_1 A + D_2(y^* - \hat{y}) + \dfrac{2\hat{d}}{D_0}\right) - D_2\hat{d}(y_t - \hat{y}) - (\varepsilon_0 + \varepsilon_1)\overline{e} \\ + \varepsilon_1 f_t + (\varepsilon_0 + \varepsilon_1) p_t \\ \Delta y_t = \Delta\overline{y} - \dfrac{\alpha}{D_0} d\beta g \quad (\gamma + \partial\gamma +) p_{1\ t} \\ p_{t+1} - p_t\theta(y \quad z) \end{cases}$$

where $\Delta = 1 - \alpha D_2 - \alpha(1-\varphi)\theta$

where $\overline{y}$ is the exogenous component of y_t, and where $\hat{y}$ and $\hat{d}$ are linearisation points.

Let us suppose that the country we are considering wants to stabilise its external debt at the level reached in period T, d_T.

It therefore has to achieve (in $t \ge T$):

$$(21') \quad D_2\hat{d}(y_t - \hat{y}) + (\varepsilon_0 + \varepsilon_1)\overline{e} - \varepsilon_1 f_t - (\varepsilon_0 + \varepsilon_1) p_t = \\ = d_T\left(r^* + D_1 A + D_2(y^* - \hat{y}) + \frac{2\hat{d}}{D_0}\right)$$

Let us suppose that spontaneously (for the optimal value of the public sector deficit), the external debt were to grow endlessly. To stabilise it, one therefore would have to increase initially $D_2\hat{d}(y_t-\hat{y})-(\varepsilon_0+\varepsilon_1)p_t$, therefore increase y_t to reduce the default risk premium, therefore increasing government expenditure g_t.

However, (21') shows that to stabilise d_t, y_t must increase in line with p_t (the default risk premium needs to be reduced to offset the poor competitiveness). This implies a divergence in prices and therefore also in the public sector deficit, and this solution is therefore not tenable. The need to stabilise the external debt can also result from the imposing of capital controls(2) that entail not contracting the external debt. One must therefore have (21'), and this imposes, since one can no longer play on the default risk in the absence of debt, a low enough real parity ($\overline{e}-p$ sufficiently high).

In the long term, we have $y=z$, therefore, with $D_2=0$.

$$(\gamma_0+\gamma_1)(\overline{e}-p)=\gamma_1 f+z+\alpha(r^*+D_1A)-\beta g$$

This corresponds therefore to a restrictive fiscal policy (low g), and this is very different from the policy that must be implemented when the authorities play, in the near term, on the default risk, to stabilise the debt.

b) constrained fiscal policy

When $g_t=\overline{g}$, output is given by (21) with $g_t=\overline{g}$, the external debt by (20), inflation by $\Pi_t=\theta(y_t-z)$, expected inflation by $\Pi_t^a=\varphi\Pi_{t-1}a+(1-\varphi)\Pi_t$. The dynamics is written:

2) Capital controls have been suggested for emerging countries to reduce volatility in capital flows, and free some room for manoeuvre for interest rates; cf. for instance Wyplosz [2001], Eichengreen-Rose-Wyplosz [1995], Rossi [1999], Cardoso-Goldfajn [1998], Dooley [1996], Demirgüc-Kunt, Detragiache [1998] and Kaminsky-Reinhart [1999].

$$(22)\quad \begin{cases} d_{t+1} = d_t(1 + r^* + D_1 A + D_2(y^* - \hat{y}) + \dfrac{2}{D_0}\hat{d}) - \dfrac{D_2\hat{d}}{\Delta}(-\dfrac{\alpha}{D_0}d_t + \alpha\varphi\Pi^a_{t-1} \\ -(\gamma_0 + \gamma_1)p_t) - D_2\hat{d}\overline{y} - (\varepsilon_0 + \varepsilon_1)\overline{e} + \varepsilon_1 f_t + (\varepsilon_0 + \varepsilon_1)p_t \\ \Pi^a_t = \varphi\Pi^a_{t-1} + (1-\varphi)(p_{t+1} - p_t) \\ p_{t+1} - p_t = \dfrac{\theta}{\Delta}\left(-\dfrac{\alpha}{D_0}d_t + \alpha\varphi\Pi^a_{t-1} - (\gamma_0 + \gamma_1)p_t\right) + \theta\overline{y} - \theta z \end{cases}$$

where

$$\begin{cases} \Delta = 1 - \alpha D_2 - \alpha(1-\varphi)\theta \\ \Delta\overline{y} = -\alpha(r^* + D_1 A + D_2 y^*) - \alpha(1-\varphi)\theta z + \beta\overline{g} + (\gamma_0 + \gamma_1)\overline{e} - \gamma_1 f_t \end{cases}$$

where $(\hat{d}, \hat{y})$ stands for the linearisation point of the external debt and output, and y the exogenous component of output.

For the sake of simplicity, we consider the two extreme cases: $\varphi = 1$ (perfect inertia of inflation expectations), $\varphi = 0$ (perfect flexibility of these expectations). This allows us to bring the dynamics back to the order of 2 with a characteristic polynomial:

$$\begin{aligned} (23)\quad Q(x) = x^2 - x\left(2 + r^* + D_1 A + D_2(y^* - \hat{y}) + \frac{2\hat{d}}{D_0} + \frac{D_2\hat{d}\alpha}{\Delta D_0} - \frac{(\gamma_0 + \gamma_1)\theta}{\Delta}\right) \\ + \left(1 + r^* + D_1 A + D_2(y^* - \hat{y}) + \frac{2\hat{d}}{D_0} + \frac{D_2\hat{d}\alpha}{\Delta D_0}\right)\left(1 - (\gamma_0 + \gamma_1)\frac{\theta}{\Delta}\right) \\ + \left[(\gamma_0 + \gamma_1)D_2\frac{\hat{d}}{\Delta} + (\varepsilon_0 + \varepsilon_1)\right]\frac{\alpha\theta}{D_0\Delta} \end{aligned}$$

We therefore have:

$$(24)\quad \begin{cases} Q(1) = -(\gamma_0 + \gamma_1)\dfrac{\theta}{\Delta}\left(r^* + D_1 A + D_2(y^* - \hat{y}) + \dfrac{2\hat{d}}{D_0}\right) + (\varepsilon_0 + \varepsilon_1)\dfrac{\alpha\theta}{D_0\Delta} \\ Q'(1) = -\left(r^* + D_1 A + D_2(y^* - \hat{y}) + \dfrac{2\hat{d}}{D_0} + \dfrac{D_2\hat{d}\alpha}{\Delta D_0}\right) + (\gamma_0 + \gamma_1)\dfrac{\theta}{\Delta} \end{cases}$$

A rise in the debt d_t reduces the price p_{t+1} by $-\frac{\alpha\theta}{\Delta D_0}$, and this reduces the debt d_{t+1} by $-\frac{D_2\hat{d}(\gamma_0+\gamma_1)}{\Delta}\frac{\alpha\theta}{\Delta D_0}$ because of the rise in output this implies.

Moreover, the decline in prices improves competitiveness and foreign trade, and therefore also reduces the debt (term in $\varepsilon_0+\varepsilon_1$). The spontaneous divergence in the debt results from the fact that:

- $r^*+D_1A+D_2(y^*-\hat{y})+\frac{2\hat{d}}{D_0}>0$, which means that the country's benchmark interest rate is positive;
- the rise in the debt drives the interest rate upwards by pushing the default risk upwards, and this increases instability.

$\gamma_0+\gamma_1$, and $\varepsilon_0+\varepsilon_1$ which represent the impact of prices on output and on foreign trade are simultaneously large and small. If the dynamics is to be stable, it is necessary that $Q(1)>0$ and $Q'(1)>0$.

