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THE REAL EXCHANGE RATE IN INDIA: DETERMINANTS AND TARGETING

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ABSTRACT

The paper studies the behaviour of the real exchange rate (RER) in India. The first part investigates the role of important macroeconomic (behavioural and policy) variables in explaining the movement of the RER. It is found that the investment-gdp ratio, the overall fiscal deficit of the public sector and the nominal exchange rate are important explanatory variables. The second part of the paper seeks to determine whether real exchange rate targeting has been used in India as a tool in enhancing the competitiveness of the tradable sector. It is found that this is indeed the case, and moreover, the correlation between inflation and nominal devaluations is found to be small.

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1. INTRODUCTION

Exchange rate problems have usually occupied centre stage in policy discussions in reforming economies. In fact, it has often been argued that the inadequate economic performance of various countries has been the result of inappropriate exchange rate policies. It is now well accepted at the theoretical level that excess volatility in real exchange rates, and in particular situations of real exchange rate (RER) misalignment, will be translated into important welfare costs. Maintaining the RER at the 'wrong' level generates wrong signals and greatly hurts the degree of competitiveness of the tradable sector. Determining whether a country's RER is at a particular time out of line with its long-run equilibrium level is, both theoretically and practically, one of the most difficult challenges faced by macroeconomic analysts and policy makers under both predetermined and floating nominal exchange rates.

Two broad strands can be discerned in the literature on real exchange rates. One line of research emphasises parsimonious models that investigate the influence of several macroeconomic, financial and structural (policy) variables — investment ratio, capital controls, changes in government expenditure or (higher/lower) fiscal deficit, tariffs, seigniorage and so on — in determining the RER. These models are obtained from a general equilibrium framework that explicitly recognises the influence of policy choices by the government in determining the RER. Establishing whether observed RER measurements are a result of structural changes, or a response to macroeconomic instability, or both is an empirical issue that is investigated in this paper.

The other strand emphasises RER targeting, that is, the effectiveness of nominal devaluations as a policy tool. From a purely operational point of view, the RER is probably the most popular real target in many developing countries, in no small part because of the recent emphasis on export-led growth in the context of policy reforms in developing countries. A policy of 'real exchange targeting' usually aims at controlling the level of the real exchange rate, either in an effort to keep it at a constant level in the face of domestic or external shocks, or achieve a different (typically more depreciated) level to increase growth by enhancing incentives for higher exports. It is found that India is no exception in this regard, especially since 1980/81 when the first tentative steps towards reform were initiated, and which culminated in policies during 1991-1993 designed to substantially liberalise both the trade and external payments systems.

The plan of the rest of the paper is as follows. In section 2 we sketch a parsimonious open economy model to delineate the main factors that could impinge on the real exchange rate. In section 3, using annual data for the period 1960/61-1994/95, we present the first set of results for India using the by now familiar unit root and cointegration techniques. The section investigates the role of several important macroeconomic variables in determining the RER. In section 4 we present the second set of results which relate to exchange rate targeting and analyse the well known trade-off between a depreciating exchange rate and inflation. Finally, section 5 concludes the paper.

2. A MODEL OF THE REAL EXCHANGE RATE WITH MONEY AND A ROLE FOR THE FISCAL DEFICIT

In order to model the behaviour of real exchange rates formally, it is necessary to develop a complete, but parsimonious, intertemporal framework able to capture how both policy induced disturbances and exogenous shocks could impinge on relative prices in the economy.[1]

A large number of profit maximising firms produce three goods — exportable (X), importable (M), and non-tradable (N) — using constant returns to scale technology, under perfect competition. There are two periods only (1 and 2), and there is perfect foresight. A tilde (~) over a variable indicates that it is a period 2 variable. Residents of this small country hold money and can borrow or lend internationally. There is, however, a tax on foreign borrowing which ensures that the domestic real interest rate exceeds the world interest rate. Although we model the wedge between the two interest rates as an ad-valorem tax, we can also think of the tax as representing some sort of rationing mechanism. The intertemporal constraint states that at the end of period 2 the country has repaid its debt. The importation of M is subject to import tariffs (t and $\tilde{t}$). Consumers maximise intertemporal utility, consume all three goods and hold money balances, and the current account is equal to saving minus investment in each period.

There is a government that, in the general case, consumes both tradable and nontradable goods, and issues money to facilitate exchange. Government expenditure is financed from five sources: nondistortionary taxes (net of transfers), printing money, proceeds from import tariffs, proceeds from the taxation of foreign borrowing by the private sector, and run a temporary fiscal deficit by borrowing both domestically and from abroad. The solvency criterion on the government ensures that it is subject to an intertemporal constraint — the discounted value of government expenditure (including domestic and foreign debt service) has to equal the discounted value of income from taxation and seignorage. A third constraint — that for internal equilibrium — requires that the non-tradable market clears in each period.

Production

Using duality theory, the production side of the economy is given by the revenue function:

$$R = \max\{Q_x + p(\tilde{t})Q_M + qQ_N;\ F(Q,V) \# 0\}, \qquad (2.1)$$

where Q_x, Q_M and Q_N are quantities produced of exportable, importable and non-tradable goods in that period. Q is a vector that summarizes production; V is a vector of factors of production; F() is the production function that summarizes existing technology; p is the domestic price of importable relative to exportable; and q is the price of non-tradables relative to exportable in period 1. Note that p and $\tilde{p}$ are influenced by t and $\tilde{t}$ respectively. Equation (2.1) can then be rewritten in the following way:

$$R = R(p(t),q,V). \qquad (2.2)$$

This is the maximised value of output in period 1 in terms of exportable. Naturally, the revenue function for period 2 can be written in a similar way. The advantage is that the corresponding supply functions can be derived from their derivatives with respect to prices. Thus, if we denote the partial derivatives with respect to a particular argument by a subindex, we have that:

$R_p = Q_M(p(t),...)$, supply function of M in period 1, (2.3)

$\bar{R}_{\tilde{q}} = \bar{Q}_N(\tilde{q},...)$, supply function of N in period 2. (2.4)

Another convenient property of revenue functions is that they are convex, implying that $R_{pp} \geq 0$ and that $R_{qq} \geq 0$.

