

Open Economies: Mundell - Fleming Model ¹

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¹Please study Chapter 18 of Mankiw together with these slides.

Homework for Next Week

- Read about the Big Mac Index.
- Read The Economist Article “Economists Now Accept Exchange-Rate Intervention Can Work”.

Open Economies

- During this lecture, we will study open economies, i.e., economies that trade with the rest of the world.
- These transactions can be of goods and services, financial assets, capital (physical and human), etc..

Nominal Exchange Rate

- It is the price of one country's currency in terms of another currency.
 - ▶ For example, if the exchange rate between the US and Mexico is 20, then 1 USD is equivalent to 20 Mexican Pesos.
- Whenever the local exchange rate loses value, we say that it **depreciates**, while it **appreciates** when it gains value.
- There are different exchange rate regimes:
 - ① Flexible: The exchange rate is determined by the market.
 - ② Fixed: The exchange rate becomes a policy decision, and it is determined by the Central Bank.
 - ③ Managed: The Central Banks determines bounds for the exchange rate, and it is allowed to freely fluctuate within these bounds.

Real Exchange Rate

- Compares the purchasing power of different currencies.
- It is given by:

$$\epsilon = \frac{EP}{P^*},$$

where E is the (nominal) exchange rate, P is the price level in the local economy, and P^* is the price level in the foreign economy.

- The real exchange rate is comparing the price of local goods and services relative to foreign goods and services:
 - ▶ If $\epsilon < 1$, then the local goods and services are cheaper than the foreign ones.
 - ▶ If $\epsilon > 1$, then the local goods and services are more expensive than the foreign ones.
 - ▶ If $\epsilon = 1$, then there is a parity in purchasing power.

Financial Markets in Open Economies

- Investors are able to buy either local or foreign bonds.
- Investors must take into account the following when deciding where to invest:
 - ① The interest rate in the local economy.
 - ② The interest rate in the foreign economy.
 - ③ The current exchange rate.
 - ④ The expected future exchange rate.

Financial Markets in Open Economies

- Why is the exchange rate relevant for investors?
 - ▶ Let us imagine you are deciding whether to invest for one year and both the local and foreign interest rates are equal.
 - ▶ This means, that at the end of the year, you will have the same amount of money in both economies.
 - ▶ However, if the exchange rate depreciates, then you will have less money in the local economy than in the foreign economy.
 - ▶ So you should invest in the foreign economy!

Financial Markets in Open Economies

- Let us define the Expected Currency Appreciation as:

$$\hat{E}_{t+1}^e = \frac{E_{t+1}^e - E_t}{E_t},$$

where E_{t+1}^e is the expected exchange rate at time $t+1$, and E_t is the exchange rate at time t .

- Then, if $\hat{E}_{t+1}^e > 0$ investors expect the local currency to appreciate. Otherwise they expect it to depreciate.
- The **Uncovered Interest Rate Parity** (UIP) states that the expected return on local bonds should be equal to the expected return on foreign bonds:

$$i_t = i_t^* - \hat{E}_{t+1}^e.$$

Financial Markets in Open Economies

- When should we invest in the local economy?
 - ▶ Whenever $i_t > i_t^* - \hat{E}_{t+1}^e$.
- Now, should we expect for the UIP not to hold?
 - ▶ Not really, as investors will take advantage of this arbitrage opportunity.
 - ▶ If $i_t > i_t^* - \hat{E}_{t+1}^e$ then a huge mass of investors will invest in the local economy.
 - ▶ This causes a huge demand for the local currency, which will appreciate.
 - ▶ Hence \hat{E}_{t+1}^e decreases, which reduces the attractiveness of the local economy.
 - ▶ This process will continue until the UIP holds.
- **No Arbitrage Condition in Open Economies.**

Example

- Braavos' Iron Bank is considering to whether invest in King's Landing (Westeros) or in Meereen (Essos). Let us consider that the Iron Bank is in Essos, which means that Essos is the local economy. The Iron Bank has the following information:

Exchange Rate	1/2
Expected Exchange Rate	3/4
Essos' Nominal GDP	100
Westeros' Nominal GDP	250
Essos' Real GDP	80
Westeros' Real GDP	210
Essos' Interest Rate	5%
Westeros' Interest Rate	3%

- In nominal terms, which economy is more expensive? If the Iron Bank were to buy swords, where should they buy them? In which economy should the Iron Bank invest?