This is the case if:

- α is high: the rise in the interest rate reduces output significantly, hence a fall in prices that improves foreign trade;
- $\gamma_0+\gamma_1$ is large: the improvement in competitiveness (fall in domestic prices) improves foreign trade substantially;
- $r^*+D_1A+D_2(y^*-\hat{y})+\frac{2\hat{d}}{D_0}$ is small: the benchmark interest rate on the external debt is low.

This shows that there is dynamic divergence in the external debt notably if:

- the currency board is not very credible (high D_1A);
- the average default risk premium is high (high $D_2(y^*-\hat{y})$);
- demand is not very sensitive to the rise in interest rates (the rate hike due to the accumulation of debt then does not lead to a decline in prices).

It is interesting to see that a fall in output results in two effects that cancel one another: a rise in the default risk premium and a fall in prices; therefore an improvement in competitiveness.

c) long-term equilibrium

Let us suppose that the dynamics is convergent. Let us denote $\hat{d}, \hat{y}, \hat{p}$ the long-term values of d, y, p. They verify, if $\varphi = 0$ is supposed to simplify:

$$(25)\quad \begin{cases} \hat{d} = \hat{d}\left(1 + r^* + D_1 A + D_2(y^* - \hat{y}) + \dfrac{1}{D_0}\hat{d}\right) - (\varepsilon_0 + \varepsilon_1)\overline{e} + \varepsilon_1 f + (\varepsilon_0 + \varepsilon_1)\hat{p} \\ \Delta\hat{y} = \Delta\overline{y} - \dfrac{\alpha}{D_0}\hat{d} - (\gamma_0 + \gamma_1)\hat{p} \\ \hat{y} = z \end{cases}$$

where we suppose the exchange rate of third-party countries (f) against the dollar is constant, hence:

$$(26)\quad \begin{cases} \hat{d}\left(\dfrac{\varepsilon_0 + \varepsilon_1}{\gamma_0 + \gamma_1}\dfrac{\alpha}{D_0} - \left(r^* + D_1 A + D_2(y^* - z) + \dfrac{1}{D_0}\hat{d}\right)\right) \\ = -(\varepsilon_0 + \varepsilon_1)\overline{e} + \varepsilon_1 f + \dfrac{\varepsilon_0 + \varepsilon_1}{\gamma_0 + \gamma_1}\Delta(\overline{y} - z) \\ (\gamma_0 + \gamma_1)\hat{p} = \Delta(\overline{y} - z) - \dfrac{\alpha}{D_0}\hat{d} \end{cases}$$

The coefficient of $\hat{d}$ in (26) is positive if there is dynamic stability (see (24) with $Q(1) > 0$). A depreciation in the currency of the country (rise in $\overline{e}$) reduces the external debt in the long term; if there is dynamic stability, the dominant mechanism is the reduction in output and the price that results from the rise in external debt; an improvement in competitiveness reduces the need to lower prices, therefore allows a higher external debt in the long term.

A rise in the dollar interest rate $r*$ results in the external debt being more sensitive to other shocks, since the stabilising mechanism must outweigh the rise in interest payments on the debt. If $\hat{d} > 0$, a rise in $r*$ increases the debt $\hat{d}$ in the long term.

d) effects of shocks

We would like to remind the reader that we are examining three shocks:

- the rise in the dollar interest rate $r*$; its initial impact is to reduce output and lead to a rise in the interest rate. This means it is more likely that there will be divergence in the country's external debt. If the rise in $r*$ is $dr* > 0$, and if this rise occurs at a date t, we have:

$$(27) \quad d(d_{t+1}) = d_t dr* + D_2 \frac{\hat{d}\alpha dr*}{\Delta}$$

with both the effect of the rise in the interest rate and that of the default risk premium. If the debt diverges, it diverges upwards (hence, as we will see below, a decline in output). If the dynamics of the debt is stable, the rise in $r*$ increases the debt in the long term (see the paragraph above), therefore reduces the price of equilibrium, which lowers output to the level of the supply of goods z. Initially, output contracts (see (21)).

- the depreciation against the dollar of trading partner countries $(df > 0)$ leads to an upward divergence in the debt if it is unstable. We then have:

$$(28) \quad \begin{cases} \Delta y_t = \Delta \bar{y} - \dfrac{\alpha}{D_0} d_t - (\gamma_0 + \gamma_1) p_t \\ p_{t+1} - p_t = \dfrac{\theta}{\Delta}\left(- \dfrac{\alpha}{D_0} d_t - (\gamma_0 + \gamma_1) p_t \right) + \theta \bar{y} - \theta z \end{cases}$$

If the debt follows ($u > 0$, divergent trajectory), we have $p_t \to p_0(1+u)^t$ and $y_t \to y_0(1+u)^t$ with:

$$(29)\quad \begin{cases} p_0 = \dfrac{-\dfrac{\alpha\theta}{\Delta D_0}}{u + (\gamma_0 + \gamma_1)\dfrac{\theta}{\Delta}} d_0 \\ y_0 = \dfrac{-\dfrac{\alpha}{D_0} u}{u + (\gamma_0 + \gamma_1)\dfrac{\theta}{\Delta}} d_0 \end{cases}$$

When the debt diverges (upwards), despite the decline in prices, there is a decline in output with the rise in the interest rate. The dynamic divergence of the debt therefore has a considerable cost in terms of output.

If the dynamics is stable, (26) shows that, if f rises, we have, in the long term, a rise in the debt and a decline in prices. Initially, output contracts, and subsequently the fall in prices drives it back upwards.

- inherited inflation (let us consider the case $\varphi = 1$ where inherited inflation affects durably inflation expectations), $d\Pi^a > 0$, leads to an increase in $\bar{y}$ (the exogenous component of output).

If the dynamics is stable, the rise in $\bar{y}$ (due to the rise in expected inflation) leads to a rise in the equilibrium price (since output must be brought back to the level z of supply), and a rise in the equilibrium external debt.

The dynamic spiral is complex. Initially (see (22)), the debt decreases since output rises: a rise in expected inflation drives down the real interest rate. Subsequently the increase in prices hurts foreign trade and leads to a rise in the debt. If the dynamics is unstable, the initial negative shock on the debt is never offset by price rises, and the debt decreases perpetually.

4. Flexible exchange rates

a) resolution

The dynamics is now given by:

$$(30)\quad \begin{cases} d_{t+1} - d_t = r_t d_t - \varepsilon_0 (e_t - p_t) - \varepsilon_1 (e_t - f_t - p_t) \\ r_t = r^* + D_1 (e_{t+1} - e_t) + D_2 (y^* - y_t) + \dfrac{1}{D_0} d_t \\ y_t \left(1 - \alpha (1-\varphi)\theta\right) = -\alpha r_t + \alpha\varphi \Pi^a_{t-1} - \alpha(1-\varphi)\theta z + \beta g_t \\ + (\gamma_0 + \gamma_1)(e_t - p_t) - \gamma_1 f_t \\ p_{t+1} - p_t = \theta (y_t - z) \end{cases}$$

The situation is very different from the two previous cases since the authorities choose the interest rate r_t, which is no longer determined by the equilibrium of the debt market, hence the equilibrium exchange rate e_t. For the sake of simplicity, as above, we do away with the dynamics of expected inflation by writing $\varphi = 0$ or 1, and we suppose f to be constant ($f_t = f$).

We can see that the system (30) can be rewritten into a system bearing on the debt d and the real exchange rate, $S = e - p$.

