Ch5 - The Open Economy in the Long Run

The International Flows of Goods

(Let $d$ and $f$ represents domestic and foreign goods respectively)

- In an open economy the domestic production ($Y$) can be either used domestically or exported
  \[ Y = C^d + I^d + G^d + EX \]

- Open economies also import goods for domestic consumption
  \[ IM = C^f + I^f + G^f \]

- Combining the previous two equations yields
  \[ Y = (C^d + C^f) + (I^d + I^f) + (G^d + G^f) + EX - IM \]
• which can be written as

\[ Y = C + I + G + EX - IM \]

where \( C = C^d + C^f \), \( I = I^d + I^f \) and \( G = G^d + G^f \)

• In the final equality

\[ NX = EX - IM \]

is the net exports and can also be written as

\[ NX = Y - (C + I + G) \]

= Domestic Output – Domestic Spending

– when \( NX > 0 \): the country produces more than it uses domestically, and lends the difference to abroad

– when \( NX < 0 \): the country uses more than it produces, and borrows the difference from abroad
The International Flows of Capital Interpretation of NX

- Now we think about the national income identity in an open economy in nominal terms
- If we rearrange the national income identity

\[ Y - C - G = I + NX \]

where \( Y \) is the total income of a country in nominal terms and \( Y - C - G = S \) is the total savings in an economy
- Hence,

\[ S - I = NX \]

- \( S - I \) is the difference between domestic saving and domestic investment (also called net capital outflow or net foreign investment)
• Now we also call net exports as the trade balance (the difference between the monetary value of exports and imports of output)

• The equation $S - I = NX$ indicates that the national saving can either be spent on investment goods, or lend abroad so that the foreigners are able to purchase the good and services not used domestically ($NX$).

• Hence, the international flow of funds to finance capital accumulation and the international flow of goods and services are two sides of the same coin.

• If our saving exceeds our investment, the saving that is not invested domestically is used to make loans to foreigners. Foreigners require these loans because we are providing them with more goods and services than they are providing us
In the future, we expect the foreign country to pay its debt back so that home country would enjoy from consuming their goods.

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**International Flows of Goods and Capital: Summary**

This table shows the three outcomes that an open economy can experience.

<table>
<thead>
<tr>
<th>Trade Surplus</th>
<th>Balanced Trade</th>
<th>Trade Deficit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exports &gt; Imports</td>
<td>Exports = Imports</td>
<td>Exports &lt; Imports</td>
</tr>
<tr>
<td>Net Exports &gt; 0</td>
<td>Net Exports = 0</td>
<td>Net Exports &lt; 0</td>
</tr>
<tr>
<td>Y &gt; C + I + G</td>
<td>Y = C + I + G</td>
<td>Y &lt; C + I + G</td>
</tr>
<tr>
<td>Savings &gt; Investment</td>
<td>Saving = Investment</td>
<td>Saving &lt; Investment</td>
</tr>
<tr>
<td>Net Capital Outflow &gt; 0</td>
<td>Net Capital Outflow = 0</td>
<td>Net Capital Outflow &lt; 0</td>
</tr>
</tbody>
</table>
Question 1: If saving may not be equal to investment any more, what determines the real interest rate?

- In an open economy we use perfect capital mobility assumption, meaning that residents of the country have full access to world financial markets.

- Therefore, the interest rate in our small open economy, \( r \), must equal the world interest rate \( r^* \)

\[ r = r^* \]

- This is because investors of the small open economy can always get a loan at \( r^* \) from abroad, so they would not pay higher than \( r^* \) to the residents of home country

- Similarly, residents of this economy need never lend at any interest rate below \( r^* \) because they can always earn \( r^* \) by lending abroad
Thus, the world interest rate determines the interest rate in our small open economy.

- World’s investment and saving determines the world real interest rate
- A small open economy assumption: Savings decisions cannot affect $r^*$
- A large open economy assumption: Savings decisions can affect $r^*$
Question 2: If not the real interest rate, what brings the national income identity into equilibrium?

