An Open Economy

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For simplicity, we have so far assumed that the economy under consideration is closed, i.e. there are no interactions with the rest of the world.

Now we relax this assumption, in particular we will assume that consumers can buy domestic or foreign goods and investors can buy domestic or foreign assets.

This openness has important implications for the domestic economy, in particular on output and the savings-investment relation.
Openness of the Austrian Goods Market

Figure: Share of Austrian Goods Exports & Imports (OECD, 1970-2006)
Openness in Goods Market

- In an open economy consumers face a consumption-savings decision AND they have to decide whether to buy domestic or foreign goods (or both).
- Their decision has important implications: e.g. if they buy more foreign goods, foreign output, instead of domestic output, increases.
- The decision is mainly based on the price of domestic goods in terms of foreign goods, i.e. the real exchange rate.
- The latter is not directly observable but we can construct it from the nominal exchange rate.
Nominal Exchange Rate

Quotation

There are two ways to quote the nominal exchange rate $E$

- the price of domestic currency in terms of foreign currency (e.g. price of one Euro in terms of U.S. Dollars; USD/EUR)

- the price of foreign currency in terms of domestic currency (e.g. price of one U.S. Dollar in terms of Euros; EUR/USD)

We will always use the first definition: A nominal exchange rate between the USD and the Euro of $E = 1.2644$ implies that you have to give up 1.2644 U.S. Dollars to buy one Euro.
Nominal Exchange Rate

Appreciation and Depreciation

- Appreciation: an increase in the price of domestic currency in terms of foreign currency ($E \uparrow$), i.e. more foreign currency is needed to buy one unit of the domestic currency
- Depreciation: a decrease in the price of domestic currency in terms of foreign currency ($E \downarrow$), i.e. less foreign currency is needed to buy one unit of the domestic currency
Nominal Exchange Rate between U.S. Dollar and Euro

Figure: USD per EUR (ECB, 04/01/1999-20/12/2010)
Real Exchange Rate

Motivation

- The nominal exchange rate only tells the consumer how many units of foreign currency he gets for domestic currency.
- It does not tell him how many goods he can buy with the foreign currency compared to how many goods he can buy with the domestic currency.
- Therefore consumers also have to take into account domestic and foreign prices.
Real Exchange Rate Calculation

- An Austrian consumer wants to buy a “basket of goods” (either in Austria or from the U.S.)
- The price of the Austrian goods basket is EUR $P$; a (comparable) U.S. basket costs USD $P^*$; the nominal exchange rate is $E$
- The product $EP$ gives the price of the Austrian goods basket in terms of U.S. Dollars
- Dividing this product by $P^*$ yields the price of the Austrian goods basket in terms of U.S. goods baskets, i.e. the real exchange rate:

$$\epsilon \equiv \frac{EP}{P^*}$$
Real Exchange Rate

Example

- The real exchange rate is equal to $\epsilon$
- The Euro appreciates by 2%, so the new nominal exchange rate is given by $E' = 1.02 \cdot E$
- Furthermore, the price of Austrian goods increases by 2%, i.e. $P' = 1.02 \cdot P$, while the price of U.S. goods increases by 5%, i.e. $P'^* = 1.05 \cdot P^*$
- For one Euro a consumer now gets 2% more U.S. Dollars, but the inflation rate in Austria is smaller than in the U.S.; should the consumer now buy Austrian goods or U.S. goods?
- The new real exchange rate is given by $\epsilon' = 0.99 \cdot \epsilon$
- The price of Austrian goods in terms of U.S. goods has decreased by 1%, i.e. the former are now relatively cheaper
Real Exchange Rate

Remarks

- For the construction of the real exchange rate we usually use GDP deflators (cp. Chapter 2).
- Since the latter are mere index numbers, the level of the real exchange rate is uninformative.
- However, as illustrated in the previous example, the rate of change of the real exchange rate is instructive.
- An increase in the real exchange rate is called real appreciation, while a decrease is called real depreciation.
- A real appreciation/depreciation not necessarily depends on $E$, but can also be caused by a change in $P$ or $P^*$.
Austrian Real Exchange Rate with the U.S.

Figure: Real Exchange Rate (ECB & OECD, 01/1999-12/2008)
Multilateral Exchange Rate

- The real exchange rate is the price of domestic goods in terms of the goods of one particular foreign country.

- If we want to know the price of domestic goods in terms of foreign goods in general, we have to look at the so-called multilateral exchange rate.

- The latter is a weighted sum of real exchange rates where the shares of trade with different foreign countries are used as weights.

- The multilateral exchange rate (or effective exchange rate) can be used to analyze the competitiveness of a country and its goods respectively.
Figure: Effective Exchange Rate (OECD, 01/1970-12/2008)
Open financial markets allow investors to hold both domestic and foreign assets and they facilitate trade.

Furthermore, open financial markets allow a country to run a trade deficit (or a trade surplus).

For instance, by borrowing from the rest of the world a country can finance its trade deficit, i.e. the difference that arises if the country is buying more from the rest of the world than it is selling to the rest of the world.
The Balance of Payments

Current Account

- The transactions of an economy with the rest of the world are summarised in the balance of payments (BOP), which consists of the current account (CA) and the financial account (FA).

