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CAPITAL CONTROL POLICIES IN A PORTFOLIO-BALANCE MODEL

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ABSTRACT

This paper analyzes the effects of capital control policies in a portfolio-balance framework. Capital controls are modeled as a licensing fee that the authorities charge for transactions on world capital markets. Both fixed and floating exchange rate regimes are considered. According to the results capital control policies seem to be best suited for achieving balance-of-payments or exchange-rate targets. It is also shown that the effects of capital controls are more ambiguous in a floating exchange rate regime than in a fixed exchange rate regime.

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CONTENTS

1 INTRODUCTION

Despite the rapid integration of international financial markets which has taken place since the early 1970s, most countries even in the OECD area continue to restrict their foreign capital transactions in one way or another.[1] Also, while many large countries allow their currencies to float, the majority of small countries are still in a system of more or less fixed exchange rates, choosing to peg their currencies to a single currency or a basket of currencies. Thus it is clearly of topical interest to analyze the effects of controls on capital movements, both in the case of pegged exchange rates and in the case of floating exchange rates.

As far as the desirability of capital controls is concerned, there are arguments both for and against restricting capital mobility. On the one hand, the case for free capital movements is straightforward: in the absence of distortions, free capital mobility is Pareto optimal (see e.g. Kouri, 1983). On the other hand, if distortions exist, traditional trade theory tells us that restrictions on capital mobility may improve welfare, even though capital controls are a first-best policy only in case the distortion originates from capital markets (this is also true in overlapping generations models where the lack of perfect markets constitutes the distortion; see Sibert, 1985). Macroeconomic short-run stability arguments can also be used against free capital mobility (see Claassen and Wyplosz, 1982). To take but one example, in the well-known Mundell - Fleming model the domestic economy can fully insulate itself from foreign interest rate disturbances by controlling capital movements. On the other hand, the economy will be better insulated from certain other disturbances if there are no restrictions on capital mobility. Overall the desirability of capital controls from the macroeconomic stability point of view can be shown to depend on the origin (domestic or foreign) and nature (real or monetary) of the shocks as well as on the exchange rate system.

This paper takes the existence of capital controls as given, leaving aside the normative issues related to limited capital

mobility. Instead, the purpose of the paper is to investigate the effects of relaxing or tightening the restrictions on international capital movements, once those restrictions are in place.[2] Towards that end, in section 2 a portfolio-balance model, based on the works of Tobin and de Macedo (1981) and Tobin (1982), is formulated. The effects of changing the degree of capital control are analyzed under fixed exchange rates and under flexible exhcange rates in sections 3 and 4, respectively. Concluding remarks are made in section 4.

2 THE MODEL

The analytic framework employed in this study is the portfolio balance approach to the balance of payments and exchange rate determination, developed by Kouri (1976), Branson (1977), and Boyer (1978), among others (for a survey, see Branson and Henderson, 1985). The studies by Tobin and de Macedo (1981) and by Tobin (1982) are particularly relevant for this paper, since their approach allows a consistent and tractable integration of real and monetary phenomena, which is necessary for a study of short-run stabilization issues. Accordingly, a similar framework, with modifications to incorporate capital controls into the model, is adopted in this study.

Consider a small open economy where there are three assets available to savers: domestic government bonds B, foreign bonds F (denominated in the foreign currency), and domestic base (high-powered) money M. Government bonds and base money are issued to finance budget deficits while foreign currency assets are earned by current account surpluses, consisting of a trade surplus and earnings on the foreign bonds themselves. In equilibrium, the desired changes in the holdings of the three assets, defined as the difference between the desired end-of-period stocks and the current stocks held by wealth owners, must equal the actual changes in the holdings of the assets, caused by government deficits, current account surpluses, and by central bank interventions in the asset markets.

