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FLOATING EXCHANGE RATES AND CAPITAL MOBILITY*

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1 Introduction

Since the breakdown of the Bretton Woods fixed exchange rate system in the early 1970s, Finland, like Sweden and Norway and some other small countries, has pursued a policy of pegging the exchange rate by means of a currency index.[1] Lately, however, adherence to this policy has clearly diminished the scope for conducting monetary policies independently from the rest of the world because of the increased mobility and sensitivity of foreign capital flows. As financial integration increases, a fixed exchange rate regime in which the exchange rate is pegged to the currency index or to the EMS currencies is an obvious choice for exchange rate policy as part of the integration process. However, the reduction of autonomy in domestic monetary policy could be especially severe if there is a loss of confidence in the fixed exchange rate policy and consequent inflation target because of insufficient flexibility in the labour market and fiscal policy. In these circumstances domestic monetary policy becomes tightly constrained by the need to safeguard external liquidity.

Autonomy in domestic monetary policy could be desirable if economic gains can be expected. This might be the case when insulation from different shocks impinging on the economy is sought after or when economic structures and economic policy targets differ across countries. Differences in economic developments and in requirements for the conduct of successful economic policies might also call for an independent monetary policy.

Autonomy of monetary policy could be supported in the short run by isolating domestic and foreign financial markets, either by increasing controls on foreign capital movements or by flexible exchange rates. As the former is clearly not a realistic alternative under increased worldwide financial integration, introducing exchage rate flexibility is the only way to increase monetary autonomy.[2]

The choice between alternative exchange rate regimes by a small open economy seeking to insulate the economy from domestic and foreign shocks or from the point of view of policy effectiveness has been treated extensively in the literature and seems to depend on a range of structural factors.[3] These include the openness of the economy and the degree of capital mobility, the rigidity of wage and price adjustment and the interest rate elasticity of domestic demand.

On the other hand, insulation and policy effectiveness properties of flexible exchange rates also depend on similar factors. Normally this issue is studied assuming perfect capital mobility, i.e. uncovered interest rate parity. However, for many small open economies, such as Finland, perfect capital mobility cannot be assumed. Thus, the degree of capital mobility as well as wage and price rigidity become important in this connection. To study this issue a theoretical model is first constructed in section 2. In section 3 simulations with an econometric macromodel for Finland incorporating varying capital mobility is conducted. In the final section some concluding comments are given.

2 Theoretical considerations

2.1 The model

In this section the significance of capital mobility and wage indexation under a flexible or floating exchange rate regime in the adjustment of the economy to various kinds of shocks is examined with a simple rational expectations equilibrium model. The equations of the model are

$$(1) \qquad -a_1 \Delta r_t + a_2 \Delta y_t = \Delta H_t/P_t + \Delta R_t/P_t$$

$$(2)\quad e_t - e_{t-1} = \beta\Delta R_t/P_t = \beta\{b_2(p_t^* + e_t - p_t) - b_3 y_t + b_4 y_t^* + f\Delta[r_t - r_t^* - (E_t e_{t+1} - e_t)] + \Delta T_t^{cb}/P_t\},\ \beta \leq 0$$

$$(3)\quad p_t = \gamma(p_t^* + e_t) + (1 - \gamma)w_t,\ 0 \leq \gamma \leq 1$$

$$(4)\quad w_t = E_{t-1}p_t + \theta(p_t - E_{t-1}p_t),\ 0 \leq \theta \leq 1$$

$$(5)\quad y_t = b_1 y_t + CA_t/P_t = b_1 y_t + b_2(p_t^* + e_t - p_t) - b_3 y_t + b_4 y_t^*.$$

In the model lower case variables (except interest rates and production) are expressed as logarithms and r is the domestic interest rate, y production, H banks' central bank financing, R the foreign exchange reserves of the central bank, CA the current account, e the exchange rate, r^* the foreign interest rate, p^* the foreign price level, y^* a stochastic foreign demand shock, p the domestic price level and w wages. The expectations operator is denoted by E, with the subscript showing the period when expectations are formed for the endogenous variable in the next period.

Equation (1) is the equilibrium condition for the demand for and supply of real money balances. The foreign component of the supply of money is the change in the foreign exchange reserves consisting of the current account and capital account

$$(6)\quad \Delta R_t/P_t = CA_t/P_t + \Delta F_t/P_t - \Delta F_t^b/P_t,$$

where F is the net stock of foreign liabilities of the public and F^b banks' forward cover in the form of deposits with foreign banks. The open foreign exchange position of the public is

$$(7)\quad A_t^p/P_t = (F_t - T_t)/P_t = f[r_t - r_t^* - (E_t e_{t+1} - e_t)],$$

where T is forward exchange purchases.

