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Foreign Debt and Fear of Floating: A Theoretical Exploration

By Michael Bleaney & F. Gulcin Ozkan

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Michael Bleaney
University of Nottingham

F. Gulcin Ozkan*
University of York

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Abstract

This paper explores the relationship between the denomination of public debt and the choice of exchange rate regime. Unlike indexed domestic debt, foreign debt is subject to valuation effects from real exchange rate shocks. In a standard set-up, where a peg functions only as a nominal anchor, more foreign debt makes pegging less attractive, because it increases the value of a flexible exchange rate as a shock absorber. This result can be reversed if we incorporate the stylized fact that pegs have lower real exchange rate volatility, and if external shocks are sufficiently large relative to domestic shocks.

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Key words: inflation, output, public debt and exchange rate regimes.

*Corresponding author; Department of Economics, University of York, Heslington, York, YO10 5DD; Tel: 01904-434673; E-mail:fgo2@york.ac.uk.

1 Introduction

The appropriate choice of exchange rate regime has been one of the most controversial issues in international economics. Conventional wisdom suggests that, in making this choice, policy-makers would weigh the advantages of enhanced monetary policy credibility under a fixed exchange rate regime against the ability to react to shocks under a flexible exchange rate regime. Given that the nature of this credibility-flexibility trade-off varies with individual country characteristics, there is no universal optimal regime to be adopted by all countries. Historically, policy advice has favoured one regime over the other at different times, in parallel with the evolution of the international monetary system. For example, most countries preferred a fixed rate regime at the beginning of the 20th century and adopted the gold standard. In contrast, a century later flexible exchange rate regimes have appeared as the preferred choice of a large number of countries (see, for example, Bordo, 2003).

In spite of this trend towards more widespread adoption of flexible exchange rate regimes, many floats tend to be heavily managed, especially in developing countries, a phenomenon referred to as 'fear of floating' (Hausmann *et al.,* 2001; Calvo and Reinhart, 2002). Indeed, recent studies distinguishing between the announced (*de jure*) and actual (*de facto*) exchange rate regimes establish that a significant proportion of the so-called floaters are actively engaged in activities aimed at limiting exchange rate flexibility (see, for example, Reinhart and Rogoff, 2004; Levy-Yeyati and Sturzenegger, 2005).

This paper provides a theoretical underpinning for the fear-of-floating hypothesis by incorporating a link between the currency denomination of public debt and the choice of exchange rate regime. We adapt a standard model of monetary policy-making so that real exchange rate movements create valuation effects for foreign debt, and we also allow the peg to have the additional property of reducing the volatility of real exchange rate shocks. This is consistent with the experience of the advanced countries since the breakdown of the Bretton Woods system: the volatility of real exchange rates has increased, without any discernible increase in the volatility of any other real variables (Baxter and Stockman, 1989; Flood and Rose, 1995; Hasan and Wallace, 1996; Mussa, 1986), a phenomenon that Obstfeld and Rogoff (2000) describe as one of the six major puzzles of international macroeconomics.

In our model a country may choose either to retain the freedom to vary its exchange rate or to peg to some zero-inflation anchor currency. The country's debt may be denominated in foreign currency or in domestic currency, possibly with some degree of indexation to the domestic price level. An important aspect of real exchange rate volatility is its impact on the real burden of debt denominated in foreign currency. These valuation effects of real exchange rate movements have been identified as a major factor in the negative output effects of currency crises in emerging market countries (Frankel, 2005; Cook, 2004, provides a theoretical model), and there is evidence that exposure to pro-cyclical valuation effects on foreign debt induces these countries to choose a less flexible exchange rate regime (Bleaney and Francisco, 2008; Honig, 2005).

Our analysis provides a set of interesting results. First, we show that the composition of public debt plays a key role in determining which exchange rate regime creates more fluctuations in economic activity. More specifically, both inflation and output are shown to be more stable under a flexible exchange rate regime in the absence of foreign debt. With foreign debt, however, this is not necessarily the case; the negative impact of the valuation effects can outweigh the positive "shock-absorber" function of flexibility when debt is denominated in foreign rather than domestic currency. Second, our results suggest that policy-makers are more likely to adopt a flexible exchange rate regime as the magnitude of shocks becomes large, because of the shock-absorbing nature of this regime, but only if real exchange rate shocks are similar across regimes. Otherwise, the benefit of smaller real exchange rate fluctuations under a peg may more than offset the benefit of flexibility in absorbing these shocks. Third, the share of foreign debt in total borrowing is an important determinant of fear of floating. The greater the share of foreign debt, the greater the negative valuation effects, which can consequently outweigh the shock-absorber benefits of flexibility and thus increase the attractiveness of the fixed exchange rate regime.