We obtain:

$$(31)\quad \begin{cases} d_{t+1} - d_t = r_t d_t - (\varepsilon_0 + \varepsilon_1) S_t + \varepsilon_1 f \\ S_{t+1} - S_t = \dfrac{r_t - r^*}{D_1} - \dfrac{D_2}{D_1} y^* + \theta z + \left(\dfrac{D_2}{D_1} - \theta\right) y_t - \dfrac{1}{D_0 D_1} d_t \end{cases}$$

or in another way, by identifying y_t:

$$(31')\quad S_{t+1} - S_t = \frac{r_t - r^*}{D_1} - \frac{D_2}{D_1} y^* + \theta z - \frac{1}{D_0 D_1} d_t$$
$$+ \frac{\left(\dfrac{D_2}{D_1} - \theta\right)}{1 - \alpha(1-\varphi)\theta} \left(-\alpha r_t + \alpha\varphi \Pi^a - \alpha(1-\varphi)\theta z + \beta g_t - \gamma_1 f\right) + \frac{\left(\dfrac{D_2}{D_1} - \theta\right)(\gamma_0 + \gamma_1)}{1 - \alpha(1-\varphi)\theta} S_t$$

A real depreciation (rise in S_t) reduces the accumulation of debt and increases output. The rise in output reduces the default risk premium, hence an expected depreciation (term $\dfrac{D_2}{D_1} y_t$); but it increases inflation, hence a real appreciation, in the opposite direction (term $-\theta y_t$).

We write:

$$u = \frac{\gamma_0 + \gamma_1}{1 - \alpha(1-\varphi)\theta}$$

The characteristic polynomial of (31) is:

$$(32) \quad Q(x) = x^2 - x\left(2 + r_t + \left(\frac{D_2}{D_1} - \theta\right)u\right) + \left(1 + \left(\frac{D_2}{D_1} - \theta\right)u\right)(1 + r_t) - \frac{\varepsilon_0 + \varepsilon_1}{D_0 D_1}$$

hence:

$$(32') \quad Q(1) = r_t\left(\frac{D_2}{D_1} - \theta\right)u - \frac{\varepsilon_0 + \varepsilon_1}{D_0 D_1}$$

The "natural" way to obtain a stable dynamics is to have:

- $\frac{\varepsilon_0 + \varepsilon_1}{D_0 D_1}$ high, so that $Q(1) < 0$: this implies that the dynamics of the debt is stabilised by trends in the exchange rate; but if $\frac{D_2}{D_1} - \theta$ is not high, the dynamic stability is ensured even with a low value of $\varepsilon_0 + \varepsilon_1$;
- $\frac{D_2}{D_1} - \theta > 0$: an initially depreciated exchange rage (S_t high) leads to an expected depreciation; and the depreciation's crucial impact, via the rise in output, is to reduce the default risk. The specific dynamics of the exchange rate therefore displays the required instability.

If $Q(1) < 0$, the dynamics is stable (1 single specific value higher than 1), and the long-run equilibrium $(\hat{S}, \hat{d})$ is written (by supposing the variables S_t, g_t, f_t, Π_t^a are constant:

$$(33)\quad \begin{cases} \left(\dfrac{\varepsilon_0+\varepsilon_1}{r}\dfrac{1}{D_0D_1}-\left(\dfrac{D_2}{D_1}-\theta\right)u\right)\hat{S}=\dfrac{r-r^*}{D_1}-\dfrac{D_2}{D_1}y^*+\theta z+\dfrac{\varepsilon_1}{r}\dfrac{1}{D_0D_1}f \\ +\dfrac{\left(\dfrac{D_2}{D_1}-\theta\right)}{1-\alpha(1-\varphi)\theta}\left(-\alpha r+\alpha\varphi\Pi^a-\alpha(1-\varphi)\theta z+\beta g-\gamma_1 f\right) \\ r\hat{d}=(\varepsilon_0+\varepsilon_1)\hat{S}-\varepsilon_1 f \end{cases}$$

The coefficient of $\hat{S}$ in the first equality of (33) is positive since $Q(1)<0$.

b) effects of shocks, when fiscal policy is free

The authorities now have two instruments: the public sector deficit g_t and the interest rate r_t.

Let us suppose that a shock occurs in period t, as the previous situation is the stationary equilibrium given by (33). Like previously, this shock consists in df (change in the parity of trade partners), $dr*$ (change in the dollar interest rate), and $d\Pi^a$ (change in expected inflation). These changes are supposed to be permanent. We can see that if the authorities implement changes in the two instruments of economic policy that verify:

$$(33)\quad \begin{cases} d_t d(r)+\varepsilon_1 df=0 \\ \dfrac{d(r)}{D_1}-\dfrac{dr^*}{D_1}+\dfrac{\left(\dfrac{D_2}{D_1}-\theta\right)}{1-\alpha(1-\varphi)\theta}\left(-\alpha d(r)+\alpha\varphi d\Pi^a+\beta d(g)-\gamma_1 df\right)=0 \end{cases}$$

then the equilibrium is never modified.

Let us take the case of a depreciation in the currencies of trading partners $(df>0)$.

To avoid a deterioration in the current-account balance, a decline in the interest rate $\left(d(r)=\dfrac{-\varepsilon_1 df}{d_t}\right)$ is required. To avoid a

change in the expected change in the exchange rate, a change in the public sector deficit is required that verifies:

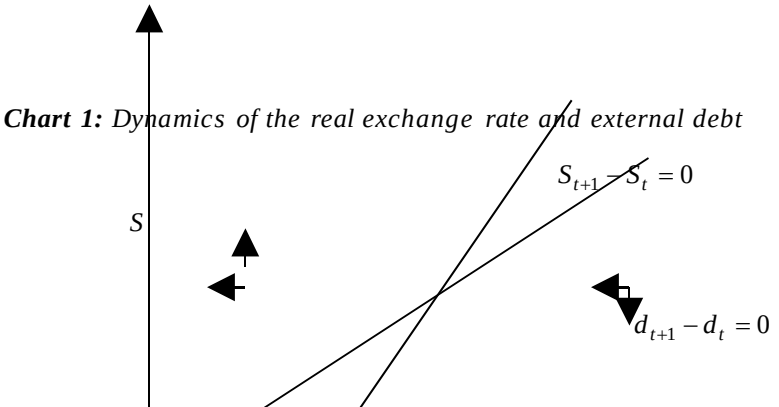
$$(33') \quad \beta d(g) = \gamma_1 df + \alpha d(r) - \frac{\left(1-\alpha(1-\varphi)\theta\right)}{\left(\frac{D_2}{D_1}-\theta\right)} \frac{d(r)}{D_1}$$

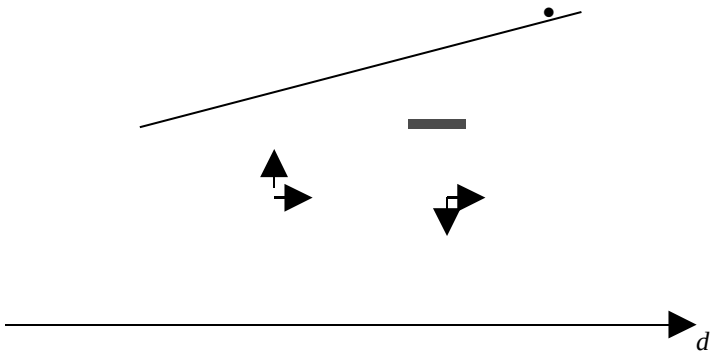
The depreciation in the currencies of trading partners $(df > 0)$ reduces output; the decline in the interest rate $(d(r) < 0)$ reduces the expected return on the country's securities, hence a rise in government expenditure to sustain output and reduce the default risk; but the decline in r has the direct effect of stimulating output, hence a fall in g. The total impact on the public sector deficit is ambiguous. If $\frac{D_2}{D_1} - \theta > 0$ is small, it is probably positive: output needs to be bolstered since it is weakened by the depreciation in neighbouring countries.

c) constrained public sector deficit $(g = \overline{g})$

We continue to look at the case where the dynamics is stable. We can represent the dynamics graphically as follows:

Chart 1: *Dynamics of the real exchange rate and external debt*





(we have $\frac{r}{\varepsilon_0 + \varepsilon_1} < \left[\left(\frac{D_2}{D_1} - \theta\right) u D_0 D_1\right]^{-1}$, hence the position of the curves).

