8. Simultaneous Equilibrium in Output and Financial Markets: The Short Run Determination of Output, the Exchange Rate and the Current Account
The Aggregate Demand Function and Short Run Equilibrium in the Output Market of an Open Economy

The Aggregate Demand Function in an Open Economy

\[ D = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, S) \]
\[ ( + - + - + - + - ) \]

Short Run Equilibrium in the Output Market

\[ Y = D \]

Thus, equilibrium output is determined by the equality of aggregate demand with aggregate output and income, which implies,

\[ Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, S) \]
\[ ( + - + - + - + - ) \]
Equilibrium in Financial Markets  
The Domestic Money Market and the Foreign Exchange Market

Short Run Equilibrium in Financial Markets

If the central bank controls the money supply, equilibrium in the domestic money market implies that,

$$\frac{M}{P} = L(Y, i)$$

Equilibrium in the market for foreign exchange implies that,

$$S = S^e\left(\frac{1+i}{1+i^*}\right)$$

Hence, the domestic interest rate is determined in the domestic money market, while the exchange rate is determined in international financial markets, by the interest parity condition, given the domestic and foreign interest rates.

In what follows we shall assume that, in the short run, expectations about the future exchange rate are given. This implies that an increase in the domestic interest rate causes an appreciation of the spot exchange rate, and a decrease in the domestic interest rate causes a depreciation of the spot exchange rate, without affecting the expected future exchange rate, which will be treated as exogenous. Foreign interest rates will be treated as exogenous as well.
Simultaneous Equilibrium in Goods and Financial Markets

Short Run Equilibrium in the Market for Goods and Services

\[ Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, S) \]

Short Run Equilibrium in the Domestic Money Market

\[ M/P = L(Y,i) \]

Short Run Equilibrium in the Foreign Exchange Market

\[ S = S^e((1+i)/(1+i^*)) \]
Simultaneous Determination of Output and the Interest Rate in an Open Economy

Since the exchange rate depends positively on the domestic interest rate, through the uncovered interest parity condition, we can use this condition to substitute for the exchange rate in the equilibrium condition for goods and services.

An increase in the domestic interest rate causes a reduction in net exports \((NX)\) because it causes an exchange rate appreciation. Hence, an increase in the domestic interest rate reduces aggregate demand for two reasons: First, because it reduces domestic investment, and, second, because it reduces net exports, through an appreciation of the exchange rate.

\[
Y = C(Y-T) + I(Y,i) + G + NX(Y, Y^*, i, i^*, S^e) \\
+ - - + - + + -
\]

Hence, even in an open economy, equilibrium in the domestic market for goods and services implies a negative relation between output and the nominal interest rate, once one takes into account the positive relation between the interest rate and the exchange rate.
The IS Curve in an Open Economy

\[ IS \ (G, T, Y^*, i^*, S^e) \]

Real Output, \( Y \) vs. Nominal Interest Rate, \( i \)

Points: \( E_0, E_1, E_2 \)

Levels: \( Y_0, Y_1, Y_2 \)

i_0, i_1, i_2
The LM Curve in an Open Economy

\[ \text{Nominal Interest Rate, } i \]

\[ \text{Real Output, } Y \]

\[ Y_2 > Y_0 > Y_1 \]

\[ \text{LM (M/P)} \]
The UIP Curve in an Open Economy

\[
\text{Nominal Interest Rate, } i
\]

\[
i_2 > i_0 > i_1
\]

\[
\text{UIP (} i^*, S^0 \text{)}
\]

\[
S_1 \quad S_0 \quad S_2
\]
Short Run Macroeconomic Equilibrium in an Open Economy

Graph showing the Short Run Equilibrium point, $E$, with Real Output, $Y$, on the horizontal axis and Nominal Interest Rate, $i$, on the vertical axis.