The rest of the paper is organized as follows. Section 2 sets out the basic model. The characterization of equilibrium under the two exchange rate regimes is presented in Section 3. Section 4 provides a comparative analysis of the two regimes and derives conditions for the optimal choice of exchange rate regime. Finally section 5 concludes the paper.

2 The basic model

We utilize a simple model of discretionary monetary and fiscal policy, in which the government dislikes deviations of inflation and output from target, and tax distortions depress output.[1] Different forms of debt provide different incentives to generate unexpected inflation, and their cost (the *ex post* real interest rate) responds differently to shocks, thus affecting the tax rate. For example, an unexpected real exchange rate depreciation increases the burden of debt denominated in foreign currency, which depresses output.

The government's disutility function can be represented in the following form:

$$L_t^G = \frac{1}{2}\sum_{t=1}^{T}\beta_G^{t-1}\left[\mu{\pi_t}^2 + (x_t - \widetilde{x}_t)^2\right] \tag{1}$$

where L_t^G denotes the welfare losses incurred by the government, μ represents the government's relative dislike for the deviations of inflation (π_t) from its target level (0) relative to the deviations of (log of) output (x_t) from its target level ($\widetilde{x}_t$), and β_G is the government's discount factor. As standard, the target level of inflation is taken to be zero to indicate the desirability of price stability. A non-zero output target ($\widetilde{x}_t$) represents the bliss point for output in the absence of non-tax distortions, for example, due to labour or commodity market imperfections. Both the weight μ and the bliss point for output ($\widetilde{x}_t$) reflect the political and the institutional structure of the economy.

Output is given by the following production function: $Y_t = N_t^\gamma$, where Y_t and N_t represent output and labour respectively in period t, and $0 < \gamma < 1$. Distortionary taxes, which are the only form of taxes available to the government, are levied on output at the rate τ_t. A representative competitive firm's problem is to maximize profits $P_t(1-\tau_t)N_t^\gamma - W_tN_t$, where P_t and W_t represent the price level and the wage rate respectively, in period t. A representative competitive firm chooses labour to maximize profits by taking P_t, W_t and τ_t as given. The resulting output supply function is $y_t = \alpha(p_t - w_t - \tau_t) + z$, where lower case letters represent logs, e.g. $y_t = ln(Y_t)$, $\alpha = \gamma/(1-\gamma)$, $z = \alpha ln(\gamma)$ and $\ln(1-\tau) \simeq -\tau$. Normalizing output by subtracting z from y_t for simplicity, and utilizing $w_t = p_t^e$, yields the following normalized output supply function

$$x_t = \alpha(\pi_t - \pi_t^e - \tau_t) + u \tag{2}$$

where π_t^e is expected inflation, u is a random shock with zero mean and variance η^2, and all other variables are as defined above.

[1] Similar variants of this model are used by Beetsma and Bovenberg (1997, 1999) and Ozkan (2000).

The fiscal structure is the following. The policymaker inherits a given level of public debt from the previous period which has to be paid off in full at the end of the current period. Thus the cost of debt repayments together with the current public spending make up the financing requirement in each period.

In addition to the revenue taxes, the policymaker can also use the inflation tax to pay for current spending and debt repayments. The government budget constraint is formally given by:[2]

$$\tau_t = (g_t - k\pi_t) + (1 + r - \theta(\pi_t - \pi_t^e) + \lambda s f)d_{t-1} \tag{3}$$