Let us analyse the effects of shocks.

- a shock stemming from a rise in the dollar interest rate r^* leads in the long term to an appreciation in the exchange rate and a decline in the external debt; the decline in the debt offsets the decline in the yield spread $r - r^*$, and, by reducing the interest payments on the debt, implies a deterioration in the current-account balance, hence the appreciation in the exchange rate. In the Chart above, there is a move from A to E, therefore, instantaneously, a depreciation in the currency to improve the trade balance and reduce the debt, and enable a necessary expected appreciation with the rise in r^*.

We have, in the long term:

$$\hat{y}\left(1 - \alpha(1-\varphi)\theta\right) = -\alpha r + \alpha\varphi\Pi^a - \alpha(1-\varphi)\theta z + \beta g + (\gamma_0 + \gamma_1)\hat{S} - \gamma_1 f \quad (34)$$

and

$$\hat{\Pi} = \theta(\hat{y} - z) \quad (35)$$

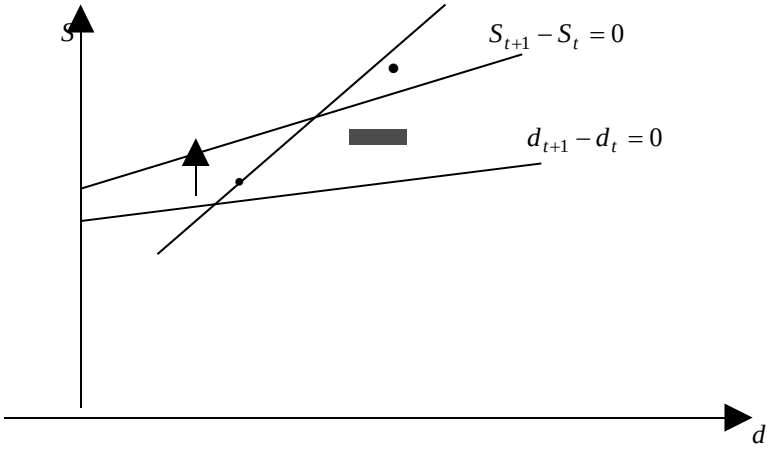
($\hat{\Pi}$ stands for inflation in the long term).

If there is no reaction in monetary policy, the shock (rise in $r*$) therefore leads to:

- in the near term, a depreciation, a rise in output and additional inflation;
- in the long term, an appreciation and a fall in output.

Let us suppose that the reaction in monetary policy consists in getting the foreign interest rate to follow the domestic rate in order to ensure that $S_{t+1} - S_t$ (of (31')) does not vary.

Therefore $\frac{r - r*}{D_1} - \alpha \frac{\left(\frac{D_2}{D_1} - \theta\right)}{1 - \alpha(1-\varphi)\theta} r$ must not vary. To ensure dynamic stability, $\frac{D_2}{D_1} - \theta$ must be low. One can therefore reasonably suppose that this implies a rise in r if there is a rise in $r*$. The spot in the points where $S_{t+1} - S_t = 0$ then is not modified by the shock, and the one where $d_{t+1} - d_t = 0$ has a steeper slope:



he equilibrium then moves from A *to* E with a depreciation in the currency, in the near term as in the long term. The reason why is that the debt needs to be reduced since the interest rate on the

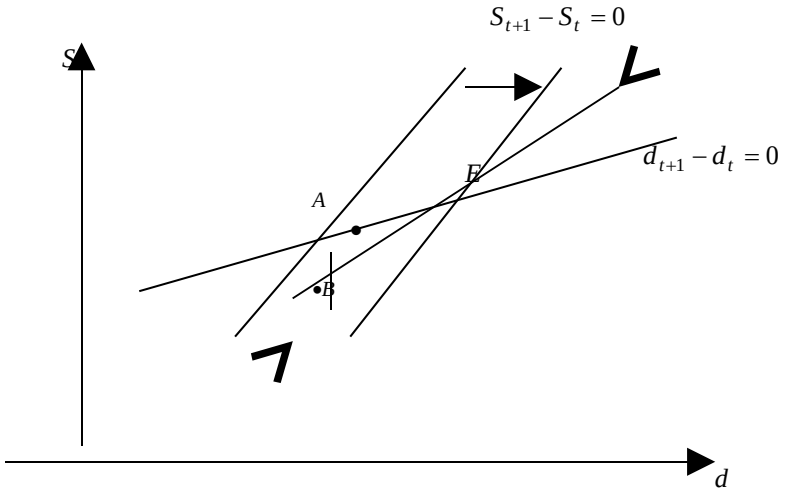
debt is increased. The impact on output is ambiguous, since there is both a rise in the interest rate and a depreciation in the currency.

- an inherited inflation shock $(d\Pi^a > 0)$ increases output, reduces the default risk premium and therefore enables a higher level of debt in the long term. As a result, the currency depreciates in the long term. In the near term, there is an instantaneous appreciation, which is used to increase the debt, followed by a gradual depreciation.

The rise in Π^a does not change the spot in points where $d_{t+1} - d_t = 0$. Conversely, it stimulates *ex ante* output, hence a decline in S_{t+1} for a given value of d_t, to stabilise the exchange rate.

We therefore have graphically:

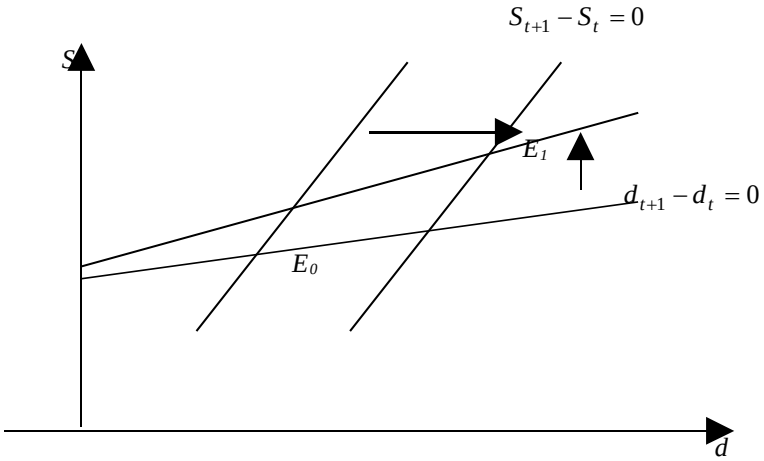
Chart 2: *rise in expected inflation*



The rise in expected inflation instantaneously leads the equilibrium to move from A to B, with an appreciation in the exchange rate; then there is a gradual depreciation until E. We have, after the shock, $S_{t+1} - S_t > 0$, and this implies that there is a rise in output in the near term. There is therefore also a rise in inflation.

In the long term, there is a rise in the external debt, therefore a rise in output to reduce the default risk, therefore also higher inflation.

