The Mundell-Fleming Model and the Dornbusch Model

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The Mundell Fleming Model

• This model has been the basis on which a large part of the short-term analysis of international macroeconomic phenomena has rested for several decades.

• It is an extension of the basic Keynesian model IS-LM, in an open economy with free capital mobility.

• The reference point of the model is that there is price rigidity in goods and services markets but that financial market prices adjust quickly in order to achieve equilibrium.
The Static Form of the Mundell Fleming Model

- We assume a small open economy, which takes international developments as exogenous, because of its small size.

- The demand for domestic goods and services depends on three factors: domestic income (positive), the domestic interest rate (negative) and the real exchange rate.

- The latter is defined as the relative price of international goods and services, expressed in domestic currency, and has a positive effect on domestic demand.

- These factors, together with fiscal policy, determine aggregate demand, which of course will be equal to total output.
y is the logarithm of domestic output, s the logarithm of the nominal interest rate (units of domestic currency per unit of foreign currency), \( p^* \) the logarithm of the foreign price level (in foreign currency units), \( p \) the logarithm of the domestic price level, \( i \) the domestic nominal interest rate (which because of price rigidity is equal to the real interest rater), and \( g \) an index of the impact of fiscal policy on aggregate demand. The parameters \( \delta, \gamma \) and \( \sigma \) are positive, with \( 0 < \gamma < 1 \).
Equilibrium in the Domestic Money Market

\[ m - p = \phi y - \lambda i \]

\( m \) is the logarithm of the money supply, \( \phi \) the elasticity of money demand with respect to real output, and \( \lambda \) the semi-elasticity of money demand with respect to the nominal interest rate.
Equilibrium in International Financial Markets

\[ i = i^* \]

We assume that there is free international capital mobility, and that equilibrium in the international financial markets implies *uncovered interest parity*. With *static expectations* about the future evolution of the exchange rate, this means that domestic interest rates are equal to international interest rates.
Short Run Macroeconomic Equilibrium in the Mundell Fleming Model
A Regime of Fixed Exchange Rates

Substituting uncovered interest parity in the equilibrium condition for the markets of goods and services and money, and taking the total differential of the system of equations obtained, we get,

\[ dm = \frac{\phi \delta}{1-\gamma} ds - \left( \lambda + \frac{\phi \sigma}{1-\gamma} \right) di^* + \frac{\phi}{1-\gamma} dg \]

\[ dy = \frac{\delta}{1-\gamma} ds - \frac{\sigma}{1-\gamma} di^* + \frac{1}{1-\gamma} dg \]
Ineffectiveness of Monetary Policy in a Regime of Fixed Exchange Rates
Inefficacy of Monetary Policy in a Regime of Fixed Exchange Rates

- A domestic credit expansion has no effect on the money supply, if there is no change in the exchange rate, international interest rates or fiscal policy. Domestic credit expansion would cause foreign reserve outflows, as domestic interest rates cannot fall below international rates, and the central bank will have to intervene to support the fixed exchange rate.

- These outflows, will be equivalent to the initial increase in domestic credit, and there will be no effect on the domestic money supply.

- The Mundell-Fleming model predicts that domestic monetary policy has no ability to influence the economy under a regime of fixed exchange rates.
Effects of a Devaluation
Effects of a Devaluation

A devaluation causes an increase in both domestic income, and the money supply. This is due to the shift in demand in favor of domestic products, the increase in net exports and the consequent accumulation of foreign reserves that increase the money supply.

Thus, a devaluation causes both an increase in domestic income and an improvement in the current account in this model.
Effects of a Fiscal Expansion under Fixed Exchange Rates
Effects of a Fiscal Expansion under Fixed Exchange Rates

A fiscal expansion increases both domestic income and the domestic money supply. This is because it increases the demand for domestic products, this leads to an increase in money demand, which, with given domestic credit, results in inflows of foreign exchange reserves, which increase the money supply.

Alternatively one can say that a fiscal expansion causes upward pressure on domestic interest rates, which cause foreign capital inflows to equilibrate the money market, as domestic interest rates may not differ from international rates.

Whereas a devaluation increases domestic income but causes an improvement in the current account, if the Marshall Lerner condition is satisfied, a fiscal expansion causes a deterioration in the current account.
Effects of an Increase in International Interest Rates under Fixed Exchange Rates
Effects of an Increase in International Interest Rates under Fixed Exchange Rates

Finally, an increase in international interest rates leads to a decrease in both domestic income, and the money supply.