where g_t is current public spending as a share of output; k is real money holdings as a share of output and is therefore a measure of seigniorage revenues; d_{t-1} is the total debt issued in period $t-1$ (as a ratio of output) that has to be paid back at the end of period t; r is the real interest rate; θ indicates the portion of debt that is in nominal domestic currency and can be devalued in real terms through inflation; f is the proportion of debt denominated in foreign currency; s denotes a zero-mean real exchange rate shock with a variance σ^2 (with a positive value representing a depreciation); and λ is a regime-specific parameter that captures the intensity of real exchange rate shocks (we set $\lambda = 1$ under flexible rates and $0 < \lambda < 1$ under a peg to denote pegs' favourable impact on real exchange rate volatility, as explained earlier). Only when debt is indexed to the domestic price level is the *ex post* real interest rate on debt constrained to equal its *ex ante* rate (r). If debt is fixed in nominal terms (θ=1), the *ex post* rate equals the *ex ante* rate minus unanticipated inflation. If debt is denominated in foreign currency (f=1), the *ex post* rate equals the *ex ante* rate plus the rate of real exchange rate depreciation.

3 Characterization of equilibrium

In order to focus on exploring the linkages between the composition of existing debt obligations and exchange rate regime choice, we abstract from additional debt dynamics and allow no new borrowing. Hence there are no linkages between periods and thus all our results can be derived by using a one-period framework. The order of events is as follows. At the beginning

[2] Falcetti and Missale (2004) use a similar representation of taxes, but without foreign borrowing and seigniorage revenues.

of the period, the government inherits an exogenous level of total debt which it must pay off at the end of the period, issuing no new debt. First the government chooses its exchange rate regime, which is either a peg (with no possibility of devaluation) or a flexible regime. Then it observes the domestic shock (u) and the real exchange rate shock that we define below. Finally, if a flexible exchange rate regime has been chosen, the government selects the rate of devaluation, e, which we assume to be directly controlled by the policymaker, to minimize its loss function.

3.1 Flexible exchange rates

The relationship between inflation and the external (real exchange rate) shock is described by the following stochastic version of the purchasing power parity condition:[3]

$$\pi \ = \pi^* + e - s \tag{4}$$

where π^* is foreign inflation (which we assume throughout to be zero, for simplicity), e is the rate of change of the nominal exchange rate (home currency units per unit of foreign currency) and s is a zero-mean random variable. Time subscripts are omitted for notational clarity given the one-period nature of the set-up. After the real exchange rate shock s is observed, monetary policy is chosen, which amounts to selecting e (or equivalently π) in order to minimize the loss function in equation (1) above. The domestic and external shocks are assumed to be independently distributed.

The government budget constraint in this case takes the following form

$$\tau = g - k\pi + (1 + r - \theta(\pi - \pi^e) + sf)d \tag{5}$$

where the full scale of real exchange rate shocks, s, is reflected in the fiscal burden (sfd), as $\lambda = 1$ under the flexible exchange rate regime.

Substituting the output supply function from (2) and the tax rate from (5) into (1), differentiating the resulting expression with respect to π and solving for π under rational expectations results in

[3] Berger *et al.* (2001) use a similar framework in analysing the optimal choice of exchange rate regime but in the absence of any role for public debt.

$$\pi^F = \frac{Z}{\mu + Z\alpha k} Y + \frac{Z\alpha}{\mu + Z^2} f ds - \frac{Z}{\mu + Z^2} u \tag{6}$$

where superscript F refers to outcomes under the flexible exchange rate regime; $Z = \alpha(1 + k + \theta d)$; and $Y = \alpha g_D + \widetilde{x}$, where g_D is the financing requirement in the absence of nominal and foreign debt in period t and is given by $g_D = g + (1 + r)d$.

Equation (6) suggests that the deterministic part of inflation bias (the first term) is a function of the financing requirement and the output target, $Y = \alpha g_D + \widetilde{x}$, which might be referred to as the total structural distortions. A rise in the financing requirement brings about a rise in equilibrium inflation, so that part of the additional finance is met through seigniorage. The deterministic part of inflation is also an increasing function of Z, which captures the incentive to increase output through unanticipated inflation. This incentive is greater, the steeper the output supply function (higher α), the larger the monetary base (larger k) and the higher the nominal debt (higher θd). Clearly, inflation is lower, the greater the policy-maker's price stability weight (higher μ).

Substituting the equilibrium inflation from (6) into (5) above and rearranging yields the following equilibrium tax rate under the floating regime

$$\tau^F = g_D - \frac{kZY}{\mu + Z\alpha k} + \frac{\mu + Z\alpha}{\mu + Z^2} f ds + \frac{Z(k + \theta d)}{\mu + Z^2} u \tag{7}$$

Equation (7) indicates that high inflation reduces the fiscal burden through seigniorage (the second term), in contrast to the real exchange rate shocks that have an unfavourable effect on the equilibrium tax rate under floating (the third term). Because inflation falls when u is positive, there is less seigniorage revenue and a lower *ex post* real interest rate on nominal debt, so the tax rate has to rise (the last term).

