The Effectiveness of Monetary Policy Reconsidered

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Abstract

This paper inspects the standard policy rule that under a flexible exchange rate regime with perfectly elastic capital flows monetary policy is effective and fiscal policy is not. The logical validity of the statement requires that the effect of an exchange rate change on the domestic price level be ignored. The price level effect is noted in some textbooks, but not formally analysed. When it is subjected to a rigorous analysis, the interaction between changes in the exchange rate and the domestic price level significantly alters the standard policy rule.

The logically correct statement would be, under a flexible exchange rate regime with perfectly elastic capital flows the effectiveness of monetary policy depends on the values of the import share and the sum of the trade elasticities. Inspection of data from developing countries indicates the effectiveness of monetary policy under flexible exchange rates can be quite low even if capital flows are perfectly elastic.

I. The Issue Stated

> Since the early 1960s, the dominant policy paradigm for studying open-economy monetary and fiscal policy issues has been the Keynesian framework developed by Mundell and Fleming. (Obsteld & Rogoff 1996, 609)[1]

As the quotation indicates, the keystone of open economy macroeconomics is the Mundell-Fleming model (MF model), approaching its fiftieth birthday.[2] The model provided a simple and apparently consistent method of integrating the

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[1] See also Agenor and Monteil, "The most common analytical framework adopted in modelling the production structure in open-economy models of industrial countries is the Mundell-Fleming framework" (Agenor & Monteil 1996, 44).

[2] It is difficult to identify the "original" source, because the model emerged in a series of articles by Fleming and Mundell, and the evolution is discussed in detail in Darity and Young (2004). Representative of the full version of the model are Fleming (1962) and Mundell (1963).

exchange rate into multi-market equilibrium analysis, which could be presented as an extension of the IS-LM model developed a generation earlier by Hicks and others.[3] The Mundell and Fleming analysis seemed to transform the Keynesian neoclassical synthesis framework from a model of closed to an open economy that generated powerful policy rules that could still be found in textbooks a half century later.

While synthesis Keynesian in structure with its use of IS and LM schedules, the Mundell-Fleming model carried a non-Keynesian lesson for a flexible exchange rate regime, that monetary policy is effective and fiscal policy is not.[4] The reasoning goes as follows:

> 1) at an equilibrium characterized by balanced trade and less than full employment, with perfectly elastic capital flows an increase in the money supply raises output, which generates a trade deficit, as well as putting downward pressure on the domestic interest rate to cause a potential capital outflow;
>
> 2) the trade deficit is instantaneously eliminated by depreciation of the exchange rate, which *via* an increase in exports and decrease in imports generates the effective demand to bring an equilibrium in product and money markets.

In contrast, an increase in government expenditure instantaneously places upward pressure on the domestic interest rate, which results in an appreciation of the currency that reduces exports and increases imports, counteracting the fiscal expansion.[5] While these conclusions are based on the extreme assumption of perfect

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[3] The word "synthesis" refers to a putative integration of Keynesian and pre-Keynesian theory. The closed economy IS-LM model is typically attributed to Alvin Hansen (1949) and John Hicks (1937). An alternative graphical approach which presents each market separately is found in Smith (1956).

[4] Taylor has persuasively argued that the fixed/flexible dichotomy is invalid in theory and practice (Taylor 2000). This paper accepts the distinction for purposes of inspecting the validity of Mundell-Fleming within the rules of the model.

[5] Kenen gives the following summary:

> Fiscal and monetary policy under a flexible exchange rate
>
> 1. with perfect capital mobility, the effectiveness of monetary policy is maximized, but fiscal policy is deprived of any effect on the domestic economy;
> 2. as capital mobility falls, the effectiveness of monetary policy diminishes, but its effect on income is always larger than the effect obtained with a pegged exchange rate and complete sterilization;
> 3. as capital mobility falls, the effectiveness of fiscal policy grows, and its effect on income can be larger than the effect obtained with a pegged exchange rate and complete sterilisation… (Kenen 1994, 379)

capital flows, it is common to present them as the general lesson: fiscal policy is effective with a fixed exchange rate and ineffective with a flexible rate, and the opposite holds for monetary policy.[6]

With the collapse of the IMF-monitored system of fixed exchange rates in the early 1970s, the conclusion that monetary policy was effective and fiscal policy ineffective passed from theoretical curiosity to practical importance. It seemed to counsel that active fiscal policy, like fixed exchange rates, was an anachronism gone with fixed exchange rates.[7] However, the Mundell-Fleming analysis of a flexible exchange rate regime would appear to ignore an obvious, simple and fundamental economic relationship, the impact of exchange rate changes on the price level.[8]

A logically complete story of a monetary expansion would be:

Dunn and Mutti provide one the most complete discussions, considering fiscal expansion with flexible exchange rates for the three possible cases in the Mundell-Fleming model: perfect capital mobility (fiscal policy completely ineffective); when the balance of payments schedule is flatter than the LM schedule (currency appreciates, fiscal policy partially effective); and when the balance of payments schedule is steeper than the LM schedule (currency depreciates, with fiscal policy more effective).