- It is the real exchange rate that secures the equilibrium in the national income identity by adjusting the net exports

\[ \tilde{Y} = C(\tilde{Y} - \tilde{T}) + I(r^*) + \tilde{G} + NX(\epsilon) \]

- We start to discussion by examining the trade balance
• Remember that

\[ S = Y - C - G \]

• Also that

\[ NX = \bar{S} - I(r^*) \]

• In a closed economy, the real interest rate adjusts to equilibrate saving and investment. However, in a small open economy, the interest rate is determined in world financial markets \((r^*)\)

• The difference between saving and investment determines the trade balance
• In the figure country saves more than it invests. The difference is exported abroad

• Notice that NX can be negative as well
CASE STUDY: The U.S. Trade Deficit

The U.S. Trade Balance

The U.S. Saving and Investment
A Fiscal Expansion at Home

- An increase in government purchases or a reduction in taxes reduces national saving
- The result is a trade deficit
A Fiscal Expansion Abroad

- A fiscal expansion in a foreign economy large enough to reduce world saving raises the world interest rate from $r_1^*$ to $r_2^*$
- The higher world interest rate reduces investment in a small open economy, causing a trade surplus
Shifts in Investment Demand

- Suppose the government changed the tax laws to encourage investment thus the demand for investment goods at every interest rate increases.
- The result is a trade deficit.
Evaluating Trade Policies

- A trade deficit could be a reflection of low saving
  - In a closed economy, low saving leads to low investment and a smaller future capital stock
  - In an open economy, low saving leads to a trade deficit and a growing foreign debt, which eventually must be re-paid
  - In both cases, high current consumption leads to lower future consumption; future generations bear the burden of low saving

- A trade deficit could be a sign of economic development
  - When poor economies develop into modern industrial economies, they may finance their high levels of investment with foreign borrowing
The Real Exchange Rate and the Trade Balance

- Just as the relative price of hamburgers and pizza determines which you choose for lunch, the relative price of domestic and foreign goods affects the demand for these goods. The lower the real exchange rate, the domestic goods becomes cheaper relative to the foreign goods. Thus net exports increases and becomes positive.
Örnek: Dolar ile yen arasındaki döviz kuru 120 yen/dolar olsun. Bir amerikan arabaşı 10.000 dolar, benzer bir Japon arabaşı da 2.400.000 yen olsun. Bu iki ülke arasındaki reel döviz kuru kaçtır?

Cevap: Amerikan arabaşı 10.000 dolar değerinde; 1 dolar ise 120 yen alıyor. Dolayısıyla Amerikan arabaşı 1.200.000 yen değerinde.

Aynı araba Japonya’da 2.400.000 yen olduğundan 1 Amerikan arabaşı ancak 0,5 Japon arabaşı alabiliyor (0,5 Japon arabaşı/Amerikan arabaşı; yani Amerikan arabaşı daha ucuz), bu da iki ülke arasındaki reel döviz kuru oluyor

$$\epsilon_{yen/$$} = \epsilon_{yen/$$} \times \left( \frac{P}{P^*} \right) = 120 \times \frac{10.000}{2.400.000} = 0,5$$
(*) Aynı soruyu tersten de çözebilirdik

\[ \varepsilon_{\$/yen} = \varepsilon_{\$/yen} \times \left( \frac{P^*}{P} \right) = \frac{1}{120} \times \frac{2.400.000}{10.000} = 2 \]

Yani bir Japon arabasını fiyatına (onu satıp) 2 Amerikan arabası alınabiliyor

**Not:** Bu durumda insanlar Amerikan arabalarına talep ve de Amerika’nın ihracatı artır
The Determinants of the Real Exchange Rate

- Remember that: \( NX = \bar{S} - I(r^*) \)

- This means the amount of net export has already been determined. We also know that there is one unique real exchange rate for each Net Export value. Thus we can find the equilibrium real exchange rate
Financial Markets Interpretation of the Determination of the Real Exchange Rate

- The vertical line, S-I, represents the net capital outflow and thus the supply of domestic currency to be exchanged into foreign currency and invested abroad.