We can now represent the deviation of output from its target level under the floating exchange rate regime by substituting (7) into the output supply function in (2) and subtracting $\widetilde{x}$ from the resulting expression, which yields

$$(x - \widetilde{x})^F = -\frac{\mu Y}{\mu + Z\alpha k} - \frac{\mu\alpha}{\mu + Z^2} f ds + \frac{\mu}{\mu + Z^2} u = -\frac{\mu}{Z}\pi^F \tag{8}$$

Thus the deviation of output from target is directly proportional to inflation. Note that the external shock effect in (6) and (8) is zero if there is no foreign debt ($f = 0$). Without foreign debt, the real exchange rate shock is entirely absorbed in the nominal exchange rate adjustment, so that inflation is independent of the shock, as is output. Foreign debt reduces the extent to which a flexible exchange rate absorbs the shock, with a real depreciation resulting in lower output and higher inflation, because of the greater fiscal burden. As far as domestic shocks are concerned, foreign and indexed debt are equivalent, and the only debt composition effect relates to the share of nominal debt. The larger the share of nominal debt, the larger is Z, and the smaller the effect of the domestic shock on output.

3.2 Under a fixed exchange rate regime

Under a fixed exchange rate regime the nominal exchange rate is pegged, so $e = 0$. The peg also reduces the intensity of real exchange rate shocks, which are only $\lambda(< 1)$ times as big as under flexible rates. Under the peg the government has no freedom to set the inflation rate, which is now given by

$$\pi = \pi^* + e - \lambda s \tag{9}$$

Given that $\pi^* = e = 0$, inflation will be equal to

$$\pi^P = -\lambda s \tag{10}$$

where superscript P indicates the peg. Since s has a mean of zero, expected inflation is zero.

Equilibrium inflation under the peg in (10) suggests that the required tax rate in this case is given by

$$\tau^P = g - k\pi + (1 + r - \theta(\pi - \pi^e) + \lambda s f)d \tag{11}$$

The contribution of the real exchange rate shocks to the tax burden is smaller under a fixed exchange rate regime because of the lower intensity of the real exchange rate shocks under the peg, $\lambda < 1$.

Utilizing the equilibrium values of inflation and taxes from (10) and (11), it is straightforward to derive the output gap under a peg as the following:

$$(x - \widetilde{x})^P = -Y - \lambda s(Z + \alpha f d) + u \tag{12}$$

Under pegging, prices will fall when $s > 0$, and this raises the fiscal burden unless debt is indexed to the price level.[4] This increase in the tax rate magnifies the direct negative output effect of the external shock.

By comparing the equilibrium inflation and output under the two exchange rate regimes we establish the following results.

Result 1. A larger share of nominal debt raises the volatility of output under pegging relative to flexibility.

It can be seen from (8) that increasing Z reduces the sensitivity of output to s under flexibility. In contrast, from (12), increasing Z increases the sensitivity of output to s under pegging. Exactly the same applies to the domestic shock, u. Since Z is an increasing function of θ, the share of nominal debt in the total, the result follows.

The intuition behind this result is the following. A rise in θ increases expected inflation under flexibility but also increases the degree to which shocks are absorbed by inflation. This is reflected in the reduced responsiveness of equilibrium output to real exchange rate shocks in this regime. On the other hand, under pegging, a real exchange rate depreciation brings about deflation, which increases the fiscal burden through both negative seigniorage and unexpected deflation, given that $\pi^e = \pi^* + e = 0$. This, in turn, requires a greater change in taxes and thus increases the sensitivity of output to real exchange rate shocks. At the same time, unexpected inflation cannot be used to absorb domestic shocks under a peg.

[4] A case in point is the later years of Argentina's currency board. From 1995 to 2001, consumer prices fell by 1.0%, compared with a rise of 16.2% in the United States, in whose currency most of Argentina's debt was denominated, and against which the peso was pegged. This contributed significantly to Argentina's fiscal problems.

