

# Capital Mobility and Fiscal Policy Under Flexible Exchange Rates: An Application of Romer's IS-MP Model

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## Abstract

This paper applies Romer's IS-MP model to reexamine the well-known Mundell proposition: fiscal policy is totally ineffective in changing domestic output under flexible exchange rates with perfect capital mobility. We show that the Mundell proposition is mainly based on the IS-LM framework. If the LM curve was replaced by the monetary policy function and the exchange rate affects this policy function, we further show that fiscal policy does stimulate domestic output. This indicates that the Mundell proposition is sensitive to the specification of monetary policy reaction function.

## Keywords

Romer's IS-MP Model, Central Bank Reaction Function, Fiscal Policy, Capital Mobility, Flexible Exchange Rates

## 1. Introduction

In his path breaking 1963 paper, Robert Mundell [1] uses the IS-LM model, the primary model of short-run economic fluctuations, to show that fiscal policy is totally ineffective in changing domestic output under flexible exchange rates if the economy is small and capital is perfectly mobile. This interesting and important proposition has been reproduced in most of intermediate macroeconomics and international economics textbooks, see Blanchard and Johnson [2] and Mankiw [3]. Recent works by Taylor [4],[5] and Romer [6],[7],[8] make a strong case for an alternative model. Romer proposes the IS-MP model to replace the conventional IS-LM model. He points out that "[t]he alternative replaces the LM curve, along with its assumption that the central bank targets the money supply, with an assumption that the central bank follows a real interest rate rule." Romer [6]. Romer [7] further confirms that the Mundell proposition holds in the IS-MP model. This confirmation is based on the assumption that the real interest rate rule is independent of the exchange rate. However, Ball [9], Hsing [10],[11],[12], Krugman [13], Svensson [14] and Taylor [5] suggest that the exchange rate will affect central bank's interest rate target. It should be noted that Romer is also aware of this. He notes that "the real exchange rate may affect the central bank's interest rate

target. For simplicity we neglect this possibility here." [7]

The purpose of this paper is to show that the Mundell proposition is sensitive to plausible specification in the real interest rate rule along the lines of the suggestion of Ball [9], Hsing [10],[11],[12], Krugman [13], Romer [7], Svensson [14] and Taylor [5]. It will be shown that fiscal policy is effective in changing domestic output under flexible exchange rates with perfect capital mobility if the exchange rate is included in the real interest rate reaction function.

## 2. The IS-MP Model

Following Romer [7], the small open economy with perfect capital mobility can be described by the following three equations:

$$Y = C(Y-T) + I(r) + G + NX(Y-T, \varepsilon) \quad (1)$$

$$r = r(Y, \varepsilon, \pi) \quad (2)$$

$$r = r^* \quad (3)$$

where  $Y$  = output,  $C$  = consumption,  $T$  = tax,  $I$  = investment,  $r$  = real interest rate,  $G$  = government purchases,  $NX$  = net export,  $\varepsilon = eP^*/P$  = real exchange rate,  $e$  = nominal exchange rate,  $P^*$  = price of foreign goods,  $P$  = price of domestic goods,  $\pi$  = inflation rate,  $r^*$  = foreign real interest rate. It is

assumed, as usual, that  $1 > C' \equiv \partial C/\partial(Y-T) > 0$ ,  $I_r \equiv dI/dr < 0$ ,  $NX'_\epsilon \equiv \partial NX/\partial(Y-T) < 0$ ,  $NX_\epsilon \equiv \partial NX/\partial\epsilon > 0$ ,  $r_Y \equiv \partial r/\partial Y > 0$ ,  $r_\epsilon \equiv \partial r/\partial\epsilon > 0$ ,  $r_\pi \equiv \partial r/\partial\pi > 0$ . Note that  $NX_\epsilon > 0$  is the well-known Marshall-Lerner condition.

Equation (1) represents the IS curve. Equation (2) is the monetary policy (MP) reaction function. It indicates that the central bank follows the real interest rate in making policy. Equation (3) describes the perfect capital mobility condition. It indicates that the real interest rate ( $r$ ) in the economy is determined by the foreign real interest rate ( $r^*$ ). It is worth noting that the inclusion of the real exchange rate as an argument in the real interest rate reaction function constitutes the only point of departure from Romer's model.