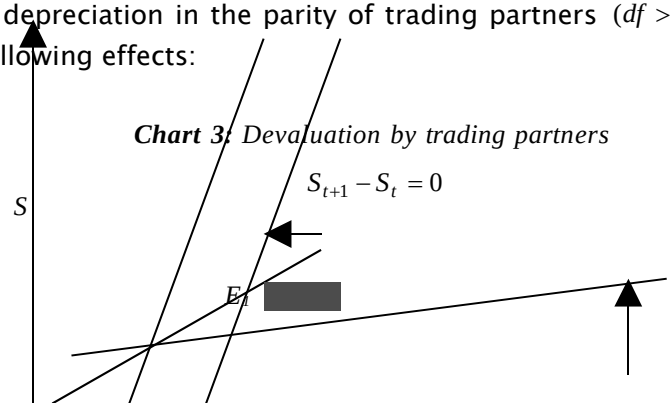
The central bank therefore faces additional inflation, in the near term as in the long term. If it increases the domestic interest rate *r*, we have (if $\frac{1}{D_1} - \frac{\alpha\left(\frac{D_2}{D_1} - \theta\right)}{1-\alpha(1-\varphi)\theta} > 0$, as we have supposed):

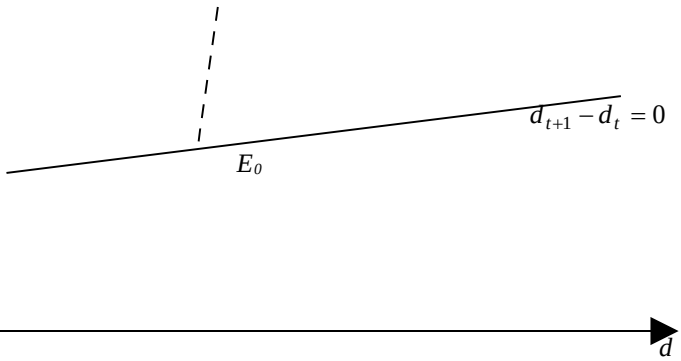


In the near term, there is an appreciation in the exchange rate (to increase the default risk) and a reduction in output and inflation. This paves the way for further accumulation of external debt and, in the long term, there is a depreciation in the currency (to offset the rise in interest payments on the debt), therefore even more inflation than without the response in monetary policy.

- A depreciation in the parity of trading partners $(df > 0)$ has the following effects:

Chart 3: *Devaluation by trading partners*





(33) shows that, in the long term, if the stability condition is verified, a rise in f leads to a rise in S. The effect on the debt has an ambiguous sign and is normally weak, the depreciation in the country's currency offsetting that in currencies of competitors. There is also an instantaneous depreciation in the near term (from E_0 to F in Chart 3). If the change in the long term of the debt is weak, as well as in the near term, the effect on output and inflation is reduced thanks to the depreciation, without any need to modify monetary policy arising.

5. Debt denominated in foreign currencies

We will now look again at the hypothesis according to which the debt, domestic or external, is denominated in the country's currency.

5.1. Domestic and external debt denominated in foreign currencies

Let us look here at the way in which the results above diverge if the country's entire debt (domestic and external) is denominated in dollars and not in the country's currency. The interest rate on the debt is no longer affected by currency risk, but only by default risk. We therefore have, in all cases:

$$(36) \quad r_t = r^* + D_2(y^* - y_t)$$

The above shows that the currency board becomes identical to dollarisation, since the fact that the currency board may not be

credible has no impact on the interest rate. Moreover, the flexible exchange rate regime is no longer meaningful since it there is no longer any interest rate on the country's debt that the country's authorities can control.

5.2. External debt only denominated in currencies

If the external debt is denominated in foreign currencies and the domestic debt in the country's currency, one needs to draw a distinction between two interest rates on the two debts.

In the case of dollarisation, both interest rates are identical, and the results of section 2 apply again.

In the case of the currency board, the interest rate on the external debt, which we denote R, comes from:

$$(37) \quad R_t = r^* + D_2(y^* - y_t)$$

since it bears only default risk. The domestic interest rate comes from:

$$(38) \quad r_t = r^* + D_1 A + D_2(y^* - y_t) + \frac{1}{D_0} d_t$$

since it bears the risk of lack of credibility in the currency board. We suppose that the interest rate on the domestic debt is the one that influences demand for goods.

The dynamics of the debt, with constrained fiscal policy, becomes (instead of the dynamics of (22)):

$$(39) \quad d_{t+1}\left(1 + r^* + D_2(y^* - \hat{y})\right) - \frac{D_2 \hat{d}}{\Delta}\left(-\frac{\alpha}{D_0} d_t - (\gamma_0 + \gamma_1) p_t\right) - D_2 \hat{d}\overline{y}$$
$$- (\varepsilon_0 + \varepsilon_1)\overline{e} + \varepsilon_1 f + (\varepsilon_0 + \varepsilon_1) p_t$$

$$(\Delta = 1 - \alpha D_2 - \alpha(1 - \varphi)\theta) \, .$$

The term $D_1 A + \frac{2}{D_0}\hat{d}$ linked to the presence of currency risk in the interest rate on the external debt disappears, and the condition of dynamic stability becomes:

$$(40)\quad \begin{cases} -(\gamma_0+\gamma_1)\dfrac{\theta}{\Delta}\left(r^*+D_2(y^*-\hat{y})\right)+(\varepsilon_0+\varepsilon_1)\dfrac{\alpha\theta}{D_0\Delta}>0 \\ -\left(r^*+D_2(y^*-\hat{y})+\dfrac{D_2\hat{d}\alpha}{\Delta D_0}\right)+(\gamma_0+\gamma_1)\dfrac{\theta}{\Delta}>0 \end{cases}$$

and this is naturally more easily verified than in the case where the external debt is denominated in domestic currency since the interest rate on the debt is lower.

The fact that the external debt is denominated in foreign currencies also reduces (see (26)) the long-term impact of the various shocks on the debt and the equilibrium price.

In the case of flexible exchange rates, the dynamics with the external debt denominated in foreign currencies is written, instead of (31):

$$(41)\quad \begin{cases} d_{t+1}-d_t = R_t d_t - \varepsilon_0(e_t-p_t)-\varepsilon_1(e_t-f_t-p_t) \\ R_t = r^*+D_2(y^*-y_t)+D_3(e_t-p_t-\overline{S}) \\ y_t\left(1-\alpha(1-\varphi)\theta\right)=-\alpha r_t+\alpha r_t+\alpha\varphi\Pi^a-\alpha(1-\varphi)\theta z+\beta g_t \\ \quad +(\gamma_0+\gamma_1)(e_t-p_t)-\gamma_1 f_t \\ r_t = r^*+D_1(e_{t+1}-e_t)+D_2(y^*-y_t)+\dfrac{1}{D_0} \\ p_{t+1}-p_t=\theta(y_t-z) \end{cases}$$

The authorities control only the interest rate on the domestic debt r_t; that on the external debt varies with the dollar interest rate and the default risk premium. But we also need to take into account the fact that a real devaluation in the exchange rate worsens the situation of borrowers since the external debt is denominated in foreign currencies and their incomes are in local currency. This is represented by the term $D_3(e_t - p_t - \overline{S})$. The dynamics (31')

of the trade-weighted exchange rate is still valid, but the dynamics of the external debt becomes:

$$(42)\quad d_{t+1}-d_t = d_t\left(r^*+D_2(y^*-\hat{y})\right)-\frac{D_2\hat{d}}{1-\alpha(1-\varphi)\theta}(-\alpha r_t+\alpha\varphi\Pi^a-\alpha(1-\varphi)\theta z$$
$$-\gamma_1 f_t+\beta g_t)-\left(\frac{D_2\hat{d}}{1-\alpha(1-\varphi)\theta}(\gamma_0+\gamma_1)+(\varepsilon_0+\varepsilon_1)\right)S_t+\varepsilon_1 f_t+D_3\hat{d}(S_t-\overline{S})$$

A real depreciation (a rise in S) reduces the external debt directly and also by shoring up output and by driving down the default risk. But it increases it by worsening the weight of the debt expressed in domestic currency (term D_3).