Result 2. In the absence of foreign debt, inflation and output are more stable under the flexible exchange rate regime. With foreign debt, this is not necessarily true.

Without foreign debt ($f = 0$), it can be seen from (6), (8), (10) and (12) that inflation and output are independent of shocks under flexible rates, whereas they vary with s under pegged rates. With foreign debt, the critical factor is how much real exchange rate fluctuations are damped under pegged exchange rates. If λ is large, so that real exchange rate volatility is similar under the two regimes, inflation and output are likely to be more volatile under a peg, whereas if λ is small, they may be more volatile under flexibility.[5]

4 Optimal exchange rate regime choice

To establish the superiority of one exchange rate regime over the other, one needs to compare welfare losses under the two regimes. Substituting the equilibrium values of inflation and output under the two regimes into the policymaker's loss function in equation (1) yields the following loss levels under flexible and fixed exchange rate regimes

$$E(L^F) = \frac{\mu(Z^2+\mu)Y^2}{(\mu+Z\alpha k)^2} + \frac{\mu\alpha^2 f^2 d^2}{(Z^2+\mu)}\sigma^2 + \frac{\mu}{(Z^2+\mu)}\eta^2 \qquad (13)$$

and

$$E(L^P) = \mu\lambda^2\sigma^2 + Y^2 + \lambda^2(Z+\alpha f d)^2\sigma^2 + \eta^2 \qquad (14)$$

where $E(L^F)$ and $E(L^P)$ are (expected) loss levels under flexible and fixed rates, respectively, σ^2 is the variance of the external shock, s, and η^2 is the variance of the domestic shock, u.

[5] Céspedes *et al.* (2004) present a model with sticky wages, in which a flexible exchange rate perfectly absorbs shocks, even with foreign debt. This explains their result that flexible exchange rates are always better, despite valuation effects. As Cook (2004, p. 1157) explains, in a model with sticky prices this is no longer true. Our formulation is more consistent with the large output losses from currency crashes (Frankel, 2005; Gupta *et al.*, 2007) and the evidence that devaluations are contractionary in emerging markets (Bleaney and Castilleja Vargas, 2008).

It follows that the policymaker would be better off adopting a fixed exchange rate regime if the following condition holds:

$$\begin{aligned} E(L^F) - E(L^P) &= Y^2\left(\frac{\mu(Z^2+\mu)}{(\mu+Z\alpha k)^2} - 1\right) + \frac{\mu\alpha^2\sigma^2 f^2 d^2}{(Z^2+\mu)} \\ &\quad -\lambda^2\sigma^2[\mu + (Z+\alpha f d)^2] - \frac{Z^2\eta^2}{(Z^2+\mu)} > 0 \end{aligned} \quad (15)$$

.

Note first of all the effect of the amplitude of shocks.

Result 3. policy-makers are more likely to prefer a flexible exchange rate regime as the magnitude of shocks increases, because of its shock-absorbing properties. However, this only holds for real exchange rate shocks if they are similar in size across regimes.

It is clear from the last term in (15) that a larger amplitude of domestic shocks reduces the losses under flexibility relative to pegging. To establish this result for external shocks, we differentiate (15) with respect to σ^2, which yields

$$\partial[E(L^F) - E(L^P)]/\partial\sigma^2 = 2\sigma(\mu^*(\alpha f d)^2 - \lambda^2[\mu + (Z+\alpha f d)^2]) \quad (16)$$

where $\mu^* = \frac{\mu}{\mu+Z^2}$. Since μ^* is a fraction, and $Z>0$, (16) must be negative for λ close to one. On the other hand, for λ sufficiently small, (16) can be positive, provided that $fd > 0$. This is because, with foreign debt, a flexible exchange rate acts as a less than perfect shock-absorber, and with a very small λ, shocks matter very little under pegging.

4.1 The role of public debt management

How does the composition of public debt influence the choice of exchange rate regime? The difference between nominal and indexed debt (that is captured in (15) by the expression Z, which is an increasing function of θ, the proportion of nominal debt) is the temptation to inflate away the real value of debt. Under rational expectations, this temptation is reflected in inflationary expectations, which are pushed up to a higher level under nominal debt than under indexed debt. This extra inflation under nominal debt generates additional seigniorage revenue, but this is more than offset by the inflation losses, since it is an inefficiency that results from an incentive to generate unanticipated inflation that can never be realized under rational expectations. Consequently, for any given positive value of debt, nominal debt generates greater losses under flexibility than indexed debt. Under pegging, nominal debt also results in greater losses than indexed debt because it magnifies the effect of shocks: with nominal debt a real exchange rate depreciation not only directly reduces output through unanticipated deflation, but also raises the *ex post* interest rate on debt through the same mechanism.