Goods and Services Market in Open Economies

- Remember that in a closed economy, the equilibrium in the goods and services market is given by $Y = C + I + G$.
- Whenever an economy trades with the rest of the world, we must also take into account:
 - ▶ Exports: Goods and services produced in the local economy and sold abroad. Higher exports implies higher (local) production.
 - ▶ Imports: Goods and services produced abroad and sold in the local economy. Higher imports implies lower (local) production.
- Hence, in an open economy, the equilibrium in the goods and services market is given by:

$$Y = C + I + G + (X - Im) = C + I + G + NX.$$

Goods and Services in Open Economies: Imports

- We will assume that an economy's imports are given by:

$$Im(Y, \epsilon) = \alpha_1 Y + \alpha_2 \epsilon,$$

where $\alpha_1 > 0$ is the marginal propensity to import, and $\alpha_2 > 0$.

- Why do we assume this form for imports?
 - ▶ As households get richer, they will consume more goods and services, including foreign ones. Hence, there is a positive relationship between income and imports.
 - ▶ As ϵ increases, foreign goods are cheaper than local goods, which increases the demand for imports.

Goods and Services in Open Economies: Exports

- An economy's exports are given by:

$$X(Y^*, \epsilon) = \beta_1 Y^* - \beta_2 \epsilon,$$

where $\beta_1 > 0$, $\beta_2 > 0$, and Y^* represents the foreign economy's production.

- Why do we assume this form for exports?
 - ▶ As foreign households are richer, they demand more goods and services. So foreign imports increase, which means local exports increase.
 - ▶ As the real exchange rate increases, local goods and services become more expensive, which decreases the demand for local goods and services abroad.

Goods and Services in Open Economies: Net Exports

- Net exports are then:

$$NX = X - Im = \beta_1 Y^* - \alpha_1 Y - \alpha_2 \epsilon - \beta_2 \epsilon.$$

- Notice that then, if the real exchange rate appreciates (meaning ϵ increases), then net exports decrease.
- This is known as the **Marshall-Lerner Condition**.

Goods and Services in Open Economies: Equilibrium

- The equilibrium in the goods and services market is given by:

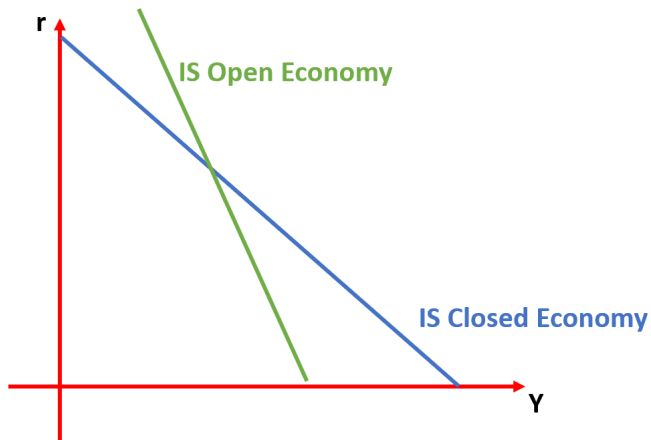
$$Y = C(Y) + I(Y, r) + G + NX(Y, Y^*, \epsilon),$$

- If we solve for the equilibrium output, we get:

$$Y = \frac{1}{1 - s - b(1 - \tau - u) + \alpha_1} [a + bSS + ubY_N + G - sr + \beta_1 Y^* - (\alpha_1 + \beta_2)\epsilon].$$

- Notice that the fiscal multiplier of an open economy is smaller than the one of a closed economy. Why?
- Why then some governments may dislike to have an open economy?

IS Curve



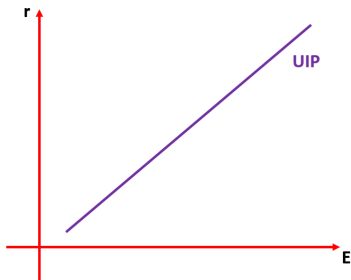
Money Markets

- The money market is not affected by the fact that an economy is open or closed.
- So, the equilibrium in the money market is still determined by the real money supply (which is a product of the decisions of the Central Bank) and money demand (which is a function of production and the real interest rate).

