Exchange Rates, Business Cycles, and Macroeconomic Policy in the Open Economy, Part 1

Agenda
- Exchange Rates
- How Exchange Rates Are Determined
  - A Supply-and-Demand Analysis

Exchange Rates
- Nominal exchange rates:
  - The nominal exchange rate indicates how much foreign currency can be obtained with one unit of the domestic currency.
  - For example, if the nominal exchange rate is 110 yen per dollar, one dollar can be exchanged for 110 yen.

Exchange Rates
- Nominal exchange rates:
  - Transactions between currencies take place in the foreign exchange market.
  - Denote the nominal exchange rate (or simply, exchange rate) as $e_{nom}$ in units of the foreign currency per unit of domestic currency.
Exchange Rates

• Nominal exchange rates:
  
  ➢ Under a flexible-exchange-rate system or floating-exchange-rate system, exchange rates are determined by supply and demand and may change every day.
  
  • This is the current system for major currencies

Exchange Rates

• Nominal exchange rates:
  
  ➢ In the past, many currencies operated under a fixed-exchange-rate system, in which exchange rates were determined by governments.
  
  • The exchange rates were fixed because the central banks in those countries offered to buy or sell the currencies at the fixed exchange rate.
  
  • Though major currencies are in a flexible-exchange-rate system, some smaller countries fix their exchange rates.

Exchange Rates

• Real exchange rates:
  
  ➢ The real exchange rate indicates how much of a foreign good can be obtained for one unit of a domestic good.
  
  • Suppose the nominal exchange rate is 110 yen per dollar, a hamburger costs 1100 yen in Japan and $2 in the U.S.
    - The price of a U.S. hamburger relative to a Japanese hamburger is 0.2 Japanese hamburgers per U.S. hamburger.
  
  • The real exchange rate is 0.2 yen per dollar.

Exchange Rates

• Real exchange rates:
  
  ➢ The real exchange rate is the price of domestic goods relative to foreign goods, or
    
    \[ e = e_{\text{nom}} \frac{P}{P_{\text{for}}} \]
Exchange Rates

- Real exchange rates:
  - Although countries produce many goods, and price indexes should be used to get $P$ and $P_{For}$ to simplify matters, assume that each country produces a unique good.
  - If a country’s real exchange rate is rising, its goods are becoming more expensive relative to the goods of the other country.

Exchange Rates

- Appreciation and depreciation:
  - In a flexible-exchange-rate system:
    - When $e_{nom}$ falls, the domestic currency has become weaker and has undergone a nominal depreciation.
    - When $e_{nom}$ rises, the domestic currency has become stronger and has undergone a nominal appreciation.

Exchange Rates

- Appreciation and depreciation:
  - In a fixed-exchange-rate system:
    - When $e_{nom}$ falls, the domestic currency has become weaker and has undergone a nominal devaluation.
    - When $e_{nom}$ rises, the domestic currency has become stronger and has undergone a nominal revaluation.
Exchange Rates

- Appreciation and depreciation:
  - In a fixed-exchange-rate system:
    - When $e$ falls, the domestic currency has become weaker and has undergone a real devaluation.
    - When $e$ rises, the domestic currency has become stronger and has undergone a real revaluation.

Exchange Rates

- Purchasing power parity:
  - To examine the relationship between the nominal exchange rate and the real exchange rate, think first about a simple case in which all countries produce the same goods, which are freely traded.
  - If there were no transportation costs, the real exchange rate would have to be $e = 1$, or else everyone would buy goods where they were cheaper.

Exchange Rates

- Purchasing power parity:
  - Setting $e = 1$ yields:
    \[ P = P_{\text{for}} / e_{\text{nom}} \]
  - This means that similar goods have the same price in terms of the same currency, a concept known as purchasing power parity, or PPP.

Exchange Rates

- Purchasing power parity:
  - Empirical evidence:
    - PPP holds in the long run but not in the short run.
      - Countries actually produce different goods.
      - Some goods are not traded internationally.
      - There are transportation costs.
      - There are also legal barriers to trade.
Exchange Rates

• Purchasing Power Parity:

- When PPP doesn’t hold, changes in the real exchange rate can be decomposed into its parts:
  \[ \Delta \frac{e}{e} = \Delta \frac{e_{\text{nom}}}{e_{\text{nom}}} + \Delta \frac{P}{P} - \Delta \frac{P_{\text{for}}}{P_{\text{for}}} \]

- This can be rearranged as:
  \[ \Delta \frac{e_{\text{nom}}}{e_{\text{nom}}} = \Delta \frac{e}{e} + \pi_{\text{For}} - \pi \]

Exchange Rates

• Purchasing Power Parity:

  \[ \Delta \frac{e_{\text{nom}}}{e_{\text{nom}}} = \Delta \frac{e}{e} + \pi_{\text{For}} - \pi \]

- A nominal appreciation is due to either:
  - A real appreciation, and/or
  - A lower rate of inflation relative to the foreign country.

Exchange Rates

• Purchasing Power Parity:

  \[ \Delta \frac{e_{\text{nom}}}{e_{\text{nom}}} = \Delta \frac{e}{e} + \pi_{\text{For}} - \pi \]

- Relative purchasing power parity works as a description of exchange-rate movements in high-inflation countries.
  - In such countries, movements in relative inflation rates are much larger than movements in real exchange rates.
Exchange Rates

• McParity:

  ➢ As a test of the PPP hypothesis, the Economist magazine periodically reports on the prices of Big Mac hamburgers in different countries.