If we differentiate (15) with respect to θ, the proportion of nominal domestic debt, we get

$$\begin{aligned}\partial[E(L^F) - E(L^P)]/\partial\theta &= \frac{2\alpha^2 d\mu^2(1+\theta d)Y^2}{(\mu + Z\alpha k)^3} - \frac{2\mu\alpha dZ}{(\mu + Z^2)^2}[(\alpha f d)^2\sigma^2 + \eta^2] \\ &\quad -2\lambda^2\sigma^2\alpha d(Z + \alpha f d) \qquad (17)\end{aligned}$$

The first term in (17) is positive, and the rest are negative, so that the sign is in general ambiguous. Without shocks the sign is unambiguously positive, since the second and third terms disappear when $\sigma^2 = \eta^2 = 0$, which means that in this case more nominal debt makes pegging more attractive. This is because nominal debt increases the incentive to inflate, which under rational expectations only leads to higher equilibrium inflation. Shocks work in the opposite direction, not only because a higher share of nominal debt increases the losses under pegging, but also because it actually reduces the shock component of losses under flexibility. More foreign debt also makes it more likely that (17) is negative, because it increases the losses under the peg from a given amplitude of external shocks. This effect is, however, smaller if pegging is more effective in reducing real exchange rate volatility.

Thus debt denomination emerges as an important determinant of the optimal exchange rate regime choice.

Result 4. A rise in the share of foreign debt increases the likelihood of adopting a fixed exchange rate regime when reductions in real exchange rate *fluctuations under the peg are sufficiently large, that is when λ is sufficiently small.* If *the size of shocks is similar across the two regimes, the opposite is true.*

Differentiating (15) w.r. to f yields

$$\partial[E(L^F) - E(L^P)]/\partial f = 2\alpha\sigma^2 d[\mu^*\alpha f d - \lambda^2(Z + \alpha f d)] \tag{18}$$

For a rise in foreign borrowing to increase the attractiveness of the peg (i.e. to induce a rise in $E(L^F) - E(L^P)$) the following condition must hold:

$$\lambda^2 < \mu^* f^* \tag{19}$$

where $f^* = \frac{fd}{1+k+(\theta+f)d}$. Note that μ^* and f^* are both fractions so this condition will hold if λ is sufficiently small (i.e. if real exchange rate volatility is greatly affected by pegging). This is because, with foreign debt (unlike with domestic debt), a flexible regime cannot completely insulate output and inflation from external shocks, and when λ is small enough, the effect of increased foreign debt on losses under a flexible regime is greater than the same effect on losses under a peg. This is more likely to happen when shock absorption under the float is less effective, with low α and k, leading to higher μ^* and f^*. Also, a rise in the share of foreign debt makes it more likely that (19) will hold, given that $\partial f^*/\partial f > 0$. In other words, the unfavourable valuation effects in the face of a real exchange rate depreciation are more likely to outweigh the positive shock-absorber function under a flexible exchange rate regime the higher the scale of foreign currency borrowing.

Another interesting issue to explore is the role of the overall debt to output ratio in the determination of the exchange rate regime choice. Differentiating (15) with respect to the volume of debt yields the following expression:

$$\begin{aligned}\partial[E(L^F) - E(L^P)]/\partial d &= 2\alpha(1+r)Y\left(\frac{\mu(\mu+Z^2)}{(\mu+Z\alpha k)^2} - 1\right) + \frac{2\alpha\mu^2\theta(1+\theta d)Y^2}{(\mu+Z\alpha k)^3} \\ &\quad + \frac{2\mu d(\alpha f)^2\sigma^2}{(\mu+Z^2)} - \frac{2\mu\alpha\theta Z}{(\mu+Z^2)^2}[(\alpha f d)^2\sigma^2 + \eta^2] \\ &\quad - 2\lambda^2\sigma^2\alpha(\theta+f)(Z+\alpha f d)\end{aligned} \tag{20}$$