The stability condition, which replaces (33') is written:

$$(43)\quad \frac{\left(\frac{D_2}{D_1}-\theta\right)(\gamma_0+\gamma_1)}{1-\alpha(1-\varphi)\theta}R_t-\frac{\left(\frac{D_2\hat{d}}{1-\alpha(1-\varphi)\theta}(\gamma_0+\gamma_1)+(\varepsilon_0+\varepsilon_1)-D_3\hat{d}\right)}{D_0D_1}<0$$

and is easier to fulfil than (32') when $\frac{D_2}{1-\alpha(1-\varphi)\theta}(\gamma_0+\gamma_1)>D_3$, i.e. if the effect of the real currency on the default risk outweighs that on the valuation of the external debt. In such a case, the long-term effects of shocks are reduced when the external debt is denominated in foreign currency.

6. Questions related to the choice of an exchange-rate system

6.1. First question: how can the dynamic stability of the external debt be ensured?

- When there is dollarisation, the dynamics of the external debt is unstable, whether fiscal policy is constrained or not. Normally, this is not a problem since the currency risk has disappeared. The country's borrowers are considered to be US borrowers, and their individual solvency alone matters. There is no macroeconomic limit to the debt level, related to the presence of currency risk. One can naturally imagine extreme solutions where the

country's macroeconomic situation has deteriorated so badly that the global mobility of capital becomes imperfect once more; however, in a normal situation, dollarisation makes it possible to have an unstable dynamics of the external debt.

- With a currency board that is not wholly credible, when fiscal policy is chosen freely with a mixed target of output and price stability and there is a shortfall in supply in relation to the desired output (i.e. full employment output), the dynamics of the external debt is explosive, whether it is in foreign currencies or in domestic currency. It is impossible to stabilise durably the external debt by the suitable choice of fiscal policy, since a rise in the public sector deficit would be required to reduce the interest rate via the decline in default risk, and this triggers an endless spiral of fiscal expansion.

When fiscal policy is constrained, the conditions to ensure dynamic stability of the debt if it is in domestic currency, are very severe, since the following factors are required: strong elasticity of domestic demand to the interest rate, a strong sensitivity of foreign trade to price-competitiveness and a low dollar interest rate.

It is therefore likely, in all scenarios, with a currency board that is not wholly credible, the external debt is divergent when it is denominated in domestic currency. When it is denominated in foreign currencies, dynamic stability is more easily achieved since the interest rate on the external debt no longer incorporates a currency risk premium. But the example of Argentina shows that the default risk premium can on its own lead to divergence in the debt.

- With flexible exchange rates, dynamic stability is far more easily achieved thanks to the exchange rate's variability. Major sensitivity of the interest rate to default risk is an advantage in a flexible exchange-rate system: this is because the real depreciation boosts output and reduces default risk. The optimal configuration consists in having the external debt denominated in currencies (to avoid the currency risk premium) and the domestic

debt denominated in domestic currency (that links output, therefore default risk, to the dynamics of the exchange rate) if the currency effect on default risk outweighs the impact of valuation of the external debt: a real depreciation reduces the default risk but increases the value in domestic currency of the external debt.

All in all:

- if currency risk exists to some extent (for example, the currency board is not credible) a flexible exchange-rate system is preferable;
- the fact that the external debt is denominated in foreign currencies and not in domestic currency is stabilising with a currency board; it has an ambiguous impact with flexible exchange rates because of opposing effects on default risk and the value of the debt in domestic currency.

It could be suggested that having an external debt denominated in foreign currencies makes a currency board credible by ruling out a devaluation because of the risk of ruining borrowers. But one could also defend the opposite argument: as a devaluation could only occur if there is a partial default if the external debt is denominated in foreign currencies, the default risk premium is increased, or, and this amounts to the same thing, there is a currency risk premium even with an external debt denominated in foreign currencies. If this is the case, the stabilising power of the external debt denominated in foreign currencies is lost.

6.2. Second question: how can disinflation be made easier?

We suppose here that the country we are considering is hurt by the consequences of its inflationary past under the guise of permanent $(\varphi = 1)$ inflation expectations $(\Pi^a > 0)$. We wonder how the economy reacts to this situation in the various exchange rate regimes, without any reaction in fiscal policy $(g_t = \overline{g})$. We will overlook useless exogenous variables.

With dollarisation, we have (see (14) and (17')), diverging from the reference situation where $\Pi^a = 0$:

$$(44)\quad \begin{cases} y_t(1-\alpha D_2) = \alpha\Pi^a - (\gamma_0+\gamma_1)p_t \\ \Pi_t(1-\alpha D_2) = \alpha\theta\Pi^a - \theta(\gamma_0+\gamma_1)p_t \\ d_{t+1} = d_t\left(1+r^*+D_2(y^*-\hat{y})\right)+\left(\dfrac{D_2\hat{d}}{\Delta}(\gamma_0+\gamma_1)+(\varepsilon_0+\varepsilon_1)\right)p_t \end{cases}$$

This shows that there is a gradual rise in prices and a decline in output until inflation (initially increased by $\dfrac{\alpha\theta}{1-\alpha D_2}$) has stabilised

Production is initially stimulated by the decline in the real interest rate and the decline in default risk. In the long term, it returns to its reference level. The rise in prices hurts competitiveness and triggers an endless rise in the debt.

With a currency board that is not wholly credible, we have (still as a divergence from the solution for $\Pi^a = 0$):

$$(45)\quad \begin{cases} d_{t+1} = d_t\left(1+r^*+D_1A+D_2(y^*-\hat{y})+\dfrac{2\hat{d}}{D_0}+\dfrac{D_2\hat{d}\alpha}{D_0\Delta}\right)-\dfrac{D_2\alpha\hat{d}}{\Delta}\Pi^a \\ \qquad\qquad +\left(\dfrac{D_2\hat{d}}{\Delta}(\gamma_0+\gamma_1)+(\varepsilon_0+\varepsilon_1)\right)p_t \\ p_{t+1}-p_t = -\dfrac{\alpha\theta}{\Delta D_0}d_t+\dfrac{\alpha\theta}{\Delta}\Pi^a-\dfrac{\theta}{\Delta}(\gamma_0+\gamma_1)p_t \text{ avec } \Delta = 1-\alpha D_2 \\ \Delta y_t = -\dfrac{\alpha}{D_0}d_t+\alpha\Pi^a-(\gamma_0+\gamma_1)p_t \end{cases}$$

As we have seen above (section 3):

- if the dynamics (d, p) is stable, there is a rise in p up to the point where $y = 0$, and a rise in the equilibrium external debt;
- but if the dynamics of the debt is unstable, there is a steady decline in the external debt. At the date T of the shock, we have:

$$d(d_{T+1}) = -\frac{D_2 \alpha \hat{d}}{\Delta} \Pi^a$$

and, with respect to the price:

$$d(p_{T+1}) = \frac{\alpha \theta}{\Delta} \Pi^a$$

the debt declines since output rises with the decline in the real interest rate, therefore the default risk decreases, and inflation climbs.

In the following period:

$$d(d_{T+2}) = -\left(2 + r^* + D_1 A + D_2 (y^* - \hat{y}) + \frac{2\hat{d}}{D_0} + D_2 \frac{\hat{d}\alpha}{D_0 \Delta}\right) \frac{D_2 \alpha \hat{d}}{\Delta} \Pi^a + \left(\frac{D_2 \hat{d}}{\Delta}(\gamma_0 + \gamma_1) + (\varepsilon_0 + \varepsilon_1)\right) \frac{\alpha \theta}{\Delta} \Pi^a$$

When the debt is unstable (see (25)), competitiveness effects are small and $r^* + D_1 A + D_2 (y^* - \hat{y}) + \frac{2\hat{d}}{D_0}$ is high: the divergence in the debt continues to head downwards, and there is a steady rise in inflation.