- The downward-sloping line, NX, represents the net domestic currency demand of foreigners to buy net exports from the home country.

- At the equilibrium real exchange rate, the supply of dollars available from the net capital outflow balances the demand for dollars.
Expansionary Fiscal Policy at Home

- Increase in government purchases or a cut in taxes, reduces national saving. The fall in saving reduces the supply of dollars to be exchanged into foreign currency, from $S_1 - I$ to $S_2 - I$. This shift raises the equilibrium real exchange rate from $\epsilon_1$ to $\epsilon_2$. 
Expansionary Fiscal Policy Abroad

- The world saving is reduced and raises the world interest rate raises from $r_1^*$ to $r_2^*$. The increase in $r^*$ reduces investment at home, which in turn raises the supply of dollars to be exchanged into foreign currencies.
- The equilibrium real exchange rate falls from $\epsilon_1$ to $\epsilon_2$. 

Ozan Eksi (TOBB-ETU)
The Impact of an Increase in Investment Demand

- It reduces world saving and raises the world interest rate from $r_1^*$ to $r_2^*$. The increase in this rate reduces investment at home, which in turn raises the supply of dollars to be exchanged into foreign currencies.
- The equilibrium real exchange rate falls from $\epsilon_1$ to $\epsilon_2$.
The Impact of Protectionist Trade Policies

- Policies such as a ban on imported cars, raises the real exchange rate from $\epsilon_1$ to $\epsilon_2$ but leaves the level of net exports unchanged.
- It is because investment and savings (as long as imported car consumption is replaced by domestic car consumption) are unchanged.
The Determinants of the Nominal Exchange Rate

- The equation

$$\epsilon = \epsilon \times \left( \frac{P}{P^*} \right)$$

is just an equality. Actually nominal exchange rate depends on the real exchange rate and the price ratios of two countries

$$e = \epsilon \times \left( \frac{P^*}{P} \right)$$

- Taking natural logarithm (ln) of both sides

$$\ln(e) = \ln(\epsilon) + \ln(P^*) - \ln(P)$$

which implies that

$$\%\text{Change in } e = \%\text{Change in } \epsilon + \%\text{Change in } P^* - \%\text{Change in } P.$$
• and

\[ \% \text{Change in } e = \% \text{Change in } \epsilon + (\pi^* - \pi) \]

• If a country has a high (low) rate of inflation relative to the home country, domestic currency will buy an increasing (decreasing) amount of the foreign currency over time

• In result:
  – Private and public saving decisions of a country determines its net exports, which determines the real exchange rate
  – The real exchange rate, combined with countries’ monetary policies, determine the nominal exchange rate.
Appendix: How did we end up with % changes in the two previous slide?

- Let’s take a quick look to the logarithm

\[ \ln(e_t) = \ln(\epsilon_t) + \ln(P_t^*) - \ln(P_t) \quad \& \quad \ln(e_{t-1}) = \ln(\epsilon_{t-1}) + \ln(P_{t-1}^*) - \ln(P_{t-1}) \]

- If we subtract RHS from the LHS

\[
\ln(e_t) - \ln(e_{t-1}) = \ln(\epsilon_t) - \ln(\epsilon_{t-1}) + \ln(P_t^*) - \ln(P_{t-1}^*) - (\ln(P_t) - \ln(P_{t-1}))
\]

\[ \ln(\frac{e_t}{e_{t-1}}) = \ln(\frac{\epsilon_t}{\epsilon_{t-1}}) + \ln(\frac{P_t^*}{P_{t-1}^*}) - \ln(\frac{P_t}{P_{t-1}}) \]