It is assumed that the banks' foreign exchange position is closed, i.e.

$$(8) \qquad A_t^b/P_t = T_t/P_t - F_t^b/P_t - T_t^{cb}/P_t = 0,$$

where T^{cb} is forward exchange sales by the central bank.

According to (7) and (8)

$$(9) \qquad F_t/P_t - F_t^b/P_t = A_t^p/P_t + T_t^{cb}/P_t$$

$$= f[r_t - r_t^* - (E_t e_{t+1} - e_t)] + T_t^{cb}/P_t.$$

Equation (2) shows the exchange policy rule and the central bank is assumed to lean against the wind. If $\beta = 0$, the exchange rate is completely fixed and if $\beta = -\infty$, it is floating. Domestic prices are determined according to equation (3) as a weighted average of foreign prices and wages. Wages are set in equation (4) to be equal to expected prices in the previous period corrected for wage indexation. The indexation parameter θ varies between zero (no indexation) and one (complete indexation). In equation (5) the demand for the domestic commodity depends on relative prices and exogenous demand shocks. When b_2 approaches infinity domestic and foreign commodities become perfect substitutes, implying purchasing power parity. For simplicity it is assumed that domestic demand is not affected by the interest rate.

In the model the important parameters which are related to the economic policy or to the adjustment of the economy are β describing the degree of exchange policy activity, f financial openness so that as f increases towards infinity the uncovered interest rate parity (perfect capital mobility) obtains, b_2 commodity market openness and θ wage indexation.

The model can be reduced by inserting equations (3)-(5) into (1)-(2). The endogenous variables r_t and e_t depend on the exogenous variables H_t, T_t^{cb}, p_t^*, r_t^*, y_t^*, and expectations $E_t e_{t+1}$, $E_{t-1} e_t$ and $E_{t-1} p_t$. To close the model it is assumed that expectations are formed rationally. As the model is simultaneous and dynamic with respect to the exchange rate, prices and expectations concerning them, the model cannot be solved explicitly. The model can, however, be easily solved in some special cases. In the following the effects of unanticipated, temporary shocks in the short run and the effects of unanticipated, permanent disturbances in the long run are examined.

2.2 Short-run effects

In the case of an unanticipated and temporary shock in period t it can be assumed without loss of generality that $E_t h_{t+1} = E_t p^*_{t+1} = E_t r^*_{t+1} = E_t y^*_{t+1} = 0$ so that also $E_t e_{t+1} = 0$. Correspondingly, $E_{t-1} h_t = E_{t-1} p_t = E_{t-1} r^*_t = E_{t-1} y^*_t = 0$ implying $E_{t-1} e_t = E_{t-1} p_t = 0$. Under these assumptions and using approximations $H_t/P_t \simeq \omega_1(h_t - p_t)$ and $T_t^{cb}/P_t \simeq \omega_2(t_t^{cb} - p_t)$ the reduced form of the model is

$$(10) \qquad Ar_t + Be_t = -\omega_1 h_t - \omega_2 t_t^{cb} + Cp_t^* + fr_t^* + Dy_t^*.$$

$$(11) \qquad Er_t + Fe_t = \beta t_t^{cb} + Gp_t^* - \beta fr_t^* + Hy_t^*,$$

where

$$A = a_1 + f > 0$$

$$B = (b_2 - a_2 b_2' - b_3 b_2')(1 - \gamma') + f - (\omega_1 + \omega_2)\gamma' > 0$$

$$C = -(b_2 - a_2 b_2' - b_3 b_2')(1 - \gamma') + (\omega_1 + \omega_2)\gamma' \gtrless 0$$