Substituting (3) into (1) and (2), we obtain

$$Y = C(Y-T) + I(r) + G + NX(Y-T, \epsilon) \quad (1')$$

$$r^* = r(Y, \epsilon, \pi) \quad (2')$$

where  $Y$  and  $\epsilon$  are endogenous variables.  $G$ ,  $T$ ,  $r^*$  and  $\pi$  are exogenous variables. We can solve (1') and (2') for the equilibrium values of  $Y$  and  $\epsilon$  as:

$$Y = Y(G, T, r^*, \pi) \quad (4)$$

$$\epsilon = \epsilon(G, T, r^*, \pi) \quad (5)$$

The expressions for the partial derivatives such as  $\partial Y/\partial G$  and  $\partial \epsilon/\partial G$  can be obtained by applying the standard comparative static procedure. Totally differentiating (1') and (2') and using Cramer's rule, we obtain

$$(\partial Y/\partial G) = (1/J)r_\epsilon \quad (6)$$

$$(\partial \epsilon/\partial G) = (-1/J)r_Y \quad (7)$$

and

$$J = (1-C'-NX')r_\epsilon + r_Y NX_\epsilon > 0 \quad (8)$$

Assume first that  $r_\epsilon = 0$ . It follows from (6) and (7) that

$$(\partial Y/\partial G) = 0, (\partial \epsilon/\partial G) = (-1/J)r_Y < 0 \quad (9)$$

where  $J = r_Y NX_\epsilon > 0$ .

Thus, an increase in government purchases leads only to the appreciation of the exchange rate and has no effect on domestic output. This result is consistent with Romer's in [7] and the Mundell proposition.

But if  $r_\epsilon > 0$ , then it follows that

$$(\partial Y/\partial G) > 0, (\partial \epsilon/\partial G) < 0 \quad (10)$$

In other words, if the exchange rate affects the central bank's interest rate target, fiscal policy is effective under flexible exchange rates with perfect capital mobility. This shows that the Mundell proposition is sensitive to the specification of the monetary policy rule.

The different results in (9) and (10) can be well understood by examining equations (2) and (3) together, i.e., equation (2'):  $r^* = r(Y, \epsilon, \pi)$ . In the conventional view,  $r_\epsilon = 0$ . At a given inflation rate, fiscal policy does not have the impact on

domestic output because the domestic output must remain intact for ensuring  $r = r^*$ . However, in the case where  $r_\epsilon > 0$ , an increase in government expenditure will increase domestic output because  $Y$  and  $\epsilon$  will change simultaneously to fulfill  $r = r^*$ .

### 3. Graphic Depiction

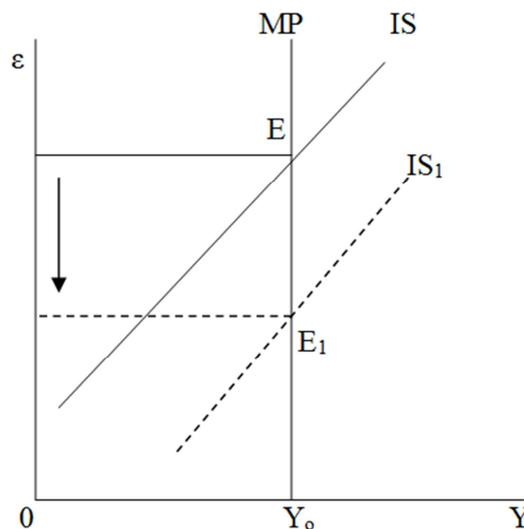


Figure 1. The Case of  $r_\epsilon = 0$ .

$$(d\epsilon/dY)_{IS} = -[(1-C'-NX')/NX_\epsilon] > 0$$

$$(d\epsilon/dY)_{MP} = -(r_Y/r_\epsilon) \rightarrow -\infty \text{ as } r_\epsilon = 0.$$

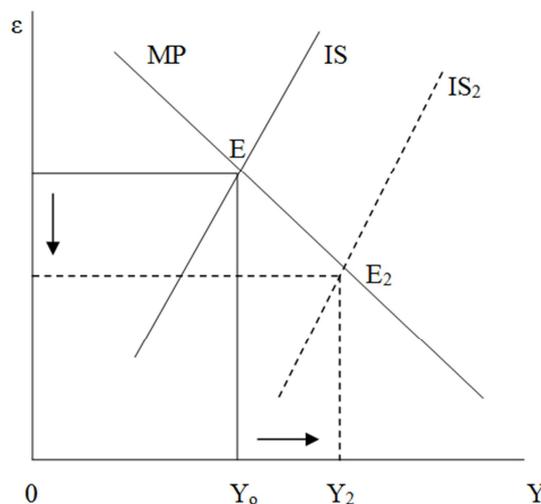


Figure 2. The Case of  $r_\epsilon > 0$ .