With flexible exchange rates, as we saw above, the inflationary shock results in permanently higher inflation: output is higher in the long term, thanks to the real depreciation, and this reduces the default risk and allows the external debt to be stronger. If the central bank raises the interest rate to reduce inflation in the near term, there is an initial real appreciation, therefore even more debt is accumulated as is even more inflation.

The above shows that dollarisation is undoubtedly the most efficient exchange-rate system when an economy faces an inflationary shock. The rise in the external debt is of no importance if there is perfect mobility of capital, and the default risk is initially reduced before returning to its previous level.

With a currency board that is not wholly credible, the divergence in the debt implies an endless rise in inflation. With flexible exchange rates, the shock increases inflation, in the near term as in the long term, and the situation is even worse in the long term if there is a reaction in monetary policy to fight inflation in the near term.

6.3. Third question: the role of fiscal policy

If there is dollarisation or a (not wholly credible) currency board, the optimal choice of fiscal policy (of the public sector deficit g_t with our denotations) allows output and inflation to be completely separated from the impact of the shocks that we are studying (on f, r^*, Π^a).

The situation is, however, different in the two cases; with a not wholly credible currency board, as the country's interest rate depends on the level of external debt, in all the situations where the external debt increases (rise in r^*, the foreign interest rate, depreciation in the currency of trade partners, rise in f, chronically inflationary situation, $y^* > 0$), the optimal public sector deficit must grow endlessly to offset the impact on the interest rate of the rise in the external debt, and this is obviously not a durable equilibrium. Similarly, if the country wants to use fiscal policy to stabilise its external debt with a currency board, it can do so initially provided it increases the public sector deficit to reduce the default risk premium. This leads to a rise in prices, therefore a steady and unbearable rise in the public sector deficit to stabilise the external debt.

With flexible exchange rates, the fact that there are two instruments of economic policy (the country's interest rate and the public sector deficit) allows the effects of all the shocks to be neutralised. All that it is required to do so is a constant change in the deficit, which cannot spin out of control over time since the external debt also is kept unchanged.

Freedom to determine fiscal policy therefore is of interest (and is not tenable) only with dollarisation or flexible exchange rates. With a currency board, one needs to use fiscal policy in the opposite direction to the expected direction in the near term, since it must help reduce the default risk by bolstering output. On the other hand, the stabilisation carried out with fiscal policy entails an impossible divergence in fiscal policy, and therefore leads back to the regime where it is constrained.

6.4. Fourth question: resilience with regard to shocks

Lastly, we will now look into two shocks that have often hit emerging countries, in Latin America as in Asia: a rise in the dollar interest rate $r*$, a depreciation against the dollar in the currency of a major trade partner or competitor — e.g. Brazil for Argentina.

We have just reviewed the ways in which shocks can be corrected by using fiscal policy; we will not labour this point and will look at the case of constrained fiscal policy.

With dollarisation, a rise in $r*$ or in f has negative effects in the near term: a decline in output, fuelled by the rise in default risk. However, the induced decline in inflation gradually improves competitiveness, and this corrects the impact of shocks in the long term and brings output back to its initial level with a decline in the level of prices.

With a currency board, the impact of the rise in the dollar interest rate can be to make the dynamics of the debt unstable, and it will subsequently grow perpetually, hence a perpetual decline in output; a devaluation of trading partners leads to the same result if the debt is unstable. If it is stable, the dynamics is similar to that obtained in the case of dollarisation.

With flexible exchange rates lastly, a rise in the foreign interest rate leads to a real depreciation in the near term, which reduces

the debt and a real appreciation in the long term, therefore to a fall in output.

If the domestic interest rate follows the dollar interest rate, there is a depreciation in the long term to reduce the debt, therefore an ambiguous impact on output. The depreciation in the currency of trading partners leads to a depreciation in the country's currency that offsets the shock, and there is no major depreciation in the external debt or output, even without monetary policy being used.

Clearly, the flexible exchange rate regime offers better protection from interest-rate or exchange-rate shocks: it enables a response in monetary policy or the exchange rate to be implemented. Dollarisation is stabilising, but only in a long-term approach; in the near term, the economic cost from the shock is large, and amplified further by the default risk.

6.5. Effects of nominal rigidity

The adjustment in prices is likely to be slow in the near term, and this would correspond to a situation where θ is small. Let us look at the case of debt denominated in domestic currency and constrained fiscal policy. This implies:

- with dollarisation or currency board, a durable loss in output in the event of unfavourable shocks (rise in $r*$ or f), since the level of prices does not decline;
- with flexible exchange rates, a smaller instantaneous real depreciation in the exchange rate in response to similar unfavourable shocks, since the price does not rise and a smaller rise in output suffices, via the decline in default risk (in (32'), $\frac{D_2}{D_1} - \theta$ is replaced by $\frac{D_2}{D_1}$).

In all cases, the initial rigidity in prices increases the initial real cost of unfavourable shocks.

Summary

Which exchange-rate regime should be chosen?

- dynamic stability of the external debt can probably be reached only with flexible exchange rates, or with a currency board if it is nominated in currencies and not in domestic currency, and this eliminates currency risk but not default risk;
- dollarisation is the most efficient system when facing an inflationary shock, which leads to a divergence in the external debt with a currency board that is not totally credible and increases durably inflation, regardless of the reaction in monetary policy, with flexible exchange rates;
- dollarisation and flexible exchange rates are the only systems where the free implementation of fiscal policy is useful, since with a currency board that is not credible, there is necessarily a permanent divergence in the public sector deficit if it is used for stabilisation purposes;
- shocks bearing on global interest rates or on the exchange rates of other countries are far better absorbed with flexible exchange rates.

This leads us to recommend:

- avoiding a currency board if it is not totally credible, i.e. as soon as it lets currency risk premia appear;
- preferring dollarisation if the crucial objective is to lower inflation;
- preferring flexible exchange rates if the shocks or uncertainty bear especially on global interest rates, the world's economic situation — if it diverges from the country's — or exchange rate policies of competitor countries.

References

Aghion P., Bacchetta P., Banerjee A., 2000, "A Simple Model of Monetary Policy and Currency Crises", *European Economics Review, 44*, pp. 728-738.

Aiznman J., Hausman R., 2000, "Exchange Rate Regime and Financial Market Imperfections", *NBER Working Paper n° 7738*, June.

Alesina A., Barro R., 2000, "Dollarization", *NBER Working Paper 7927*.

Artus P., 2001, "Comment sortir d'une situation de compétitivité insuffisante et de risque de défaut en changes fixes avec dette en devises ?", *Document de travail n° 2001-48/EI*, March, Caisse des dépôts.

Atkeson M., Rios-Rull J.V., 1995, "How Mexico lost its Foreign Exchange Reserves?", *NBER Working Paper n° 5329*, October.

Bayoumi T., Eichengreen B., 1998, "Exchange Rate Volatility and Intervention: Implications of the Theory of Optimum Currency Areas", *Journal of International Economics, 45*, pp. 191-209.

Burnside C., Eichenbaum M., Rebelo S., 2001, "Hedging and Financial Fragility in Fixed Exchange Rate Regimes", *European Economic Review, Vol. 45, n° 7*, June, pp. 1151-1194.

Calomiris C., Powell A., 2000, "Can Emerging Bank Regulators Establish Credible Discipline? The Case of Argentina, 1992-1999", *World Bank 2000 ABCDE Conference*.

Calvo G., Vegh C., 1994, "Stabilization Dynamics and Backward Looking Contracts", *Journal of Development Economics, 43*, pp. 59-84.