- If \( g \) represents the growth rate of variables

\[
\ln(\frac{e_{t-1} (1 + g_{\epsilon})}{e_{t-1}}) = \ln(\frac{\epsilon_t (1 + g_{\epsilon})}{\epsilon_{t-1}}) + \ln(\frac{P_t^* (1 + g_{P^*})}{P_{t-1}^*}) - \ln(\frac{P_t (1 + g_P)}{P_{t-1}})
\]
• As for small \( c \), \( \exp(c) \approx 1 + c \)

\[
\ln(\exp g_e) = \ln(\exp g_\epsilon) + \ln(\exp g_{P*}) - \ln(\exp g_P)
\]

and

\[
g_e = g_\epsilon + g_{P*} - g_P
\]

hence

\[
\%\text{Change in } e = \%\text{Change in } \epsilon + (\pi^* - \pi)
\]

• This analysis implies that as long as we assume price levels are constant over time, the changes in real and nominal exchange rates are similar and our analysis for real exchange rates are valid for the nominal ones as well.
Inflation Differentials and the Exchange Rate

- The horizontal axis shows the country’s average inflation rate minus the U.S. average inflation rate over the period 1972–2000. The vertical axis is the average percentage change in the country’s exchange rate (per U.S. dollar) over that period.
The Special Case of Purchasing-Power Parity

- The law of one price states that the same good cannot sell for different prices in different locations at the same time.
  - If a dollar could buy more wheat domestically than abroad, there would be opportunities to profit by buying wheat domestically and selling it abroad. Profit-seeking arbitrageurs would drive up the domestic price of wheat relative to the foreign price.

- The law of one price applied to the international marketplace (for all goods) is called purchasing-power parity. A dollar (or any other currency) must have the same purchasing power in every country.

- Purchasing-Power Parity suggests that net exports are highly sensitive to small movements in the real exchange rate. This high sensitivity is
reflected here with a very flat net-exports schedule

Purchasing-Power Parity

- Result 1: Because the net-exports schedule is flat, changes in saving or investment do not influence the real or nominal exchange rate
- Result 2: Because the real exchange rate is fixed, all changes in the nominal exchange rate result from changes in price levels
Is Purchasing Power Parity Theory True?

- Not totally consistent with the facts
- But does it make it wrong?
  - No, just missing
  - Many goods are not easily traded, so that their prices do not need to equate
  - Second, even tradable goods are not always perfect substitutes
  - There is home bias in the similar concept. The rate of return to investment is lower in the US compared to other developing countries, yet there is more FDI flow into US that outflow from this country.
- Conclusion: It is worth to know
APPENDIX: The Large Open Economy

The Market for Loanable Funds

- Remember that in a small economy savings are used to finance investment or lend abroad so that the foreigners are able to purchase the good and services not used domestically

\[ \bar{S} = I(r^*) + NX \]

- If $NX > 0$, the domestic currency is lend abroad; if not, foreign currency is borrowed. We call these capital flows as the net capital outflow and denote with $CF$
• In case of a small open economy the capital outflow is perfectly elastic around the world interest rate \( (r^*) \)

\[ \bar{S} = I(r^*) + CF(r^*) \]

• If the interest rate that is consistent with the closed economy is less than the world interest rate, the capital flows abroad and \( CF > 0 \)
• A large open economy can influence world financial market and world interest rate. Therefore the previous equation could be modified as

$$\bar{S} = I(r) + CF(r)$$

• If home interest rate rises, the capital flows into country
Therefore the equality: \( \bar{S} = I(r) + CF(r) \) can be drawn as

which determines the interest rate in a large open economy

- For instance if saving is lower than the investment, interest rate rises, which decreases investment and increases capital flow into the economy
The Market for Foreign Exchange

- National Income Identity tells that $NX = S - I$
- It can also be written as $NX(\epsilon) = CF$

- At the equilibrium exchange rate, the supply of dollars from the net capital outflow, $CF$, balances the demand for dollars for the $NX$
A Reduction in National Saving in the Large Open Economy

A reduction in savings reduces both investment and net exports
An Increase in Investment Demand in the Large Open Economy

- An increase in investment demand leads reduction in net exports
An Import Restriction in the Large Open Economy

- An import restriction reduces imports. But since net exports has to be the same, dollar appreciates so that exports are also reduced.
If interest rates in Germany reduce, net capital outflow and the interest rates in the US reduce too. Investment increases, net exports fall.