The IS curve is given by: \[ IS(G,T,Y^*,i^*,S^*) \]

The LM curve is given by: \[ LM(M/P) \]

The equilibrium point is marked as $E$, with Real Output, $Y_E$, and Nominal Interest Rate, $i_E$. The graphical representation illustrates the intersection point of the IS and LM curves, indicating the equilibrium values of Real Output and Nominal Interest Rate.
The Current Account and Internal versus External Balance

- We define as *internal balance* a level of aggregate demand that is compatible with high employment (low unemployment).
- In an open economy another important concept is *external balance*.
- *External balance* is an intertemporal concept, requiring a path for the current account which does not lead the country to becoming unable to service its debts, nor other countries to becoming unable to service their own debts to the country in question.
- External balance, *in the short run*, will be defined as a zero current account deficit (or surplus), although in principle small current account deficits or surpluses are not incompatible with intertemporal external balance.
- In what follows we shall concentrate as net exports as the variable relevant for external balance.
The Short Run Relationship between External Balance, Output and the Exchange Rate

\[ NX = X - M = X(S,Y^*) - \frac{1}{S} M^*(S,Y) = 0 \]

Given that the volume of exports \( X \) is a negative function of the exchange rate \( S \), and that the volume of imports \( M^* \) is a positive function of the exchange rate \( S \) and real income \( Y \), external balance requires a negative relationship between the exchange rate and income, if the Marshall Lerner condition, holds.

This negative relation between the exchange rate \( S \) and domestic real income \( Y \) is shown graphically as the curve \( NX=0 \), in the next diagram.

In addition, if we use the uncovered interest parity condition to substitute for the exchange rate in the external balance condition, we get,

\[ NX = NX(i,Y,i^*,Y^*) = 0 \]
The External Balance Condition

\[ NX(Y^*) = 0 \]

Nominal Exchange Rate, \( S \) vs. Real Output, \( Y \)

- Trade or Current Account Deficit
- Trade or Current Account Balance
- Trade or Current Account Surplus

\( S_0 \), \( S_1 \), \( S_2 \) represent exchange rates.
\( Y_0 \), \( Y_1 \), \( Y_2 \) represent real outputs.
The External Balance Condition and the Nominal Interest Rate

\[ NX (i^*, Y^*) = 0 \]

- Trade or Current Account Deficit
- Trade or Current Account Balance
- Trade or Current Account Surplus
Short Run Macroeconomic Equilibrium in an Open Economy

*Short-run macroeconomic equilibrium* in an open economy is determined at the level of output, the domestic interest rate and the exchange rate where,

1. The market for goods and services is in equilibrium, in the sense that aggregate demand equals aggregate supply,

2. The domestic money market and international financial markets are in equilibrium, in the sense that the demand for money equals the supply of money and uncovered interest parity holds.

If this equilibrium implies full employment, then short run macroeconomic equilibrium implies *internal balance*.

If this equilibrium implies a zero current account, then this macroeconomic equilibrium also implies *external balance*.

In general, short run macroeconomic equilibrium is not characterized by this *divine coincidence*, and may imply neither internal nor external balance.
## Short Run Macroeconomic Equilibrium and its Relation to Internal and External Balance

<table>
<thead>
<tr>
<th>Unemployment</th>
<th>Current Account Deficit</th>
<th>Current Account Balance</th>
<th>Current Account Surplus</th>
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George Alogoskoufis, *Macroeconomics 2018-19*
Short Run Macroeconomic Equilibrium with Internal and External Balance
Short Run Macroeconomic Equilibrium with Unemployment and a Current Account Deficit

\[ IS (G, T, Y^*, i^*, S^e) \]

\[ LM (M/P) \]

\[ NX (Y^*, i^*, S^e) = 0 \]
A Monetary Expansion under Floating Exchange Rates
Conclusions about the Short Run Effects of Monetary Policy on Output, the Exchange Rate and the Current Account

1. If the central bank controls the money supply, a monetary expansion (increase in the money supply) causes a fall in the domestic interest rate, a depreciation of the exchange rate, and an increase in output and employment.

2. If the central bank controls the interest rate, a fall in the nominal interest rate causes an increase in the money supply, a depreciation of the exchange rate and an increase in output and employment.