Formally, the model is

$$(1) \qquad ID^B \equiv A^B\underset{+}{(r}, \underset{+}{r^*} - \underset{-}{t} + \underset{+}{\hat{e}^e}, \underset{+}{y}, \underset{+}{W_{-1}}) - \underset{-}{q_B(r)}B_{-1}$$

$$= \gamma D + z_B$$

$$(2) \qquad ID^F \equiv A^F\underset{-}{(r}, \underset{+}{r^*} - \underset{+}{t} + \underset{+}{\hat{e}^e}, \underset{+}{y}, \underset{+}{W_{-1}}) - eF_{-1}$$

$$= CA(\underset{+}{e}, \underset{-}{\hat{e}^e}, \underset{+}{r}, \underset{?}{r^*}, \underset{-}{y}, \underset{?}{F_{-1}}, \underset{-}{W_{-1}})$$

$$(3) \qquad ID^M \equiv A^M(r, r^* - t + \hat{e}^e, y, W_{-1}) - M_{-1}$$
$$(-) \quad (-) \quad (+) \quad (+)$$
$$= (1-\gamma)D + z_M$$

where ID^i (i = B, F, M) = incremental demand for asset i, A^i = end-of-period private demand for asset i, r = nominal rate of return on government bonds, r^* = nominal rate of return on foreign bonds, t = tax on capital movements (licensing fee), $\hat{e}^e$ = expected rate of depreciation of the domestic currency, y = national income, $W_{-1} = q_B B_{-1} + eF_{-1} + M_{-1}$ = beginning-of-the period wealth, q_B = market valuation of a government bond, e = exchange rate (the domestic-currency price of foreign currency), D = government budget deficit, γ = share of government deficit financed by issuing bonds, CA = current account surplus, z_i (i = B, F, M) = intervention instruments of the domestic central bank, satisfying the restriction that $z_B + z_F + z_M = 0$.

Each asset equation has the period's incremental demand (desired change) on the left, and the new supply on the right. The incremental demand is the difference between the stock desired at the end of the period and the value of the pre-existing stock at this period's asset prices, $q_B B_{-1}$, eF_{-1}, and M_{-1}. Following Tobin and de Macedo (1981), domestic government bonds, unlike foreign bonds, are taken to be consols so that the market valuation of a government bond q_B is an inverse function of its yield r. This formulation enables us to ignore the effects of domestic interest rate changes on government deficit. On the right, government deficits supply money and bonds, the current account balance changes the stock of foreign assets, and central bank interventions can cause changes in the stocks of all three assets. For example, an open market operation means that $dz_M = -dz_B$, and the sterilization of payments imbalances can be modeled by writing $dz_B = -\alpha dz_F$, $dz_M = -(1-\alpha)dz_F$ where $0 \leq \alpha \leq 1$ is the degree of sterilization (non-sterilization: $\alpha = 0$, full sterilization: $\alpha = 1$). Note that $dz_F < 0$ means that foreign exchange reserves are increasing so that for example $dz_F + dz_M = 0$, $dz_F < 0$ is equivalent to a non-sterilized increase in reserves.

The sum of equations (1) - (3) yields the IS equation of the economy, the left hand side of that equation representing private saving (desired accumulation of wealth) and the right hand side showing the sum of the government deficit and the current account balance. Being redundant, the IS equation is dropped from subsequent analysis.

The signs of the partial derivatives of the A^i are based on the assumption of gross substitutability of assets. It is further assumed that private saving depends positively on income and non-negatively on the yields of all assets. Taken together, these assumptions imply that the incremental demand for each asset depends positively on that asset's own yield and negatively on the other asset's yields (the yield on money is taken to be zero). A standard assumption, not implied by the positive relationship between saving and income alone, will also be that all A^i_y are positive.