Financial Markets

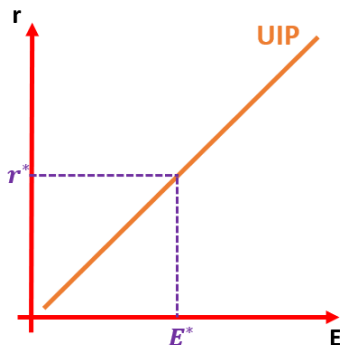
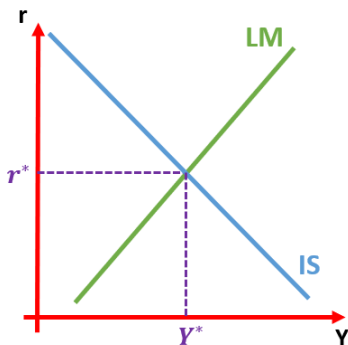
- An important market for the open economy is the bond market.
- This market is important to determine the equilibrium exchange rate value.
- The equilibrium in the bond market is given by the UIP (expressed in real terms):

$$r = r^* + (\pi^* - \pi) - \hat{E}_{t+1}^e.$$



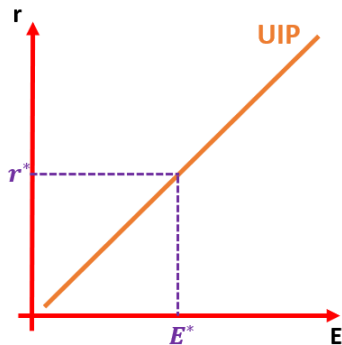
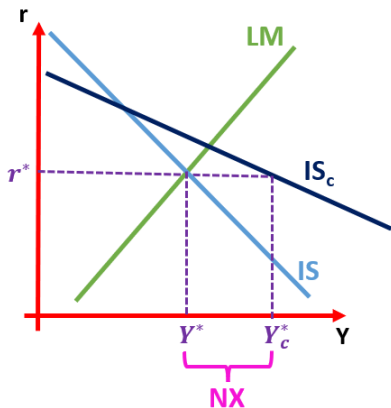
Mundell-Fleming Model

- IS-LM model for open economies. It incorporates the analysis of the goods and services market, the money market, and the bond (financial) market.



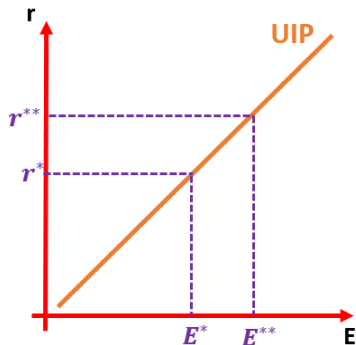
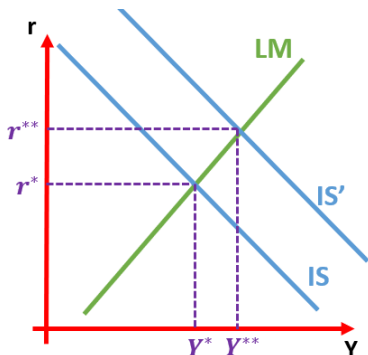
Mundell-Fleming Model: Analyzing Net Exports

- For a given interest rate, net exports are the difference between the GDP of a closed economy vs the GDP of an open economy. This can be seen graphically using the IS curve.



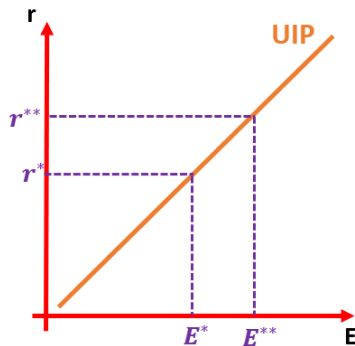
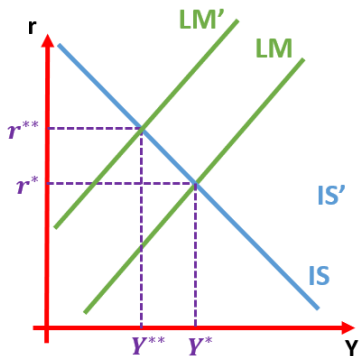
Mundell-Fleming Model: Effect of Fiscal Policy

- This model allows us to analyze the effect of different policies on variables such as output, interest rate, exchange rate, investment, taxes, etc... For example, let us analyze the effect of an increase in government expenditures.



Mundell-Fleming Model: Effect of Monetary Policy

- Let us analyze the effect of an open market operation in which the government sells bonds.



Mundell-Fleming Model: Fixed Exchange Rates

- Consider an economy in which the Central Bank wants the exchange rate to be fixed at a value \bar{E} .
- Since the UIP always has to hold, the Central Bank must make sure that the interest rate remains constant at a value \bar{r} .
- Then, the Central Bank must always adjust the money supply, such that the interest rate does not change.
- In a sense, if the Central Bank wants a fixed exchange rate, it “loses” its ability to control the money and the interest rate.

Mundell-Fleming Model: Effect of Monetary Policy

- In an open economy with a fixed exchange rate, the LM curve is completely flat.