The increase in international interest rates cause capital outflows, which due to the interventions of the central bank to support the exchange rate, reduce foreign exchange reserves and the money supply and increase domestic interest rates.
Difference between Fixed and Floating Exchange Rates

When the monetary authorities do not intervene in the foreign exchange market, as happens under floating exchange rates, the endogenous variables are domestic income and the exchange rate. The money supply (and domestic interest rates) can be used as a policy tool.
Floating Exchange Rates

Substituting uncovered interest parity in the equilibrium conditions for the markets for goods and services and money, and taking the total differential of the system of equations obtained, we get,

\[
ds = \frac{1 - \gamma}{\phi \delta} dm + \left( \frac{\lambda (1 - \gamma) + \phi \sigma}{\phi \delta} \right) di^* - \frac{1}{\delta} dg
\]

\[
dy = \frac{1}{\phi} dm + \frac{\lambda}{\phi} di^*
\]
Effects of an Increase in the Money Supply under Floating Exchange Rates
Effects of an Increase in the Money Supply under Floating Exchange Rates

An increase in the money supply through a domestic credit expansion leads to a depreciation of the currency. The depreciation causes an increase in domestic demand and has a positive impact on domestic output and the current account.
Effects of a Fiscal Expansion under Floating Exchange Rates
A fiscal expansion puts upward pressure on domestic interest rates, and causes an appreciation of the exchange rate. The appreciation of the real exchange rate reduces aggregate domestic demand and counteracts the demand effects of the fiscal expansion. Accordingly, a fiscal expansion is not accompanied by monetary expansion, has no impact on domestic output in a floating exchange rate regime. Its only effect is to cause an appreciation of the exchange rate and a deterioration in the current account.
Effects of an Increase in International Interest Rates under Floating Exchange Rates
Effects of an Increase in International Interest Rates under Floating Exchange Rates

An increase in international interest rates leads to a depreciation of the domestic currency. This leads to an increase in domestic demand, as the restrictive effect of rising interest rates is outweighed by the expansionary impact of the depreciation of the exchange rate. To the extent that the domestic money supply is constant, the decrease in money demand caused by the increase in interest rates is offset by an increase in money demand due to increased domestic output and income.
Weaknesses of the Mundell Fleming Model

• First, it ignores, like all short-term models of this type, the distinction between stocks (such as foreign debt) and flows (such as the current account).

• Second, it assumes complete price stickiness, so it can not say anything about price changes and inflation and its effects on internal and external balance.

• Third, it assumes static expectations.

• Finally, its microeconomic foundations are not based on optimising behaviour on the part of households and firms.
The Dornbusch Model

The Dornbusch model is a significant improvement of the Mundell Fleming model, in at least two directions:

First, it has a less extreme approach to the adjustment of the price level. Instead of assuming constant prices it assumes that the price level gradually adjusts to equilibrate the market for goods and services at full employment.

Second, instead of static expectations, it assumes rational expectations about the future evolution of the exchange rate, which is assumed to be floating.

In this way, the model can explain the overshooting of nominal exchange rates to monetary changes, but also to describe the adjustment of the economy towards long-term equilibrium with full employment.
Assumptions of the Dornbusch Model

\[ m - p = \phi y - \lambda i \]

\[ y^d = \delta (s - p) + \gamma y - \sigma i + g \]

\[ p = \pi (y^d - y) \]

\[ i = i^* + s^e = i^* + s \]
Solution of the Dornbusch Model

\[ s = -\frac{1}{\lambda} (m - p - \phi y + \lambda i^*) = -\frac{1}{\lambda} (m - p - \phi y) - i^* \]

\[ p = \pi \left[ \delta (s - p) + \frac{\sigma}{\lambda} (m - p) + g - \left( (1 - \gamma) + \frac{\sigma \phi}{\lambda} \right) y \right] \]
Long Run Equilibrium in the Dornbusch Model and the Adjustment Path

• First, the long-run equilibrium characterized by *monetary neutrality*. A permanent change in the money supply has no real effect but merely causes a change in the same proportion to the price level and the exchange rate.

• Second, a change in the money supply has short-term real effects, as the price level can not adjust immediately, but only gradually. Only the nominal rate can change immediately.

• Third, the economy converges to its long-run equilibrium, from any initial state. The long run equilibrium is a saddle point, since the two first order differential equations of the model have one positive and one negative root. There is a unique path that leads to this long-term equilibrium. The path is unique because the price level is a predetermined variable and the exchange rate is a non predetermined variable.
Equilibrium and Adjustment in the Dornbusch Model
An Increase in the Money Supply and Exchange Rate Overshooting
The Inter-temporal Evolution of the Exchange Rate, Prices and Interest Rates, Following a Monetary Expansion
The Inter-temporal Evolution of the Nominal and Real Exchange Rate, Following a Monetary Expansion
A Fiscal Expansion in the Dornbusch Model
An Increase in International Interest Rates in the Dornbusch Model
Conclusion about the Dornbusch Model

• The Dornbusch model, like most models based on the gradual adjustment of the price level, combines long-run classical neutrality, with short-run Keynesian features. The overshooting of exchange rate changes would not occur if the price level did not adjust gradually, as, if prices also adjusted immediately, the economy would immediately jump to its long run equilibrium.

• The Dornbusch model explains how the combination of gradual adjustment of the price level and the immediate adjustment of exchange rates results in high volatility of both nominal and real exchange rates, as a result of both monetary, and real shocks.

• However, much like the Mundell Fleming model, upon which it is an improvement, the Dornbusch model lacks satisfactory microeconomic foundations.