[6] For example,

> For the sake of simplicity, the theoretical discussion of this chapter assumes a clean float; accordingly, it is assumed that the exchange rate moves sufficiently to maintain equilibrium in the payments accounts. These assumptions permit rather clear distinctions between the workings of a flexible and fixed exchange rate system. The broad conclusions of this theory hold for the real world, though in a less precise way. (Dunn & Mutti 2004, 432, emphasis added)

[7] Dunn and Mutti wrote, "There is now relatively little serious discussion of abandoning flexible [exchange] rates" (Dunn and Mutti 2004, 431)

[8] A typical treatment where price effects are ignored is found in Romer:

> …[T]he exchange rate does not affect money demand…
>
> The fact that the LM curve is vertical means that output for a given price level – that is, the position of the AD curve – is determined entirely in the money market… [S]uppose that government purchases rise. This change shifts the IS curve to the right…At a given price level this leads only to appreciation of the exchange rate and has no effect on output. (Romer 1996, 207)

In their introduction to the discussion of flexible exchange rates, Dunn and Milner point out the price effect of exchange rate changes: "Since the exchange rate, rather than the balance of payments, moves constantly, domestic prices of traded goods are affected (Dunn & Milner 2004, 434). On the following and subsequent pages exchange rate changes are analyzed assuming all prices are fixed. For example, they write, "…depreciation also increases domestic prices of tradable goods…*The original increase in the domestic money supply remains intact*…" (*Ibid*., 436, emphasis added).

However, in they call a "monetarist" analysis the price effect of exchange rate changes renders monetary policy ineffective except in the short run. No comment is made on the implicit contradiction between the standard Mundell-Fleming argument and the "monetarist" analysis, though they are presented within a few pages of each other (Dunn & Mutti 2004, 438-440).

1) an increase in the money supply results in a trade deficit; with prefect capital flows this deficit is instantaneously eliminated by depreciation of the currency;

2) the depreciation of the currency raises the price level via its impact on imported goods;[9]

3) this price increase lowers the real money supply, and makes the real depreciation is less than the nominal;

4) therefore, monetary policy would not be completely effective because of the price effect on the real money supply and the real exchange rate.

Some might argue that the Mundell-Fleming analysis is within a "fixed price" model,[10] and to include the exchange rate effect on prices is not obeying the rules of the story. This argument cannot be correct. The comparative statics of the MF model require a change in a price, the exchange rate; so by its own formulation it cannot be fixed price in character. The model has no mechanism by which the price effect of a change in the exchange rate would be exactly compensated by a change in non-import prices in the opposite direction. Further, the trade adjustment implicitly required for equilibrium requires a change in relative prices to make tradables more profitable. The initial level of income would be the only possible equilibrium if the model were fixed-price because no relative price change would occur to provoke expenditure switching.

Second, an empirical argument might be made that domestic prices in practice adjust slowly, so that the price level effect of changes in the exchange rate can be ignored in the short run. This argument would be a refutation of the main conclusions of the model, because in the absence of an immediate relative price change the necessary adjustment in exports and imports would not occur. Finally, it might be asserted that Mundell-Fleming refers to a chronological "long run", not to short run adjustment. Like the first two, this argument cannot eliminate the need to consider price effects. The first implication of a "long run" argument is that the model has little policy importance; a balance of payments disequilibrium must be resolved in

[9] That this effect is ignored in macro analysis is all the more surprising because it is dealt with in detail in trade theory (for example, see van der Ploeg 1994, 53ff).

[10] It is the invalid interpretation of Mundell-Fleming as fixed-price that allows the model to exclude consideration of the distinction between the nominal and the real exchange rate. I thank Anwar Shaikh for pointing this out to me. His review of the exchange rate literature aided the analysis of this paper (Shaikh 1999).

the short run if the alleged advantages of a flexible exchange rate would be realized. The second implication is that in the "long run" all variables must adjust, and the price level is one of these.

In light of the above, we proceed to consider the price effects of exchange rate adjustment, because these cannot be ignored if the MF model would have internal consistency. In what follows, the price level effects are considered algebraically, after which some statistics are used to assess the likely magnitude of these effects in developing countries. The discussion is carried out according the analytical rules of the model, and its static character is accepted without criticism for sake of presentation.

II. MF and Flexible Exchange Rates: The Algebra and its Implications

To investigate interaction of the exchange rate and monetary policy, we consider the "small country" case, in which the country's demand for imports and supply of exports do not affect world prices.[11] Thus, a change in the nominal exchange rate affects only internal prices, altering the profitability of traded goods relatively to domestic goods.