Calvo G., Reinhart C., Vegh CA., 1995, "Targeting the Real Exchange Rate: Theory and Evidence", *Journal of Development Economics*, 47, pp. 97-133.

Calvo G., Mendoza E., 1996, "Petty Crime and Cruel Punishment: Lessons from the Mexican Debacle", *AEA Papers and Proceedings*, May.

Calvo G., Vegh C., 1999, "Inflation Stabilisation and BOP Crises in Developing Countries", *NBER Working Paper 6925*, February.

Calvo G., Mendoza E., 2000, "Capital-Markets Crises and Economic Collapse in Emerging Markets: An Informational-Frictions

Approach", *American Economic Review: Papers and Proceedings, 90*, May, pp. 59-64.

Calvo G., Reinhart C., 2000, "Fear of Floating", *NBER Working Paper 7993*, November.

Calvo G., Reinhart C., 2000b, "Reflections on Dollarization", *in A. Alesina and R. Barro, eds, Currency Unions, Stanford: Hoover Institution Press*.

Calvo G., 2001, "Capital Markets and the Exchange Rate", *Journal of Money, Credit and Banking*, May, pp. 312-334.

Caprio G., Dooley M., Leipziger D., Walsh C., September 1996, "The Lender of Last Resort Function under a Currency Board: the Case of Argentina", *World Bank Working Paper n° 1648*.

Cardoso E., Goldfajn I., 1998, "Capital Flows to Brazil: the Endogeneity of Capital Controls", *IMF Staff Papers, Vol. 45, n° 1*, pp. 161-202.

Cespedes LF., Chang R., Velasco A., 2000, "Balance Sheets and Exchange Rate Policy", *NBER Working Paper n° 7840*, August.

Chang R., Velasco A., 1999, "Illiquidity and Crises in Emerging Markets: Theory and Policy", *Working Paper, New York University*, New York.

Cooper R., Kempf H., 2001, "Dollarization and the Conquest of Hyper-Inflation in Divided Societies", Juin, *Mimeo, Boston University and Université Paris 1*.

Demirgüc-Kunt A., Detragiache E., 1998, "The Determinants of Banking Crises in Developing and Developed Countries", *IMF Staff Papers, Vol. 45, n° 1*, pp. 81-109.

Dooley M., 1996, "A Survey of Academic Literature on Controls overs International Capital Transactions", *IMF Staff Papers, 43*, pp. 639-687.

Dornbusch R., Goldfajn I., Valdes R., 1995, "Currency Crises and Collapses", *Brookings Papers on Economic Activity, Vol. 2*, pp. 253-315.

Easterly W., 1996, "When is Stabilization Expansionnary?", *Economic Policy, Vol. 22*, pp. 67-107.

Edwards S., 1999, "How Effective are Capital Controls?", *Journal of Economic Perspectives, Fall, 13:4*, pp-65-84.

Edwards S., 2001, "Dollarization and Economic Performance: an Empirical Investigation", *NBER Working Paper n° 8274*, May.

Eichengreen B., Rose A., Wyplosz Ch., 1995, "Exchange Market Mayhem: The Antecedents and Aftermath of Speculative Attacks", *Economic Policy, 21*, pp. 249-296.

Eichengreen B., Fishlow A., 1996, "Contending with Capital Flows, what is Different from 1990's?", *Council of Foreign Relations*, New York.

Fischer S., 1986, "Exchange Rate Versus Money Targets in Disinflation", *in Indexing, Inflation and Economic Policy, MIT Press, Cambridge, Mass*.

Fischer S., Sahay R., Vegh C., 1996, "Stabilization and Growth in Transition Economies: the Early Experience", *Journal of Economic Perspectives, Vol. 16*, pp. 45-66.

Fischer S., 1998, "Capital-Account Liberalization and the Role of the IMF", *in Should the IMF Pursue Capital-Account Convertibility?, Princeton University, International Finance Section, Essays in International Finance*, May, 207, pp. 1-10.

Fischer S., R. Sahay, 2000, "The Transition Economies after Ten Years", *IMF Working Paper, WP/00/30, International Monetary Fund, Washington D.C.*, February.

Fischer S., 2001, "Distinguished Lecture on Economics in Government: Exchange Rate Regimes: is the Bipolar View Correct?", *Journal of Economic Perspectives, Vol. 15, n° 2*, Spring, pp. 3-26.

Frankel J., 1999, "No Single Currency Regime is Right for All Countries or at all Times", *NBER Working Paper n° 7338*, September.

Ghosh A., Gulde A.M., Wolf H., 2000, "Currency Boards: More than a Quick Fix?", *Economic Policy, XXXI (2000)*, pp. 269-335.

Kaminsky G., Reinhart C., (1999, "The Twin Crises: The Causes of Banking and Balance of Payments Problems", *American Economic Review, 89 (3)*, pp. 473-500.

Mendoza E., 2000, "On the Benefits of Dollarization when Stabilization Policy is not Credible and Financial Markets are Imperfect", *NBER Working Paper n° 7824*, August.

Mendoza E., 2001, "The Benefits of Dollarization when Stabilization Policy Lacks Credibility and Financial Markets are Imperfect", *Journal of Money, Credit and Banking, Mai, Vol. 33, n° 2*, pp. 440-474.

Montiel P., Ostry J., 1991, "Macroeconomic Implications of Real Exchange Rate Targeting in Developing Countries", *IMF Staff Papers, n° 38*, pp. 605-625.

Mundell R., 1961, "A Theory of Optimum Currency Areas", *American Economic Review, 51*, pp. 657-665.

Mussa M., Masson P., Swoboda A., Jadresic E., Mauro P., Berg A., 2000, "Exchange Rate Regimes in an Increasingly Integrated World Economy", *IMF Occasional Paper, 193*.

Obstfeld M., Rogoff K., 1995, "The Mirage of Fixed Exchange Rates", *Journal of Economic Perspectives, Vol. 9, n° 4*, Autumn, pp. 73-96.

Rebelo S., Vegh CA., 1995, "Real Effects of Exchange Rate based Stabilisation: an Analysis of Competing Theories", *NBER Macroeconomics Annual*, pp. 125-174.

Rossi M., 1999, "Financial Fragility and Economic Performance in Developing Countries: Do Capital Controls, Prudential Regulation and Supervision Matter?", *IMF Working Paper WP/99/66*.

Sachs J., Tornell A., Velasco A., 1995, "The Collapse of the Mexican Peso: What have we Learned?", *Economic Policy, n° 23*, April, pp. 15-63.

Schmitt-Grohé S., Uribe M., 1999, "Dollarization and Seigniorage: How much is at Stake?", *Paper, University of Pennsylvania*, July 1999 (available at http://www.econ.upenn.edu/~uribe).

Schmitt-Grohé S., Uribe M., 2001, "Stabilization Policy and the Costs of Dollarization", *Journal of Money, Credit and Banking*, May, Vol. 33 n° 2, pp. 482-509.

Sims Ch., 2001, "Fiscal Consequences for Mexico of Adopting the Dollar", *Journal of Money, Credit and Banking, Vol. 33, n° 2*, May, pp. 597-616.

Uribe M., 1997, "Exchange Rate based Inflation Stabilization: the Initial Real Effects of Credible Plans", *Journal of Monetary Economics, Vol. 39*, pp. 197-221.

Vegh C., 1992, "Stopping High Inflation: an Analytical Overview", *IMF Staff Papers, n° 39*, pp. 626-695.

Williamson J., 2000, "Exchange Rate Regimes for Emerging Markets: Reviving the Intermediate Option", *Washington, D.C.: Institute for International Economics*, September.

Wyplosz Ch., 2001, "How Risky is Financial Liberalization in the Developing Countries?", *CEPR Discussion Paper n° 2724*, March.