The current account balance can be decomposed into the trade balance TB and the earnings on foreign bonds er^*F_{-1}:

$$(4) \qquad CA = \underset{+\ -\ +\ -\ -\ -}{TB(e,\ \hat{e}^e,\ r,\ r^*,\ y,\ W_{-1})} + er^*F_{-1}$$

$$\equiv \underset{+\ -\ +\ ?\ -\ ?\ -}{CA(e,\ \hat{e}^e,\ r,\ r^*,\ y,\ F_{-1},\ W_{-1})}$$

The trade balance is assumed to depend positively on the exchange rate (i.e. the Marshall - Lerner condition is assumed to hold), negatively on expected exchange-rate changes (an intertemporal substitution effect, see e.g. Haaparanta (1985), Ch. III, and in a general equilibrium framework in e.g. Persson and Svensson (1985)), negatively on the factors that increase domestic expenditure (an increase in y or W_{-1}, or a decrease in r) and negatively on the foreign interest rate which affects foreign demand and therefore exports adversely. The effect of an increase in the foreign interest rate on the <u>current</u> account is, however, ambiguous, for a creditor country ($F_{-1} > 0$), since in that case the increase in earnings on foreign bonds may outweigh the loss in exports. If the country is a net debtor internationally, $CA_{r^*} < 0$ unambiguously.

In this paper capital controls are modeled as a licensing fee or tax t that the government charges for transactions on world capital markets (and not as a quantitative limit on capital account transactions), which is in analogy with the equivalence of tariffs and quotas (under certain circumstances) in trade theory and which is also the strategy used by e.g. Greenwood and Kimbrough (1985) in their paper dealing with the role of fiscal policy under capital controls. Note that when the country is a net creditor ($F_{-1} > 0$), t must be positive to induce domestic investors to reduce their holdings of foreign assets, and $dt > 0$ means tightening of the control. If, however, the country is a net debtor ($F_{-1} < 0$), t must be negative to increase the cost of borrowing, thereby causing borrowing from abroad to decrease, and $dt > 0$ means relaxing the control. Note also that the tax revenue (or subsidy) tF_{-1} is assumed to be offset by a lump-sum transfer.

The relatively simple framework presented above can be used to analyze capital control policies under both fixed and floating exchange rate regimes. Under fixed exchange rates r, y, and z_F are the endogenous variables. Here $-dz_F$ describes a change in the country's foreign exchange reserves; e.g. $dz_F > 0$ implies a balance of payments deficit. The case of flexible exchange rates is obtained by treating r, e, and y as endogenous.

3 CAPITAL CONTROL POLICIES UNDER FIXED EXCHANGE RATES

The totally differentiated version of the system (1) - (3) with r, z_F, and y as the endogenous variables is

$$(5)\qquad \begin{bmatrix} ID_r^B & -\alpha & ID_y^B \\ ID_r^F - CA_r & 1 & ID_y^F - CA_y \\ ID_r^M & \alpha-1 & ID_y^M \end{bmatrix} \begin{bmatrix} dr \\ -dz_F \\ dy \end{bmatrix} = \begin{bmatrix} A_{r*}^B & 0 & 0 \\ A_{r*}^F & CA_{r*} & CA_{\hat{e}^e} \\ A_{r*}^M & 0 & 0 \end{bmatrix} \begin{bmatrix} dt \\ dr^* = dt \\ d\hat{e}^e = dt \end{bmatrix}$$

According to the assumptions made in section 2, the sign pattern of the system described in (5) is

$$(6)\qquad \begin{matrix} \begin{bmatrix} + & - & + \\ - & + & + \\ - & - & + \end{bmatrix} \\ + \; 0 \; + \end{matrix} \begin{bmatrix} dr \\ -dz_F \\ dy \end{bmatrix} = \begin{matrix} \begin{bmatrix} - & 0 & 0 \\ + & ? & - \\ - & 0 & 0 \end{bmatrix} \\ + \; ? \; - \end{matrix} \begin{bmatrix} dt \\ dr^* = dt \\ d\hat{e}^e = dt \end{bmatrix}$$

where the signs of the row sums are given below the matrices. It is straightforward to show that the determinant of the matrix A on the left hand side of (5) is positive.