$$D = (a_2 + b_3)b_4' - b_4 \gtrless 0$$

$$E = -\beta f > 0$$

$$F = 1 - \beta(b_2 - b_3 b_2')(1 - \gamma') - \beta(f - \omega_2 \gamma') > 0$$

$$G = \beta(1 - \gamma')(b_2 - b_3 b_2') - \beta\omega_2\gamma' < 0$$

$$H = -\beta(b_3 b_4' - b_4) < 0$$

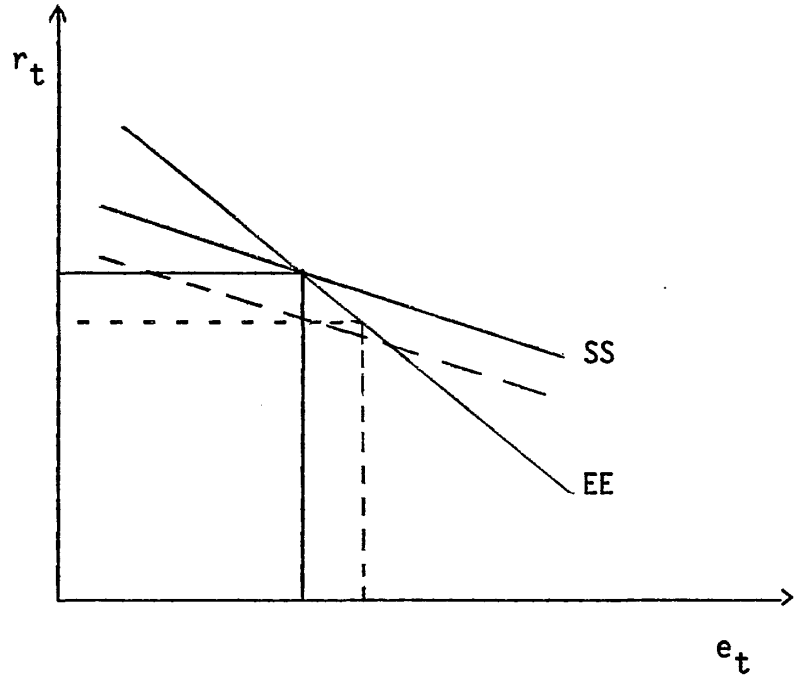
$$\gamma' = \gamma/[1 - (1 - \gamma)\theta] > 0$$

$$b_2' = b_2/(1 - b_1 + b_3) > 0$$

$$b_4' = b_4/(1 - b_1 + b_3) > 0$$

The slopes of the SS curve determined by the equilibrium in the money market, and the EE curve determined by the exchange policy rule are both negative. It can be shown that the latter is steeper.

Figure 1



According to the model an unanticipated, temporary increase in banks' central bank financing lowers the interest rate and depreciates the exchange rate (Figure 1). In the model forward market intervention

by the central bank is similar to sterilized intervention in the spot market. This is due to the banks' closed foreign exchange position together with endogenous interest rate and flexible exchange rate determination. A forward sale by the central bank appreciates the exchange rate while the effect on the interest rate is ambiguous. Effects of a foreign price level and demand shock are also ambiguous. A rise in the foreign interest rate raises the domestic interest rate and the exchange rate. The impact effects are as follows:

Table 1. Short-run effects, $\beta > -\infty$, $f < \infty$

	de_t	dr_t	dp_t	dw_t	dy_t
dh_t	+	-	+	+	+
dt_t^{cb}	-	?	-	-	-
dp_t^*	?	?	?	?	?
dr_t^*	+	+	+	+	+
dy_t^*	?	?	?	?	?

With increased indexation of wages the exchange rate also adjusts more sharply. But, according to equation (5), there is no exchange rate effect on production when indexation is complete. This is due to the absence of any lag between changes in wages and prices, i.e. the real wage is constant. On the other hand, changes in exchange rates are transmitted in full to domestic prices.

Next short-run effects of the shocks are examined when the exchange rate is flexible and capital mobility increases. First it is assumed that the exchange rate is completely flexible, thus $\beta = -\infty$. If we write $\Delta R_t/P_t = \Delta V_t^{cb}/P_t \simeq \omega_3(v_t^{cb} - p_t)$, intervention by the central bank in the spot exchange market can also be studied. With a floating exchange rate, equations (10) and (11) are of the form

$$(12)\quad a_1 r_t - [a_2 b_2'(1-\gamma') + (\omega_1+\omega_3)\gamma']e_t = -\omega_1 h_t - \omega_3 v_t^{cb} + [a_2 b_2'(1-\gamma') + (\omega_1+\omega_3)\gamma']p_t^* + a_2 b_4' y_t^*$$

$$(13)\quad fr_t + [f + (b_2 - b_3 b_2')(1-\gamma') - (\omega_2-\omega_3)\gamma']e_t = \omega_3 v_t^{cb} - \omega_2 t_t^{cb} + [(1-\gamma')(b_3 b_2' - b_2) + (\omega_2-\omega_3)\gamma']p_t^* + fr_t^* + (b_3 b_4' - b_4)y_t^*,$$

where v^{cb} is the purchase of foreign exchange by the central bank. In this case the SS curve is upward sloping. However, the impact effects of unanticipated and temporary shocks are qualitatively similar as in Table 1. Intervention in the foreign exchange market depreciates the exchange rate, while the interest rate effect is unambiguous.