3. The improvement of the current account through the exchange rate depreciation and the increase in net exports reinforces the expansionary effects of the monetary expansion.

4. A monetary policy which results in a fall in domestic nominal interest rates is called an expansionary monetary policy.

5. A monetary policy that results in a rise in domestic nominal interest rates causes an appreciation of the exchange rate and a reduction in output and employment. It is called a contractionary monetary policy.

6. If an economy suffers from both high unemployment and a current account deficit, an expansionary monetary policy can move it towards both internal and external balance.
A Fiscal Expansion under Floating Exchange Rates
Conclusions about the Short Run Effects of Fiscal Policy on Output and the Exchange Rate

1. A fiscal expansion (increase in government expenditure or reduction in taxes) causes an increase in domestic interest rates, an appreciation of the exchange rate, and an increase in output and employment.

2. The deterioration of the current account through the exchange rate appreciation and the reduction in net exports mitigates the expansionary effects of the fiscal expansion.

3. If an economy suffers from both high unemployment and a current account deficit, an expansionary fiscal policy can move it towards internal balance but causes a widening of external imbalances. A contractionary fiscal policy can move it towards external balance, but causes a rise in unemployment, and hence a widening of internal imbalances.

4. If an economy suffers from over employment and a current account deficit, a contractionary fiscal policy can move it towards both internal and external balance.
The Role of Short Run Stabilization Policy

This model can be used to analyze the role of short run stabilization policy in open economies.

In principle, the government and the monetary authorities could use either monetary or fiscal policy to counteract shocks that create recessions and external imbalances.

Short run conflicts between the objectives of internal and external balance can be addressed through the appropriate mix of aggregate demand policies, the so called *policy mix*. Almost any short run combination of internal and external imbalances can be addressed by combining a monetary expansion with a fiscal contraction, or vice versa, or by allowing both monetary and fiscal policy to be either expansionary or contractionary.

However, in the frequently encountered case where an economy suffers from both high unemployment and a high current account deficit, whereas monetary policy does not in general imply a conflict between the objectives of internal and external balance, fiscal policy does.

In addition, monetary policy is much more flexible than fiscal policy, as it does not require a lengthy legislative process, but simply a decision by the policy setting board of the central bank (the Fed in the case of the USA).

The significant role of monetary policy in the policy mix is one of the main reasons that countries chose to have an independent monetary policy.
Robert Mundell (1932-)

Nobel Prize-winning Canadian economist. Currently, he is a professor of economics at Columbia University and the Chinese University of Hong Kong.

He received the Nobel Memorial Prize in Economics in 1999 for his pioneering work in international monetary economics and optimum currency areas. His adaptation of the keynesian IS-LM model to allow for perfect capital mobility in the early 1960s is known as the Mundell–Fleming model and still serves as the basis for the analysis of short run stabilization policy in open economies.
Fixed Exchange Rates and Macroeconomic Policy

Up to now we have been assuming that the exchange rate is determined freely in foreign exchange markets.

However, many governments and central banks choose to fix (peg) the exchange rate of their currency, or even to have no national currency at all.

Fixed exchange rate regimes also applied for the major economies in many historical periods, such as the gold standard period (1870-1914) and the Bretton Woods system (1944-1973).

Furthermore, between 1978 and the creation of the euro in 1999, most of the countries of the European Union operated a fixed exchange regime among their currencies, called the European Monetary System.
Intermediate Exchange Rate Regimes

- Many countries follow exchange rate regimes that are between fixed and floating exchange rates.
- Such regimes are called soft pegs, and include pegs with fluctuations within a wide band, or a crawling peg.
- Most countries that follow pegs, peg against the dollar (43), then the euro (29), a composite of major currencies (12). Many adopt monetary or inflation targets as well.
IMF Classification of Exchange Rate Regimes

Hard pegs (25)
(Currency board arrangements and Exchange arrangement with no separate legal tender)

Soft pegs (101)
(Conventional peg, Pegged exchange rate within horizontal bands, Stabilized arrangement, Crawling peg, Crawl-like arrangement)