Consumer behaviour

Consumers are assumed to maximise the present value of utility, subject to their intertemporal constraint. Assuming that the utility function is time separable, with each subutility function homothetic, the representative consumer problem can be stated as follows:

$$\max W\{U(C_N, C_M, C_X), \bar{U}(\bar{C}N, \bar{C}_M, \bar{C}_X)\} \quad (2.5)$$

subject to:

$$C_X + p(t)C_M + qC_N + d(\bar{C}_X + \tilde{p}(\bar{t})\bar{C}_M + \bar{C}\tilde{q}_N) \leq O \text{ where,} \quad (2.6)$$

$$O=wL+?K+H+T+d(\tilde{w}\bar{L} + ?\bar{K} + \bar{H} + \bar{T})+rB^G - (r^*+t^b)B^*, \quad (2.7)$$

In addition:

$$?(C_X + p(t)C_M + qC_N) \leq H, \text{ and} \quad (2.8)$$

$$?[d(\bar{C}_X + \tilde{p}(\bar{t})\bar{C}_M + \bar{C}\tilde{q}_N)] \leq \bar{H}, \text{ where both } ?, \bar{?} > 0; \quad (2.9)$$

where W is the utility function; U and $\bar{U}$ are, respectively, periods 1 and 2 subutility functions; and C_X, C_M, C_N ($\bar{C}_N$, $\bar{C}_M$, $\bar{C}_X$) are consumption of X, M and N in period 1 (2). As before, $p(t)$ and $\tilde{p}(\bar{t})$ are the domestic price of importable relative to exportable in periods 1 and 2;[2] and q and $\tilde{q}$ are the price of non-tradables relative to exportable in periods 1 and 2.

rB^G is the income to consumers if they choose to finance the government's deficit in period 1; $(r^*+t^b)B^*$ is the interest and tax liability in period 2 on their foreign borrowing in period 1; w is the wage rate on labour; ? is the return on capital; T is the lump-sum transfer net of taxes from the government; d is the domestic discount factor, equal to $(1+r)^{-1}$, and r is the domestic real interest rate in terms of the exportable good. The last two constraints are the cash-in-advance constraints, i.e., consumers must use money (H and $\tilde{H}$) to purchase goods in the two periods.

Wealth is the discounted sum of consumers income and money holdings in both periods. Given the nature of preferences, the consumer optimisation problem can be thought of as taking place in two stages. First, the consumers decide how to allocate their wealth across periods. Second, they decide how to distribute expenditure across the three goods in each period. The demand side of the model can be conveniently summarised by a twice-differentiable concave expenditure function that gives the minimum discounted value of expenditure required to attain a level of utility $\hat{W}$ for given domestic prices in periods 1 and 2:

$$E = \min\{C_X + pC_M + qC_N + d(\tilde{C}_X + \tilde{C}\tilde{p}_M + \tilde{C}\tilde{q}_N)\}$$
$$\text{subject to } W(U,\tilde{U}) \geq \hat{W}. \qquad (2.10)$$

This expenditure function can be written as a function of prices and utility only:

$$E = E\{p, q, d\tilde{p}, d\tilde{q}; W\}. \qquad (2.11)$$

Furthermore, since we have assumed that the utility function is weakly separable with each period subutility homothetic, equation (2.11) can be written as:

$$E = E\{p(p,q), d\tilde{p}(\tilde{p},\tilde{q}); W\}, \qquad (2.12)$$

where p( ) and p̃( ) are exact price indices for periods 1 and 2, and are interpreted as unit expenditure functions. A convenient property of the expenditure function is that its partial derivatives with respect to prices are equal to the respective compensated (Hicksian) demand function. For example, the derivative of E with respect to p is equal to the compensated demand function for importable in period 1. In general, the following relations hold for period 1 (exactly analogous conditions hold for period 2, and therefore they are omitted for brevity):

$$E_p = E_p p_p = D_M(p,...), \qquad (2.13)$$

$$E_q = E_p p_q = D_N(q,...), \text{ and} \qquad (2.14)$$

$$?(C_X + pC_M + qC_N) = H; \qquad (2.15)$$

where D_M and D_N are the Hicksian demand functions for M and N in period 1, and p_p and p_q are the derivatives of the exact price indexes with respect to the relative prices of, respectively, importable and non-tradables in period 1. Since the ps are unit expenditure functions, these derivatives can be interpreted as expenditure shares of M and N in period 1. By concavity of E it follows that the second derivatives are negative — E_{pp}, E_{qq}, $E_{\tilde{p}\tilde{p}}$, $E_{\tilde{q}\tilde{q}}$ $E_{pp} < 0$ — reflecting the fact that the demand curves slope downward. Given our assumption of a time separable utility function, expenditures in periods 1 and 2 are substitutes, implying that all intertemporal cross elasticities are positive. However, since in every period there are three goods, any two of them can be complements. It is possible, then, that in each period one of the intratemporal cross elasticities will be negative.