The balance of payments equilibrium schedule (BP) is defined by the following equation, in which the sum of trade and net capital flows is zero:

1) $0 = (X - N) + F$, and

$(N - X) = - F$

Because of the small country assumption, we can measure exports (X), imports (N), and capital flows (F) in constant price units.[12] The standard behavioural assumptions are made for exports and imports. The former is determined by the real exchange rate, and the latter by the real exchange rate and the level of real output. The following explicit functions are assumed:

1.1) $0 = (\bar{A} + a_1E^*) - (a_2E^* + a_3Y) + a_4(R_d/R_w)$

Real output is Y, and E* is the real exchange rate (nominal rate divided by the price level, E/P) measured in units of the domestic currency to some composite world currency. The domestic interest rate is R_d and the "world" rate R_w. The latter, R_w,

[11] Agenor and Montiel call this the "dependent economy" model (1996, 48-52).
[12] The constant price unit of measurement requires the assumption that the economy produces only one product, a standard assumption for macroeconomic models.

is assumed constant and $\bar{A}$ is the intercept of the export-exchange rate function. The total derivative is:

1.2) $0 = (a_1 + a_2)dE^* - a_3dY + (a_4/R_w)dR_d$

If capital flows are perfectly elastic, $R_d = R_w$, and dR_d is zero. Since the exchange rate is defined as units of the national currency to the "world currency", an increase in E* raises exports and reduces imports. If the total differential is solved for the rate of growth of output, one obtains the following, where y and e* are the rates of change of output and the real exchange rate, respectively.[13]

1.3) $y = (\varepsilon_1 + \varepsilon_2)e^*$

Assuming X = N, because $R_d = R_w$.

The elasticity of exports with respect to the real exchange rate is ε_1, and ε_2 is the elasticity for imports. Their sum is positive. The small country assumption ensures that the Marshall-Lerner condition is met $(\varepsilon_1 + \varepsilon_2) > 0$, if the elasticities are not zero or contrary to the theoretically specified signs.[14] When output is not capacity constrained, its growth rate is determined by the proportional change in the exchange rate and the sum of the trade elasticities. Define $(\varepsilon_1 + \varepsilon_2) = \varepsilon_T$, which produces a quite simple equation for output growth:

1.4) $y = \varepsilon_T e^*$

By definition in a one commodity model, the rate of change of the real exchange rate is the rate of change of the nominal rate minus the rate of inflation. If the prices of domestic goods are constant due to excess capacity, and the market for imports is competitive, the rate of inflation (p) is the change in the nominal exchange rate times the import share ("pass through rate"), $e^* = (e - p) = (e - a_3e) = (1 - a_3)e$.[15]

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[13] Equation 1.3 is obtained as follows:

$y = [(a_1 + a_2)/a_3]dE^*/Y$

For the first term, multiply numerator and denominator by E*/X and substitute $a_3Y = N = X$. This produces:

$y = (\varepsilon_1 + \varepsilon_2)e^*$, define $(\varepsilon_1 + \varepsilon_2) = \varepsilon_T$, $y = \varepsilon_T e^*$

[14] If the sum of the export and import *revenue* elasticities is ε_{TR}, $\varepsilon_T = (\varepsilon_{TR} - 1)$.

[15] The price level, P, is equal to the weighted average of domestic prices (P_d) and import prices.

$P = (1 - a_3)P_d + a_3E$

1.5) $y = \varepsilon_T e^* = \varepsilon_T(e - p) = \varepsilon_T(e - a_3 e)$

$= \varepsilon_T(1 - a_3)e$

To investigate the role of monetary policy it is necessary to include money in equation 1.5. Let the demand and supply for money be:

2) $M_d = vPY + a_6 R$ (money demand)

$M_S = M^*$ (money supply)

$M_S = vPY + a_6 R$ (equilibrium)

Where P is the price level, M* is the nominal money supply set by the "monetary authorities", v is the velocity of money, and a_6 is the derivative of money demand with respect to the domestic interest rate. From equation 2 it follows that if the velocity of money and the interest rate are constant, the inflation rate is

2.3) $p = m - y$

$a_3 e = m - y$

$e = (m - y)/a_3$

We can now substitute for e in equation 1.5:

2.4) $y = [(1 - a_3)\varepsilon_T/a_3][m - y]$

Again, solve for y,

2.5) $y = (1 - a_3)\varepsilon_T/[a_3 + \varepsilon_T(1 - a_3)]m$

Dividing through by m completes the algebra for the index of effectiveness of monetary policy in the case of perfect capital flows:

3) $\varepsilon_{y,m} = [(1 - a_3)\varepsilon_T]/[a_3 + (1 - a_3)\varepsilon_T]$

Equation 3 can be interpreted as the corrected Mundell-Fleming case of perfect capital flows. From the equation it is immediately obvious that the effectiveness of monetary policy declines as the import share rises (a_3) and the trade elasticities decline (ε_T). The larger is the former, the greater will be the price impact

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When domestic prices are constant and product markets competitive, the rate of change of the price level is the import share in income times the change in the exchange rate (see Agenor and Montiel 1996, 44-45).