Three comparative-static exercises are carried out, and their results are summarized in Table 1.

TABLE 1

The Effects of Policies and Disturbances under Fixed Exchange Rates

Policy or disturbance		The effects on r	z_F	y
1. dt				
no sterilization	($\alpha = 0$)	-	-	+
full sterilization	($\alpha = 1$)	+	-	?
2. $dr^* = dt$				
no sterilization	($\alpha = 0$)	$-\text{sgn}(CA_{r^*})$	$-\text{sgn}(CA_{r^*})$	$\text{sgn}(CA_{r^*})$
full sterilization	($\alpha = 1$)	$\text{sgn}(CA_{r^*})$	$-\text{sgn}(CA_{r^*})$	$\text{sgn}(CA_{r^*})$
3. $d\hat{e}^e = dt$				
no sterilization	($\alpha = 0$)	+	+	-
full sterilization	($\alpha = 1$)	-	+	-

Let us first consider the effects of an increase in t, the licensing fee or the tax on capital movements (recall from section 2 that an increase in t means tightening of the control for a creditor country and relaxing of the control for a debtor nation). As indicated in Table 1, the results depend partly on the degree of sterilization. If the domestic central bank does not neutralize the effects of changes in foreign exchange reserves on money supply, an increase in t (i.e., a decrease in the net yield on foreign bonds for a creditor country and a decrease in the cost of foreign borrowing for a debtor country) will result in a lower domestic interest rate, a higher national income and an improvement in the balance of payments ($dz_F < 0$). With full sterilization, however, the interest rate will rise and the effect on output is ambiguous:

$$(7) \qquad \frac{\partial y}{\partial t}\bigg|_{\alpha=1} = \frac{\overset{-}{A^M_{r^*}}(\overset{+}{ID^B_r} + \overset{+}{ID^F_r} - CA_r) - \overset{-}{ID^M_r}(\overset{+}{A^F_{r^*}} + \overset{+}{A^B_{r^*}})}{\underset{+}{\det A}} \gtrless 0$$

The intuition of this ambiguity is that the increase in the domestic interest rate tends to decrease the demand for money while the fall in the net yield on foreign bonds tends to increase money demand,

thereby leaving the direction of the needed adjustment in national income an open question. The less sensitive money demand is to changes in the foreign interest rate, the more likely it is that an increase in t will cause domestic output to rise. Given the recent empirical evidence on the effects of changes in the foreign interest rate on the demand for money by Arango and Nadiri (1981) the possibility of a negative effect on output cannot be ruled out.

Next consider the effects of a simultaneous increase in the foreign interest rate and in the licensing fee ($dr^* = dt$). This case can be thought of as a kind of interest-equalization tax whereby the domestic government keeps the net yield on foreign bonds constant. As shown in Table 1, the results of this policy depend crucially on the sign of the derivative CA_{r^*} which is in general ambiguous (cf. section 2).

In the case of a net debtor country $CA_{r^*} < 0$ unambiguously since a higher foreign interest rate not only causes foreign demand for the home country's exports to fall but also increases the interest payments on foreign debt. For such a country the policy of increasing t (i.e. lowering the cost of foreign borrowing) when r^* rises causes national income to fall and the balance of payments to worsen while the domestic interest rate falls of rises depending on the degree of sterilization. An alternative interpretation of the result is that in a net debtor country t has to be increased by more than r^* increases in order to prevent output from falling and the balance of payments from worsening.