Next, perfect capital mobility is assumed with parameter f approaching infinity. In this case the SS curve is unchanged while the EE curve is determined by simple interest rate parity: $r_t^* = r_t + e_t$.

With a floating exchange rate and perfect capital mobility, the effects of changes in the exogenous variables are:

Table 2. Short-run effects, $\beta \to -\infty$, $f \to \infty$

	de_t	dr_t	dp_t	dw_t	dy_t
$dh_t \tilde{-} dv_t^{cb}$	+	-	+	+	+
dt_t^{cb}	0	0	0	0	0
dp_t^*	-	+	?	?	?
dr_t^*	+	+	+	+	+
dy_t^*	-	+	-	-	?

When domestic and foreign assets are perfect substitutes, domestic money market and foreign exchange interventions are equivalent while sterilized intervention being now identical to forward market intervention has no effect. An increase in foreign prices has an ambiguous effect on domestic prices, wages and production because domestic prices are determined in the model by foreign prices and the exchange rate, when $\gamma > 0$.

2.3 Long-run effects

As the above disturbances were unanticipated and transitory, their effects on the economy were also transitory. In order to analyze long-run effects of unanticipated and permanent changes in the exogenous variables of the model it can be assumed that expectations are realized, i.e. $E_t e_{t+1} = E_{t-1} e_t = e_t = \bar{e}$ and $E_{t-1} p_t = p_t = \bar{p}$. This implies that in the steady state solution wage indexation is irrelevant and also that purchasing power parity is obtained: $\bar{p} = \bar{p}^* + \bar{e}$.

In the long-run equilibrium solution of the model unanticipated and permanent shocks change domestic interest rate and exchange rate qualitatively in the same way as unanticipated and temporary shocks in the short run. As, in the long-run, purchasing power parity applies and relative prices (real exchange rate) are constant, only commodity market disturbances affect production. This result is analogous in the short run if wage indexation is complete.

Equations (10) and (11) are now of the form

$$(14) \qquad (a_1 + f)\bar{r} - (f + \omega_1 + \omega_2)\bar{e} = -\omega_1 \bar{h} - \omega_2 \bar{t}^{cb} + f\bar{r}^* + D\bar{y}^* + (\omega_1 + \omega_2)\bar{p}^*$$

$$(15) \qquad -\beta f\bar{r} + (1 - \beta f + \beta\omega_2)\bar{e} = \beta\omega_2 \bar{t}^{cb} - \beta f\bar{r}^* + H\bar{y}_t^* - \beta\omega_2 \bar{p}^*$$

The SS curve is upward sloping and the EE curve downward sloping.

The effects of the shocks with a flexible exchange rate and imperfect capital mobility are as follows

Table 3. Long-run effects, $\beta > -\infty$, $f < \infty$

	$d\bar{e}$	$d\bar{r}$	$d\bar{p}$	$d\bar{w}$	$d\bar{y}$
$d\bar{h}$	+	-	+	+	0
$d\bar{t}^{cb}$	-	?	-	-	0
$d\bar{p}^{*}$	?	+	?	?	0
$d\bar{r}^{*}$	?	+	?	?	0
$d\bar{y}^{*}$	?	?	?	?	?

The long-run effects also are rather ambiguous with imperfect capital mobility and a floating exchange rate. When perfect capital mobility prevails the effects are:

Table 4. Long-run effects, $\beta \to -\infty$, $f \to \infty$

	$d\bar{e}$	$d\bar{r}$	$d\bar{p}$	$d\bar{w}$	$d\bar{y}$
$d\bar{h} \simeq d\bar{v}^{cb}$	+	-	+	+	0
$d\bar{t}^{cb}$	0	0	0	0	0
$d\bar{p}^{*}$	-	+	?	?	0
$d\bar{r}^{*}$	+	+	+	+	0
$d\bar{y}^{*}$	-	+	-	-	+

3 Simulations

3.1 Introduction

In the framework of the theoretical model in the preceding section it was seen in a qualitative fashion that with flexible and floating exchange rates monetary policy retained its effectiveness in both the short run and the long run. However, with increasing capital mobility, sterilized interventions are ineffective as interventions in the domestic money market and foreign exchange market are equivalent. Thus, with various shocks impinging on the economy, monetary policy could be used effectively to isolate the economy from disturbances.