The first two terms express the effect of increasing debt in the absence of shocks ($\sigma^2 = \eta^2 = 0$) since then all the other terms go to zero. The first term can be positive or negative, depending on whether $\mu(\mu + Z^2)$ is greater or less than $(\mu + Z\alpha k)^2$. Since Z is itself a function of d, it is possible that the sign changes with the level of debt. The second term reflects the additional attractions of a nominal anchor when domestic debt is not indexed ($\theta > 0$). The third term expresses the effect of foreign debt in amplifying the losses from external shocks under flexibility. The fourth term reflects the effect of a greater proportion of domestic debt being nominal rather than indexed in reducing the losses from either domestic or external shocks under flexibility. Finally, the last term captures the amplification of losses from external shocks under a peg with nominal or foreign debt. The more effective is pegging at reducing the amplitude of external shocks (i.e. the smaller is λ), the smaller is the last term, and so the more likely it is that the attractiveness of pegging increases with the volume of debt.

4.2 Discussion

The previous section has explored the issue of exchange rate regime choice by explicitly linking this decision to the composition of public debt. In the model, the government faces a simple choice between pegging the exchange rate and losing the capacity to react to shocks, on the one hand, and keeping the freedom to react, but losing the advantages of having a nominal anchor, on the other. This is a familiar set-up, to which we have added the possibility that the peg also reduces the amplitude of real exchange rate shocks. The optimal choice of exchange rate regime depends on the absolute and relative amplitude of domestic and external shocks, how much they are damped by pegging, and the volume and composition of debt.

With purely domestic debt (indexed or not), a flexible exchange rate can perfectly absorb external (but not domestic) shocks, so the equilibrium levels of output and inflation are independent of external shocks. With foreign debt, this is no longer true since the valuation effects of real exchange rate movements cannot be avoided. When these valuation effects are adverse (i.e. in the event of a real depreciation), a degree of unanticipated inflation is chosen in order to mitigate the decline in output. Under pegging, shocks cannot be absorbed in any way, and the impact of external shocks is magnified with a greater share of nominal and/or foreign debt. The welfare losses from shocks are definitely greater under pegging if external shocks are of the same magnitude as under flexibility; but they may be less if real exchange rate volatility is sufficiently reduced under a peg, and if external shocks are large enough relative to domestic shocks. Consequently, the shock-absorbing function of flexibility is less valuable in the latter case.

A larger debt tends to increase losses, but whether it does so more under pegging or flexibility depends on a number of factors. To the extent that the debt is in nominal domestic currency, it is a question of weighing up the additional incentive to inflate without a peg against the greater losses from shocks with one. The foreign debt component increases the losses from shocks in both regimes. In both cases, however, the effect of increased losses from shocks under pegging will be smaller if pegging is more effective at reducing the amplitude of external shocks. Consequently, this is likely to be a critical factor in determining whether flexibility or pegging becomes more attractive as debt increases.

5 Conclusions

This paper has explored the link between the issue of optimal exchange rate regime choice and the indexation and denomination of public debt. With no foreign debt, the choice between pegging and flexibility depends on weighing the shock-absorbing properties of flexibility against the nominal anchor function of pegging. The same is true if external shocks are of negligible importance relative to domestic shocks. How foreign debt affects the choice of regime depends on the volatility of the real exchange rate under different regimes. If real exchange rate volatility is the same under a peg as under flexibility, then foreign debt increases the attractiveness of flexibility, because it tends to magnify the output effects of real exchange rate shocks, thus making the shock-absorbing properties of flexibility more valuable. In the more realistic case where pegging reduces real exchange rate volatility, however, denomination of debt in foreign currency can make pegging more attractive, because the shock magnification effect is damped under a peg. This is particularly likely if the volume of debt is greater (and/or a higher proportion is denominated in foreign currency), if the authorities put a relatively low weight on the inflation objective, if domestic debt is indexed to the price level (which helps to insulate output against external shocks under a peg), and if external shocks are more important relative to domestic shocks.

Thus the model provides theoretical underpinning to the notion of "fear of floating" in the presence of foreign-currency debt. In this model, it is never optimal to choose foreign-currency debt, because its burden increases when output is depressed, so it has bad insurance properties. This is reflected in the fact that foreign debt increases losses under either regime. The implication is that it is important to develop domestic debt markets.

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