If the country is a net creditor, CA_{r^*} is positive or negative depending on whether or not the increased interest earnings on foreign bonds exceed the worsening of the trade balance. In the former case ($CA_{r^*} > 0$) output will increase and the balance of payments will improve while in the latter the outcome will be qualitatively the same as for a debtor country. In any case it is worth emphasizing that a simultaneous change in the foreign interest rate and the tax on capital movements does have real effects despite

the fact that the net yield on foreign bonds remains unchanged; the reason is that r* and t have a different impact on the current account balance.[3]

Finally, consider the effects of attempts to use capital controls to neutralize the consequences of expectations of a devaluation ($d\hat{e}^e = dt$). While the net yield on foreign bonds stays the same, expectations of a devaluation have a negative intertemporal substitution effect on the trade balance, which leads to a fall in national income and which worsens the balance of payments. Thus $dt > d\hat{e}^e$ would be required to prevent national income and foreign exchange reserves from falling. The effect on the domestic interest rate again depends on the degree of sterilization.

It may be noted that in the analysis of this section the tax on capital transactions t has so far been taken to be exogenous. It is, however, of some interest to treat t as an endogenous variable, keeping z_F exogenous instead. In this case policy authorities are thought to set a target level for foreign exchange reserves, and t can be interpreted as that licensing fee or tax rate which is needed to keep the reserves unchanged. Relaxing or tightening the control of capital movements can be described by dz_F. The results turn out to be analogous with those obtained by treating r, y, and z_F as the endogenous variables. It is straightforward to show that when r, y, and t are endogenous, a non-sterilized tightening of the foreign reserves restraing ($-dz_F = dz_M > 0$) leads to an increase in t and a higher level of output whereas the domestic interest rate falls. In turn, a sterilized tightening of capital controls ($-dz_F = dz_B > 0$) causes both t and r to rise but output may fall or rise depending, among other things, on the sensitivity of domestic money demand to the foreign interest rate.

4 CAPITAL CONTROL POLICIES UNDER FLEXIBLE EXCHANGE RATES

When analyzing the consequences of capital controls under flexible exchange rates the following additional assumptions are made to rule out perverse effects (cf. the assumptions made by Tobin and de Macedo (1981) in section 3 of their study analyzing fiscal and monetary policies under flexible exchange rates):

(i) An increase in total wealth is not totally absorbed by savings but part of the increase goes into consumption ($A^B_W + A^F_W + A^M_W < 1$).

(ii) The country under consideration is a net creditor ($F_{-1} > 0$) and there is no J-curve effect (i.e., a devaluation improves the current account ceteris paribus: $CA_e + CA_W F_{-1} > 0$).

(iii) Exchange-rate expectations (which were exogenous under fixed exchange rates) are regressive[4] ($\hat{e}^e = f(e)$, $f' < 0$).

With these and the previously made assumptions, the totally differentiated version of the system (1) - (3) as well as the sign pattern of the system can be presented as follows:

$$(8) \qquad \begin{bmatrix} ID^B_r & B_e & ID^B_y \\ ID^F_r - CA_r & F_e & ID^F_y - CA_y \\ ID^M_r & M_e & ID^M_y \end{bmatrix} \begin{bmatrix} dr \\ -de \\ dy \end{bmatrix}$$

$$= \begin{bmatrix} A^B_{r*} & 0 \\ A^F_{r*} & CA_{r*} \\ A^M_{r*} & 0 \end{bmatrix} \begin{bmatrix} dt \\ dr^* = dt \end{bmatrix}$$

where $B_e = -A^B_W F_{-1} - f' A^B_{r*} < 0$

$F_e = (1-A^F_W) F_{-1} + CA_e + CA_W F_{-1} - f'(A^F_{r*} - CA_{\hat{e}^e}) > 0$

$M_e = -A^M_W F_{-1} - f' A^M_{r*} < 0$

$$(9) \qquad \begin{bmatrix} + & - & + \\ - & + & + \\ - & - & + \end{bmatrix} \begin{bmatrix} dr \\ -de \\ dy \end{bmatrix} = \begin{bmatrix} - & 0 \\ + & ? \\ - & 0 \end{bmatrix} \begin{bmatrix} dt \\ dr^* = dt \end{bmatrix}$$

$+ \; + \; +$ $\qquad\qquad$ $+ \; ?$

It is easy to show that the determinant of the matrix B on the left hand side of (8) is positive.