To assess quantitatively and dynamically how much capital mobility matters for insulation and the effectiveness of monetary policy under floating exchange rates, we study simulations with the BOF4 model.[4] BOF4 is an econometric model of the Finnish economy constructed at the Bank of Finland.[5] It is a quarterly model of about 300 equations. In the short run the model is Keynesian with production determined by demand and prices by costs while the long-run properties are classical, with wages equilibrating the labour market, production adjusting according to capacity and domestic prices determined by foreign prices and the exchange rate.

Specification of the financial market in the BOF4 model is characterized by assuming that all non-money assets which are denominated in domestic currency are close substitutes so that there is a single market rate of interest sufficient to measure the intertemporal opportunity costs of investment, consumption and holding money. Moreover, money is treated like a durable good for which a stable demand function exists. Assets denominated in foreign currency are assumed to be imperfect substitutes for domestic assets (Tarkka and Willman, 1990).

Below, the version of the model in which the domestic interest rate is flexible and the exchange rate floating is used. In the model exchange rate expectations are restrictedly rational in the sense that agents know the structure of the model only with respect

to the foreign exchange market and also all future changes in the exogenous variables are unexpected.[6]

3.2 The results

In the following the effects of unanticipated and permanent changes in the exogenous variables in the floating rate version of the model are examined when capital mobility is increasing. As noted above, this has occurred in Finland during recent years and is expected to continue as international financial integration proceeds.[7]

In the equation for the net import of foreign capital in the basic version of the BOF4 model (version A), capital imports increase by FIM 3 billion as the difference between the domestic and foreign interest rate increases by 1 percentage point. To examine the significance of increasing capital mobility for the adjustment of the economy, capital mobility was increased 2, 10 and 50 times (versions B, C and D). These four versions of the model are used to run the following simulations for the period 1988.Q1 - 1993.Q4:

1 Money market intervention: a FIM 100 million purchase of FIM-denominated CD's on the interbank market by the central bank.
2 Unsterilized foreign exchange intervention: a purchase of foreign currency in the amount of FIM 100 million by the central bank.
3 Sterilized foreign exchange intervention: a FIM 1000 million forward exchange purchase by the central bank.
4 A foreign price shock: an increase of 1 per cent in foreign prices.
5 A foreign interest rate shock: an increase of 1 percentage point in the foreign interest rate.
6 A foreign demand shock: an increase of 1 per cent in foreign export demand.

The effects of these changes in the four versions of the model are summarized in Tables 5 - 10.

Table 5. Money market intervention: a FIM 100 million purchase of FIM-denominated CD's on the interbank market by the central bank

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	1.6	0.3	0.9	0.2	0.7	-0.1	0.1	0.2	0.1	0.1
B	2.0	0.1	0.9	0.0	0.7	-0.1	0.2	0.2	0.2	0.2
C	3.1	-1.2	1.7	-1.2	0.5	0.1	0.2	0.2	0.2	0.2
D	4.1	-3.4	4.4	-4.9	0.0	-0.2	0.2	0.9	1.4	1.4
Domestic interest rate, percentage points										
A	-3.8	0.7	0.6	1.0	-0.4	0.2	-0.1	-0.0	-0.1	-0.1
B	-3.7	0.8	0.6	0.8	-0.3	0.2	-0.1	-0.0	-0.1	-0.1
C	-3.7	1.1	0.7	0.6	-0.3	0.1	-0.0	-0.0	-0.0	-0.0
D	-3.6	1.3	0.5	0.6	-0.3	0.1	-0.1	-0.1	-0.2	-0.1
GDP, %										
A	0.1	0.4	0.4	0.4	0.3	0.1	-0.0	-0.0	-0.1	-0.1
B	0.1	0.5	0.4	0.4	0.3	0.1	0.0	-0.0	-0.1	-0.1
C	0.2	0.5	0.3	0.3	0.3	0.1	0.0	-0.0	-0.1	-0.1
D	0.2	0.5	0.2	0.4	0.3	0.1	-0.0	-0.1	-0.2	-0.2
Consumption prices, %										
A	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
B	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
C	0.4	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.2
D	0.5	-0.0	0.4	-0.0	0.2	0.2	0.3	0.3	0.4	0.4
Current account, bill. FIM										
A	0.2	-0.0	-0.0	-0.1	-0.0	-0.1	0.1	0.1	0.1	0.1
B	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.1	0.1
C	0.3	-0.2	-0.0	-0.2	-0.2	-0.0	0.0	0.1	0.1	0.2
D	0.4	-0.4	0.1	-0.5	-0.4	-0.4	0.1	0.4	0.7	0.7