- The current account records all payments to and from the rest of the world:
  1. exports (+) and imports (-) of goods and services
  2. investment income received (+) and paid (-) (e.g. dividends on shares, interests on bonds)
  3. transfers received (+) and paid (-) (e.g. foreign aid)

- The sum of net payments is called current account balance; if it is positive (negative), the country is running a current account surplus (deficit).
The Balance of Payments

Financial Account

- A current account deficit implies that a country has to borrow from the rest of the world.
- Borrowing in this respect means that foreign holdings of domestic assets are larger than domestic holdings of foreign assets, i.e. net capital flows to the country are positive.
- The **financial account** describes these asset holdings.
- Positive (negative) net capital flows are called financial account surplus (deficit).
- The current and the financial account balance should in principle be the same (with different signs); in reality there is a statistical discrepancy (due to different data sources).
Domestic vs. Foreign Assets

Motivation

▶ In an open economy, investors face the decision whether to buy domestic or foreign *interest-paying* assets.

▶ If the investor decides to invest in foreign assets he first has to get foreign currency to buy the assets and then has to exchange the returns on the asset (which are paid out in the foreign currency) back into his domestic currency.

▶ Therefore, his decision in which asset to invest will not only be influenced by the respective interest rates but also by the nominal exchange rate at the time of the purchase and the expected exchange rate at the maturity date of the asset.
Domestic vs. Foreign Assets

Example

- An Austrian investor wants to invest one Euro, either in one year Austrian bonds or one year U.S. bonds
- If the nominal interest rate on Austrian bonds in year $t$ equals $i_t$ then in $t+1$ the investor gets $(1 + i_t)$ Euros
- If the investor buys U.S. bonds he first has to buy U.S. Dollars; for one Euro he gets $E_t$ U.S. Dollars
- If the nominal interest rate on U.S. bonds in year $t$ equals $i_t^*$ then in $t+1$ the investor gets $E_t(1 + i_t^*)$ U.S. Dollars
- The investor then has to convert these U.S. Dollars into Euros; if the expected nominal exchange rate equals $E_{t+1}^e$, his expected return is $[E_t(1 + i_t^*)]/E_{t+1}^e$ Euros
Domestic vs. Foreign Assets

Graphical Representation

<table>
<thead>
<tr>
<th>Year $t$</th>
<th>Year $t + 1$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austrian bonds</td>
<td></td>
</tr>
<tr>
<td>€1</td>
<td>€$(1 + i_t)$</td>
</tr>
<tr>
<td>€1</td>
<td>€$E_t(1 + i^*<em>t)(1/E^e</em>{t+1})$</td>
</tr>
<tr>
<td>U.S. bonds</td>
<td></td>
</tr>
<tr>
<td>$\downarrow$</td>
<td></td>
</tr>
<tr>
<td>$E_t$</td>
<td>$E_t(1 + i^*_t)$</td>
</tr>
</tbody>
</table>

Table: Investing in Austrian and U.S. bonds
Interest Parity Condition

- The assessment of the attractiveness of domestic versus foreign assets should not only rely on comparing domestic and foreign interest rates.
- An investor also has to consider the (expected) nominal exchange rate in his decision.
- Assuming that the investor only cares about the expected rate of return, he will be indifferent between two assets only if their returns are equal, i.e., if

\[ 1 + i_t = (1 + i_t^*) \frac{E_t}{E_{t+1}} \] (1)

- Equation (1) is called *uncovered interest parity condition* (UIP) or simply *interest parity condition*; it is a no-arbitrage condition.
Interest Parity Condition

Why must the UIP hold?

► Suppose the UIP did not hold and e.g. Austrian bonds had a higher expected return than U.S. bonds.

► Clearly, it is better to hold Austrian bonds and people will try to sell their U.S. bonds and buy Austrian bonds instead

► This creates an excess supply for U.S. bonds (i.e. the price for U.S. bonds goes down and thus \( i^* \) goes up) and an excess demand for Austrian bonds (i.e. the price for Austrian bonds goes up and thus \( i \) goes down)

► This means that for given exchange rates, Austrian bonds become less attractive

► Eventually, this process will reach an equilibrium in which Austrian and U.S. bonds have the same expected return.
Implications of the Interest Parity Condition

- Rewriting the interest parity condition yields

\[ i_t \approx i_t^* - \frac{E_{t+1}^e - E_t}{E_t} \]  \hspace{1cm} (2)

- Thus, the domestic interest rate is approximately equal to the foreign interest rate minus the expected rate of appreciation of the domestic currency
Implications of the Interest Parity Condition

Example

► Assume that the nominal interest rate for one year bonds equals 2% in Austria and 5% in the U.S.; should an investor buy Austrian or U.S. bonds?
► At first sight U.S. bonds look more attractive
► However, the investor also has to account for the development of the nominal exchange rate, i.e. by how much the Euro will appreciate (or depreciate)
► If the investor expects the Euro to appreciate by more than 3% then it would be more attractive to invest in Austrian bonds
► If the investor expects the Euro to appreciate by less than 3% then it would be more attractive to invest in U.S. bonds
► Alternatively we could say that if the interest parity condition holds and the one year nominal interest rate in Austria is 3% lower than in the U.S., investors expect the Euro to appreciate by 3%
Summary

- Openness in goods markets allows consumers to choose between domestic and foreign goods
- Their choice primarily depends on the real exchange rate, i.e. the price of domestic goods in terms of foreign goods
- Openness in financial markets allows investors to choose between domestic and foreign assets
- Their choice primarily depends on the expected rates of return of these assets, which depend on domestic and foreign interest rates as well as on the current and the expected nominal exchange rate