Floating regimes (65)
(Floating, Free Floating)

Residual (18)
(Other managed arrangement)

Note: This methodology became effective on February 2, 2009, and reflects an attempt to provide greater consistency and objectivity of exchange rate classifications across countries and to improve the transparency of the IMF’s bilateral and multilateral surveillance in this area.
The Balance Sheet of the Central Bank and the Money Supply

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold, Foreign Exchange</td>
<td>Notes and Coins</td>
</tr>
<tr>
<td>Domestic Bonds</td>
<td>Deposit of Banks</td>
</tr>
<tr>
<td>Monetary Base</td>
<td>Monetary Base</td>
</tr>
</tbody>
</table>

Gold, foreign exchange reserves and domestic credit are the elements on the *asset* side of the balance sheet of a central bank.

Notes and coins, and deposits of commercial banks are the main elements on the *liability* side.

The liabilities of the central bank constitute the so-called *monetary base*, which largely determines the changes in the money supply.

Assets and liabilities in any balance sheet must always equal. Hence, its assets must always be equal to the monetary base.
Foreign Exchange Market Intervention and the Money Supply

When a central bank intervenes in the foreign exchange market to stabilize its exchange rate, its assets, and therefore its liabilities also fluctuate. Thus, the monetary base and the money supply fluctuate as a result of foreign exchange market interventions.

In order to peg the exchange rate, a central bank should be prepared to buy or sell unlimited amounts of domestic currency for gold or foreign currencies at a pre-determined rate. This means that it loses control of its monetary base and the money supply.

As a result, its domestic interest rate cannot differ from international interest rates, as this would trigger flows of foreign exchange reserves, which would alter its money supply.

If the domestic interest rate is lower than international interest rates, there would be outflows of foreign exchange rate reserves and a reduction of the monetary base and the money supply, until the domestic interest rate rose to the level of international interest rates. This would happen instantaneously.

If the domestic interest rate is higher than international interest rates, there would be inflows of foreign exchange rate reserves and an increase of the monetary base and the money supply, until the domestic interest rate fell to the level of international interest rates. This would happen instantaneously, as well.

Hence, domestic interest rates cannot differ from international interest rates under fixed exchange rates and free capital mobility.
Fixed Exchange Rates and Monetary Policy

A fixed (pegged) exchange rate means that domestic interest rates may not depart from foreign interest rates. This can be seen from the uncovered interest parity condition,

\[ S = S^e \left( \frac{1+i}{1+i^*} \right) \]

If the exchange rate is fixed, then \( S = S^e \) and it follows that \( i = i^* \).

Under capital mobility, monetary policy is subordinated to the goal of maintaining a fixed exchange rate, and domestic interest rates cannot deviate from foreign interest rates.

Hence, an open economy cannot simultaneously select control of its foreign exchange rate, control over its monetary policy and free movement of capital (the trilemma of open economies).
Monetary Policy Ineffectiveness under a Fixed Exchange Rate

\[ IS (G, T, Y^*, i^*, S^*) \]
\[ LM (\frac{M}{P}) \]
\[ LM (\frac{M'}{P}) \]
\[ NX (Y^*, i^*, S^*) \]

Nominal Interest Rate, \( i \)

Real Output, \( Y \)

Equilibrium at \( E \) with \( Y_E = Y_F \)
The Short Run Effects of a Fiscal Expansion under a Fixed Exchange Rate
The Short Run Effects of a One Off Devaluation of the Exchange Rate
Conclusions about Fixed Exchange Rate Regimes

Under perfect capital mobility and a fixed exchange rate, a country loses control of monetary policy, as monetary policy targets the exchange rate and cannot affect output and employment or the current account.

Fiscal policy, becomes more effective, as fiscal policy changes do not induce changes in the exchange rate.

Fiscal policy however still implies a tradeoff between internal and external balance in the case of unemployment and a current account deficit.

Unlike fiscal policy, a one off devaluation can cause a short run increase in output and employment with an improvement in the current account.