The effects of two types of disturbances are summarized in Table 2 (the case $d\hat{e}^e = dt$ is not relevant here, since $\hat{e}^e$ is endogenous).

TABLE 2

The Effects of Policies and Disturbances under Floating Exchange Rates

	The effects on		
Policy or disturbance	r	e	y
1. dt	?	-	?
2. $dr^* = dt$	?	$-\text{sgn}(CA_{r*})$	$\text{sgn}(CA_{r*})$

Consider first the effects of a change in the licensing fee or tax on capital transactions t. The only unambiguous result is that relaxing the control of capital movements ($dt < 0$; recall that the economy in question is assumed to be net creditor) will cause the domestic currency to depreciate ($de > 0$). The expressions for $\partial r/\partial t$ and $\partial y/\partial t$ (not reported here) are messy, ambiguous and rather uninformative; unlike in the case of fixed exchange rates, capital

controls do not seem to have a clearcut impact on the domestic interest rate and national income.

When the tax on capital transactions is used to keep the yield on foreign bonds constant ($dr^* = dt$), the results depend crucially on the sign of CA_{r^*}, as under fixed exchange rates. Since the country under study is a net creditor, CA_{r^*} can be positive or negative, as discussed in sections 2 and 3. If the increase in the interest earnings on foreign bonds dominates the worsening of the trade balance due to a lower export demand resulting from a higher foreign interest rate (so that $CA_{r^*} > 0$) $dr^* = dt > 0$ leads to an increase in domestic output and to an appreciation of the domestic currency. If the trade balance effect dominates the interest earnings effect (so that $CA_{r^*} < 0$), output falls and the currency depreciates. In both cases national income and the exchange rate move in opposite directions. The effect on the domestic interest rate remains ambiguous:

$$(10) \qquad \frac{\partial r}{\partial t}\Big|_{dr^* = dt} = \underset{?}{CA_{r^*}}(\underset{+}{ED^B_y}\underset{-}{M_e} - \underset{+}{ED^M_y}\underset{-}{B_e})/\underset{+}{detB} \gtrless 0$$

Overall the effects of capital control policies turn out to be much more ambiguous under floating exchange rates than under fixed exchange rates. This result is consistent with the finding by Haaparanta and Kähkönen (1986a) that the use of capital controls for insulation purposes in a floating exchange rate regime may be inappropriate due to anomalous exchange rate behavior. It is also consistent with the argument put forth by e.g. Driskill and McCafferty (1980) and McKinnon (1979) that insufficient speculation increases exchange rate volatility and may lead to perverse changes in exchange rates. Capital controls reduce speculation, and consequently they can be inconsistent with the floating rate system.

In the context of the present paper the potential incompatibility of capital controls and floating exchange rates can be seen clearly by considering the case when t, e, and y are endogenous. This corresponds to the case where monetary authorities pursue the

policy of pegging the rate of interest. The use of capital controls allows this policy without any fears of adverse effects on the foreign exchange reserves, if domestic interest rates are kept low to enhance economic growth.[5] Then it is straightforward to show that, for example, a favorable shock to the current account, say x, which in models characterized by the absence of capital control policies is known to cause the domestic currency to appreciate, may have a perverse effect on the echange rate:

$$(11) \qquad \frac{\partial e}{\partial x} = \frac{1}{\underset{?}{C}} \left(A^{M}_{r^*} \underset{-}{ID^{B}_{y}} - A^{B}_{r^*} \underset{+}{ID^{M}_{y}}\right) \gtrless 0$$

where the Jacobian determinant $C = A^{B}_{r^*}F_{e}ID^{M}_{y} + A^{M}_{r^*}B_{e}(ID^{F}_{y}-CA_{y})$

$$+ A^{F}_{r^*}M_{e}ID^{B}_{y} - A^{M}_{r^*}F_{e}ID^{B}_{y} - A^{F}_{r^*}B_{e}ID^{M}_{y} - A^{B}_{r^*}M_{e}(ID^{F}_{y}-CA_{y}) \gtrless 0$$

It should be emphasized that well-known causes for anomalous exchange rate behavior, such as the J-curve effect and perverse wealth effects, have been ruled out by assumption and that even in the special case when money demand is independent of the foreign interest rate ($A^{M}_{r^*} = 0$) exchange rate behavior remains ambiguous.