$$(d\epsilon/dY)_{IS} = -[(1-C'-NX')/NX_\epsilon] > 0$$

$$(d\epsilon/dY)_{MP} = -(r_Y/r_\epsilon) < 0.$$

The analysis in the preceding section can be illustrated graphically with the help of two diagrams. In Figures 1 and 2, each of two lines graphs one of the equations (1) and (2) with  $r = r^*$ : IS for (1) and MP for (2). The equilibrium is established at E. In the case of  $r_\epsilon = 0$ , IS is upward sloping and MP is vertical. This is depicted in Figure 1. An increase in government purchases shifts IS rightward to  $IS_1$ . The new

equilibrium will be established at  $E_1$ . Thus, an increase in government purchases will appreciate the exchange rate but will not have any effect on domestic output. This is the well-known 1963 Mundell proposition. It should be noted that this graphic presentation is similar to that in Mankiw [3] and Romer [7].

In the case where the exchange rate affects the central bank's interest rate target, that is  $r_e > 0$ , MP is downward sloping and IS is upward sloping. This is shown in Figure 2. An increase in government purchases shifts IS rightward to  $IS_2$ . The new equilibrium will be established at  $E_2$ . Thus, an increase government purchases will increase domestic output and appreciate the exchange rate. In this case, we can see that the Mundell proposition does not hold.

#### 4. Conclusions

In his best known 1963 paper [1], Mundell considers a small country case with perfect capital mobility and uses the IS-LM framework to examine the effects of fiscal and monetary policies under flexible exchange rates. He concludes that:

Fiscal policy ...completely loses its force as a domestic stabilizer when the exchange rate is allowed to fluctuate and the money supply is held constant. Just as monetary policy derives its importance as a domestic stabilizer from its influence on capital flows and the exchange rate, so fiscal policy is frustrated in its effects by these same considerations. [1]

In other words, fiscal policy is completely ineffective in changing domestic output under flexible exchange rates with perfect capital mobility. Recently, Romer [7] employs the IS-MP model to confirm this Mundell proposition.

In this paper, we have attempted a simplified synthesis of the Mundell IS-LM model and the Romer IS-MP model by replacing the LM curve with the monetary policy function (MP). We have further explicitly introduced the exchange rate into the monetary policy function. This modified Mundell-Romer IS-MP model enables us to reexamine the impact of fiscal policy on domestic output and the exchange rate under flexible exchange rates with perfect capital mobility. In the case where the central bank's interest rate rule is independent of the exchange rate, i.e.,  $r_e = 0$ , we show that an increase in government purchases will appreciate the exchange rate but will not have any effect on domestic output. This result is consistent with the Mundell proposition [1] that fiscal policy is completely ineffective in changing domestic output under flexible exchange rates with perfect capital mobility. This is also consistent with the one in Romer's IS-MP model [7].

In the case where the central bank's interest rate rule is dependent of the exchange rate, i.e.,  $r_e \neq 0$ , we show that an increase in government purchases will increase domestic output and appreciate the exchange rate. This result is quite different from the well-known Mundell proposition and Romer's result. It demonstrates that fiscal policy is effective

in controlling the level of domestic output. This indicates that the standard Mundell proposition does not apply if the exchange rate affects central bank's monetary policy making. More importantly, our analysis has generalized recent discussions on the issue that under flexible exchange rates only monetary policy can affect domestic output and the effect of expansionary fiscal policy on domestic output is offset by a rise in the exchange rate and a decrease in net export in the sense that this Mundell result can be easily obtained from our extended IS-MP model by assuming that the interest rate rule is independent of the exchange rate.

Finally, it is of interest to note that our extended IS-MP model is an alternative short-run international macroeconomic model. Hsing [10],[11],[12] applies the extended IS-MP model and Engle's GARCH process [15],[16] to empirically examine the short-run output fluctuations in Germany (1975 – 2003), Singapore (1986 – 2003) and Poland (1996 – 2003) and analyze the impact of changes in macroeconomic variables on domestic output in each country during sample ranges. Major findings of Hsing's empirical study in Germany, Singapore and Poland show that the extended IS-MP model works very well..

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