Table 6. Unsterilized foreign exchange intervention: a purchase of foreign currency in the amount of FIM 100 million by the central bank

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	1.6	0.3	0.9	0.2	0.7	-0.1	0.1	0.2	0.1	0.1
B	2.0	0.1	0.9	0.0	0.7	-0.1	0.2	0.2	0.2	0.2
C	3.1	-1.2	1.7	-1.2	0.5	0.1	0.2	0.2	0.2	0.2
D	4.1	-3.4	4.4	-4.9	0.0	-0.2	0.2	0.9	1.4	1.4
Domestic interest rate, percentage points										
A	-3.8	0.7	0.6	1.0	-0.4	0.2	-0.1	-0.0	-0.1	-0.1
B	-3.7	0.8	0.6	0.8	-0.3	0.2	-0.1	-0.0	-0.1	-0.1
C	-3.7	1.1	0.7	0.6	-0.3	0.1	-0.0	-0.0	-0.0	-0.0
D	-3.6	1.3	0.5	0.6	-0.3	-0.1	-0.1	-0.1	-0.2	-0.1
GDP, %										
A	0.1	0.4	0.4	0.4	0.3	0.1	-0.0	-0.0	-0.1	-0.1
B	0.1	0.5	0.4	0.4	0.3	0.1	0.0	-0.0	-0.1	-0.1
C	0.2	0.5	0.3	0.3	0.3	0.1	0.0	-0.0	-0.1	-0.1
D	0.2	0.5	0.2	0.4	0.3	0.1	-0.0	-0.1	-0.2	-0.2
Consumption prices, %										
A	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
B	0.3	0.2	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
C	0.4	0.2	0.3	0.2	0.3	0.2	0.2	0.2	0.3	0.2
D	0.5	-0.0	0.4	-0.0	0.2	0.2	0.3	0.3	0.4	0.4
Current account, bill. FIM										
A	0.2	-0.0	-0.0	-0.1	-0.0	-0.1	0.1	0.1	0.1	0.1
B	0.2	-0.1	-0.1	-0.1	-0.1	-0.1	0.1	0.1	0.1	0.1
C	0.3	-0.2	-0.0	-0.2	-0.2	-0.0	0.0	0.1	0.1	0.2
D	0.4	-0.4	0.1	-0.5	-0.4	-0.4	0.1	0.4	0.7	0.7

According to Tables 5 and 6, money market intervention and unsterilized foreign exchange intervention have roughly identical effects regardless of capital mobility. This is due to the fact that even in the basic A version of the model domestic and foreign asset are fairly close substitutes for each other so that interventions are indifferent. Immediately after the intervention, the domestic interest rate decreases and the exchange rate depreciates because of capital exports. Soon, as a countereffect, there occurs a reversal with the interest rate rising and the exchange rate appreciating.

When capital mobility is increasing the exchange rate depreciates more sharply because the immediate interest rate effect of the intervention does not depend much on the degree of capital mobility. Thus, the effectiveness of monetary policy for stabilization purposes increases.

Table 7. Sterilized foreign exchange intervention: a FIM 1000 million forward exchange purchase by the central bank

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	0.7	0.3	0.4	0.2	0.4	0.1	0.1	0.1	0.1	0.0
B	0.5	0.1	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1
C	0.2	0.0	0.1	-0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	0.0	-0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0
Domestic interest, percentage points										
A	0.1	0.1	0.3	0.4	0.2	0.2	0.1	0.1	0.0	0.0
B	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.0	0.0
C	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GDP, %										
A	0.0	0.1	0.1	0.1	0.1	0.0	-0.0	-0.1	-0.1	-0.1
B	0.0	0.1	0.1	0.1	0.1	0.0	-0.0	-0.0	-0.0	-0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0
Consumption prices, %										
A	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
B	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Current account, bill. FIM										
A	0.1	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.2
B	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

In the model sterilized foreign exchange intervention, i.e. a simultaneous sale of spot foreign exchange and an increase of equivalent amount in the central bank financing of the banks, corresponds to a forward market intervention. This follows from the fact that in the model the interest rate is flexible and the foreign exchange position of the banks is closed. According to Tables 5 and 6, the effects of a sterilized foreign exchange intervention are minor. In Table 7 a 10-fold intervention compared with the above

interventions displays visible effects. In particular the conventional result emerges that when capital mobility is increasing the effects of a sterilized intervention are reduced and only minor and short-run exchange rate changes can be effected.