5 SUMMARY AND CONCLUDING REMARKS

The main conclusions of the study may be summarized as follows. First, the effects of changes in the degree of capital control are most unambiguous with respect to the balance of payments and the exchange rate. Under fixed exchange rates an increase in the tax on capital transactions (reflecting tighter control in a net creditor country and easier control in a net debtor country) causes the balance of payments to improve, and under floating exchange rates the domestic currency appreciates. The effects on the domestic interest rate and output are in general ambiguous, and they depend on the degree of sterilization, among other things. Thus capital control policies seem to be best suited for achieving balance-of-payments or exchange-rate targets.

Second, a policy of keeping the yield on foreign assets (or the costs of borrowing from abroad) constant via capital controls does have real effects which depend crucially on how the current account balance reacts to changes in the foreign interest rate. In particular, if the domestic policy authorities respond to an increase in the foreign interest rate by increasing the tax on capital movements by the same amount, output will grow and the balance of payments will improve provided that the country is a net debtor or "a sufficiently small" creditor.

Third, if expectations of a devaluation arise and if policy authorities react to this by using capital controls, a bigger than proportional increase in the tax on capital movements is needed to prevent output from falling and the balance of payments from worsening.

Fourth, the effects of capital control policies are much more ambiguous under floating exchange rates than under fixed exchange rates.

This paper has been concerned with the effects of changing the degree of capital control. A related question is whether capital

controls can help in insulating the domestic economy from external shocks. That question is addressed in Haaparanta and Kähkönen (1986a) using a similar framework. Another extension, studied in Haaparanta and Kähkönen (1986b), is to consider capital controls in an explicit optimizing framework in which wage rigidity causes a distortion, yielding capital control policies a potential role in an otherwise neoclassical world. A major advantage of that framework is that the effects and desirability of capital controls can be analyzed simultaneously.

FOOTNOTES

1. See Tables 1 and 2 in Greenwood and Kimbrough (1985a) or any recent issue of the IMF Report on Exchange Arrangements and Exchange Restrictions. For an international survey of foreign exchange controls see Rosenberg (1983).

2. For related recent studies see Cumby (1984), Adams and Greenwood (1985), Greenwood and Kimbrough (1985a, b), Stockman and Hernandez (1985), and Obstfeld (1986a, b). Adams and Greenwood demonstrated an equivalence between capital controls and dual exchange rates, which means that the analysis of this paper is to a large extent applicable for dual exchange rate systems and, conversely, that studies like the one by Cumby about monetary policy under dual exchange rates also have implications for economies with capital controls. Greenwood and Kimbrough showed that there is an equivalence between foreign exchange controls and tariffs (1985b), and examined the effects of fiscal policy in the presence of capital and exchange controls (1985a). Stockman and Hernandez studied the welfare effects of restrictions on international financial markets. Obstfeld investigated the effects of a devaluation under capital account restrictions (1986a), and analyzed the effects of capital account liberalization in a Latin American type of an economy (1986b).

3. An additional factor causing real effects would be the tax revenue (or subsidy payment) tF_{-1} which is, however, assumed to be offset by a lumpsum transfer.

4. Regressive exchange rate expectations imply that investors expect the exchange rate to return to its long-run equilibrium level. If all disturbances in the economy were unexpected and transitory rational expectations would also have the form of regressive expectations.

5. Indeed, many developing countries have pursued these type of policies which according to some authors' claims lead to financial depression. See e.g. McKinnon (1973).

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