$p = a_3 e$

of a nominal devaluation. The lower is the sum of the trade elasticities, the larger must be the devaluation in order to maintain the balance between imports and exports.

III. Empirical Evidence and Policy Implications

Assessing the policy implications of the Mundell-Fleming model with the inclusion of the price effects requires information on three empirical questions: 1) the period during which an automatic adjustment of the balance of payments should occur to be policy relevant; 2) the likely value of the sum of the trade elasticities during that period; and 3) the share of imports in national income. The first is especially important, because the comparative static model presumes instantaneous adjustment. A choice by a government not to intervene in the foreign exchange market would be based on confidence that the exchange rate adjustment would bring about the necessary improvement in the balance of payments swiftly enough to avoid macro instability.

If one excludes the developed countries, China, city states and very small countries,[16] the average import share of 129 developing countries in the mid-2000s was 41.6 percent, with a median value of 39.2. Using these statistics on import shares, and making realistic and reasonable estimates of trade elasticities, equation 3 can be used to assess the effectiveness of monetary policy in an open economy.

Trade elasticities vary by country, depending on many influences, such as the commodities which are exported and the degree of substitution between imports and their domestic substitutes. In general, the elasticities will be lower the shorter the time period required for balance of payments adjustment. This period can be approximated by the reserve holdings of a country, since balance of payments equilibrium would need to be complete before reserves were exhausted. Statistics from the World Bank show that the average holding of reserves across the same group of countries was less than six months of imports. For this time period one would expect exports elasticities to be low. Import elasticities would be determined

[16] Developed countries are excluded because the most important of them, the United States, the European Union and Japan, operate with international reserve currencies and cannot be considered "small countries" for exchange rate movements. China is almost excluded on the grounds that its share of world trade is not consistent with being a "small country". City states (e.g. Singapore, Hong Kong and Djibouti) are omitted because re-exports result in extremely high import shares, over one hundred percent. Very small countries (defined as those with less than a million inhabitants) tend also to have extremely high import shares because of low economic differentiation.

primarily by the availability of domestic substitutes. Because diversification tends to be greater the more developed the country, one would expect import elasticities to be higher for middle income countries than low income ones.

On the basis of these generalizations, the sum of trade elasticities in the range of .50 to 1.00 would seem realistic. Table 1 applies these elasticities and the median import share to calculate probable values for the effectiveness of monetary policy. For a sum of trade elasticities of .50, in a country with the median import share the effectiveness of monetary policy would be about 44 percent, and greater than fifty percent for only 36 of the 129 countries. For trade elasticities summing to .755, exactly half of the countries would have an effectiveness of less than fifty percent, and half greater than fifty percent. For the relatively high sum of elasticities of unity, effectiveness of money policy rises to just over sixty percent, and is fifty percent effective for slightly less than two-thirds of the countries. It should be kept in mind that these calculations assume perfect capital flows, the most favourable case to establish the effectiveness of monetary policy.

Without a rigorous calculation of trade elasticities a firm judgement cannot be reached on the effectiveness of money policy. However, reasonable estimates suggest that for many countries, especially low-income countries, the effectiveness of monetary policy may be quite low. This implies that in practice it is not rational for governments to rely on monetary policy alone for effective macroeconomic management in the short run.

Finally, it should be noted that the analysis of this paper also implies a reassessment of the effectiveness of fiscal policy under a flexible exchange rate regime. In the Mundell-Fleming model a fiscal expansion is totally ineffective with a flexible exchange rate because it results in currency appreciation that cancels its demand effect. However, this appreciation, by lowering import prices would bring down the general price level, making the real appreciation less than the nominal, as well as raising the real money supply which would accommodate an expansion of output. The greater the import share, the greater will be this effect. A higher import share makes fiscal policy more effective, while it makes monetary policy less effective.

Table 1: Effectiveness of monetary policy, median import share, 108 countries, 2005-2007*

ε_T =	$\varepsilon_{y,m}$ for international median, N/Y = .39	Percent of countries for $\varepsilon_{y,m} > 50$
.500	43.7	27.8
.755	53.8	50.0
1.000	60.8	63.0

*Excluding developed countries, China and very small countries excluded (see text).
Source: Import shares from World Bank, *World Development Indicators*, 2009.

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