Table 8. Foreign price shock: an increase of 1 per cent in foreign prices

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	-0.7	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
B	-0.8	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
C	-0.8	-1.1	-1.0	-1.1	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
D	-0.8	-1.1	-0.9	-1.1	-1.0	-1.0	-1.0	-1.0	-1.0	-0.9
Domestic interest rate, percentage points										
A	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0
B	0.0	0.0	0.1	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0
C	0.0	0.0	0.1	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0
GDP, %										
A	0.0	0.0	0.0	-0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0
B	0.0	0.0	0.0	-0.0	0.0	-0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0
D	0.0	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	-0.0	-0.0
Consumption prices, %										
A	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	0.0
B	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	-0.0	-0.0	-0.0	-0.0	-0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Current account, bill. FIM										
A	0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	-0.0
B	0.0	-0.0	0.0	0.0	-0.0	0.1	0.0	0.0	0.0	0.0
C	-0.0	-0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0	0.0
D	-0.0	-0.0	0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0

According to Table 8, a permanent increase in foreign prices in the different versions of the model is reflected only in an immediate and permanent appreciation of the exchange rate regardless of capital mobility. Thus, with relative prices (real exchange rate) unchanged the effects on the domestic interest rate, prices and production are small.

Table 9. Foreign interest rate shock: an increase of 1 percentage point in the foreign interest rate

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	1.9	0.8	1.1	0.5	1.1	0.3	0.2	0.3	0.2	0.2
B	2.5	0.8	1.3	0.5	1.3	0.4	0.4	0.5	0.4	0.4
C	4.2	0.0	2.1	-0.2	1.5	0.7	0.8	0.9	0.9	0.9
D	6.0	-2.2	4.7	-3.6	1.1	0.5	0.9	1.5	2.0	2.1
Domestic interest rate, percentage points										
A	0.1	0.5	0.8	1.1	0.7	0.7	0.3	0.2	0.1	0.0
B	0.2	0.6	1.1	1.2	0.8	0.8	0.4	0.4	0.3	0.2
C	0.3	1.0	1.4	1.2	1.0	0.9	0.6	0.6	0.6	0.6
D	0.4	1.4	1.5	1.3	1.1	1.0	0.7	0.7	0.7	0.7
GDP, %										
A	0.1	0.3	0.3	0.3	0.3	0.1	-0.1	-0.2	-0.3	-0.3
B	0.1	0.4	0.4	0.4	0.3	0.1	-0.1	-0.2	-0.3	-0.3
C	0.2	0.5	0.4	0.4	0.4	0.1	-0.1	-0.2	-0.3	-0.4
D	0.3	0.6	0.4	0.5	0.4	0.1	-0.1	-0.3	-0.4	-0.5
Consumption prices, %										
A	0.3	0.3	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.2
B	0.3	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4
C	0.5	0.5	0.4	0.4	0.5	0.6	0.7	0.8	0.8	0.8
D	0.8	0.3	0.7	0.4	0.5	0.7	0.8	0.9	1.1	1.1
Current account, bill. FIM										
A	0.2	0.1	0.0	0.0	0.3	0.2	0.5	0.5	0.5	0.5
B	0.2	0.1	0.0	0.0	0.4	0.3	0.5	0.6	0.7	0.8
C	0.4	0.0	0.1	-0.0	0.4	0.4	0.7	0.9	1.1	1.3
D	0.5	-0.2	0.2	-0.3	0.2	0.2	0.8	1.2	1.7	2.0

In Table 9 a permanent rise in the foreign interest rate leads to capital exports which depreciate the exchange rate. This has a positive GDP effect with both the demand for money and the domestic interest rate increasing.

The greater is capital mobility the more the exchange rate depreciates in the short run. This is because changes in the domestic interest rate bring the money market into equilibrium only after a lag, causing fluctuations in the exchange rate. In the long run the exchange rate and the interest rate change more with increasing capital mobility.

Table 10. Foreign demand shock: an increase of 1 per cent in foreign export demand

Model version	Quarter I	II	III	IV	Year 1.	2.	3.	4.	5.	6.
Exchange rate, %										
A	-1.7	-0.8	-0.9	-0.7	-1.0	-0.6	-0.5	-0.5	-0.5	-0.4
B	-1.6	-0.6	-0.7	-0.6	-0.9	-0.5	-0.5	-0.5	-0.5	-0.4
C	-1.4	-0.1	-0.7	-0.2	-0.6	-0.4	-0.4	-0.4	-0.4	-0.4
D	-1.2	0.2	-0.9	0.4	-0.4	-0.2	-0.2	-0.3	-0.3	-0.4
Domestic interest rate, percentage points										
A	-0.0	-0.2	-0.6	-0.5	-0.3	-0.4	-0.2	-0.2	-0.1	-0.1
B	-0.0	-0.2	-0.4	-0.5	-0.3	-0.3	-0.1	-0.1	-0.1	-0.1
C	-0.0	-0.1	-0.3	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1
D	-0.0	-0.1	-0.1	-0.1	-0.1	-0.0	-0.0	-0.0	-0.0	-0.0
GDP, %										
A	0.0	-0.1	-0.1	-0.1	-0.1	0.0	0.2	0.3	0.3	0.3
B	0.0	-0.1	-0.1	-0.1	-0.1	0.1	0.2	0.2	0.2	0.2
C	-0.0	-0.1	-0.1	-0.0	0.0	0.1	0.2	0.2	0.2	0.1
D	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Consumption prices, %										
A	-0.2	-0.3	-0.3	-0.4	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3
B	-0.2	-0.3	-0.2	-0.3	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3
C	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
D	-0.2	-0.1	-0.2	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1
Current account, bill. FIM										
A	0.0	0.1	0.1	0.1	0.3	0.3	0.1	-0.0	-0.1	-0.1
B	0.0	0.1	0.1	0.1	0.3	0.3	0.1	0.0	-0.0	-0.1
C	0.0	0.1	0.1	0.1	0.4	0.4	0.3	0.2	0.1	0.1
D	0.1	0.2	0.1	0.2	0.5	0.4	0.3	0.3	0.2	0.2

As a result of the rise in foreign demand the exchange rate immediately appreciates because of an improvement in the current account (Table 10). The domestic interest rate has to decline because in the short-run the exchange rate appreciation has a negative effect on production and the demand for money. In the longer run these effects are weaker. Again, when capital mobility increases, adjustment of the domestic interest rate and the exchange rate are smaller and thus insulation from the demand disturbance is more complete.[8]

4 Concluding comments

As economic and financial integration in Europe is advancing rapidly and, moreover, exchange rate cooperation is intensifying, a natural choice for a small European country participating in the economic dimension of integration is to peg its currency to the EMS currencies. However, this would entail loss of independence in both monetary and fiscal policy. If this is deemed undesirable a policy option to support economic policy autonomy is to let the currency float.

In this paper floating exchange rates are studied in Finland in the circumstances of increasing financial integration and capital mobility. The effects of various shocks and the effectiveness of monetary policy in the framework of a theoretical model and the BOF4 econometric macromodel of the Finnish economy are examined. The results of this paper suggest that, with increasing capital mobility, the economy is better insulated from all the shocks studied except the foreign interest rate shock.

Policy implications from the results are quite conventional. As capital becomes more mobile the effectiveness of monetary policy in the form of intervention in the money market or unsterilized foreign exchange interventions increases while sterilized foreign exchange interventions become ineffective. However, this increase in the effectiveness of monetary policy is achieved at a cost of a loss in the effectiveness of fiscal policy.

FOOTNOTES

1. The Finnish exchange rate basket is constructed using bilateral trade weights, the effective weight of the EMS currencies being more than 60 per cent. The Central Bank can allow for fluctuations within the 6 per cent band. Realignements of the band are made by the Government on the proposal of the Parliamentary Supervisory Board.

2. Exchange rate flexibility would also serve to directly decrease capital mobility, which is inversely related to exchange risk; see Aurikko (1985).

3. For recent surveys, see Marston (1985) and Argy (1989).

4. In the simulations cooperation with Alpo Willman is gratefully acknowledged.

5. See BOF4 (1987) and Willman (1989).

6. This assumption seems not to be overly restrictive as simulations with a model in which expectations are strictly rational are similar; see Aurikko (1989).

7. In countries with a floating exchange rate, it is normally the case that capital movements are also free and uncovered interest rate parity is assumed. Experiences gained in Australia and New Zealand after letting the exchange rate float and abolishing exchange controls indicate that uncovered interest rate parity also obtains (see Argy, and Murphy, 1986).

8. This result as well as simulations with a fiscal shock indicate that as capital mobility increases effectiveness of fiscal policy diminishes.

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