  ➢ In 2006, the prices, when translated into dollar terms using the nominal exchange rate, range from just over $1 in China to over $5 in Switzerland, so PPP definitely doesn’t hold.

Price of a Big Mac

<table>
<thead>
<tr>
<th>Country</th>
<th>Dollar price of a Big Mac</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>5.30</td>
</tr>
<tr>
<td>Argentina</td>
<td>2.29</td>
</tr>
<tr>
<td>Brasil</td>
<td>2.78</td>
</tr>
<tr>
<td>Canada</td>
<td>3.14</td>
</tr>
<tr>
<td>China</td>
<td>1.14</td>
</tr>
<tr>
<td>Euro area</td>
<td>3.77</td>
</tr>
<tr>
<td>Great Britain</td>
<td>3.65</td>
</tr>
<tr>
<td>Japan</td>
<td>2.23</td>
</tr>
<tr>
<td>Malaysia</td>
<td>1.52</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.57</td>
</tr>
<tr>
<td>Russia</td>
<td>1.77</td>
</tr>
<tr>
<td>South Korea</td>
<td>2.62</td>
</tr>
<tr>
<td>Switzerland</td>
<td>5.21</td>
</tr>
</tbody>
</table>

Exchange Rates

• The real exchange rate and net exports:

  ➢ The real exchange rate is important because it represents the rate at which domestic goods and services can be traded for those produced abroad.

    • An increase in the real exchange rate means people in a country can get more foreign goods for a given amount of domestic goods.

  ➢ The hamburger price data forecast movements in exchange rates.

    • Because hamburger prices might be expected to converge, countries in which Big Macs are expensive may experience a depreciation, while countries in which Big Macs are cheap may experience an appreciation.
Exchange Rates

• The real exchange rate and net exports:
  ➢ The real exchange rate also affects a country’s net exports (exports minus imports).
    ▪ Changes in net exports have a direct impact on export and import industries in the country.
    ▪ Changes in net exports affect overall economic activity and are a primary channel through which business cycles and macroeconomic policy changes are transmitted internationally.

Exchange Rates

• The real exchange rate and net exports:
  ➢ The real exchange rate affects net exports through its effect on the demand for goods.
    ▪ A high real exchange rate makes foreign goods cheap relative to domestic goods, so there’s a high demand for foreign goods so net exports decline.
    ▪ The higher the real exchange rate, the lower a country’s net exports.

Exchange Rates

• The J curve effect:
  ➢ The effect of a change in the real exchange rate may be weak in the short run and can even go the “wrong” way.
  ▪ Although a rise in the real exchange rate will reduce net exports in the long run, in the short run it may be difficult to quickly change imports and exports.

Exchange Rates

• The real exchange rate and net exports:
  ➢ The J curve effect:
    ▪ As a result, a country will import and export the same amount of goods for a time, with lower relative prices on the foreign goods, thus increasing net exports.
    ▪ Similarly, a real depreciation will lead to a decline in net exports in the short run and a rise in the long run.
    ▪ This pattern of net exports is known as the J curve.
The J Curve

Our analysis assumes a time period long enough that the movements along the J curve are complete.

Thus, a real depreciation raises net exports and a real appreciation reduces net exports.

Exchange Rates

- The real exchange rate and net exports:
  - The J curve effect:
    - Our analysis assumes a time period long enough that the movements along the J curve are complete.
    - Thus, a real depreciation raises net exports and a real appreciation reduces net exports.

Exchange Rates

- The value of the dollar and U.S. net exports:
  - This theory suggests that the value of the dollar and U.S. net exports should be inversely related.
  - Data since the early 1970s, when the world switched to floating exchange rates, confirms the theory, at least in the 1980s.
Exchange Rates

• The value of the dollar and U.S. net exports:
  ➢ From 1980 to 1985 the dollar appreciated and net exports declined sharply.
  ➢ The dollar began depreciating in 1985, but net exports did not began to rise until late 1987.
    • 2-1/2 years is a long time for the J curve to be in effect.

Exchange Rates

• The value of the dollar and U.S. net exports:
  ➢ A possible explanation for this long lag in the J curve is a change in competitiveness.
    • The strength of the dollar for such a long period in the first half of the 1980s meant U.S. firms lost many foreign customers while foreign firms made many inroads into the United States.
    • This is known as the “beachhead effect,” because it allowed foreign producers to establish beachheads in the U.S. economy.

Exchange Rates

• The value of the dollar and U.S. net exports:
  ➢ The U.S. real exchange rate and net exports moved in opposite directions from 1997 to 2001:
    • The strong dollar reduced net exports.
    • A bigger factor was weak growth in foreign economies.

How Exchange Rates Are Determined

• What causes changes in the exchange rate?
  ➢ To analyze this, we’ll use supply-and-demand analysis, assuming a fixed price level.
  ➢ Holding prices fixed means that changes in the real exchange rate are matched by changes in the nominal exchange rate.
How Exchange Rates Are Determined

- What causes changes in the exchange rate?
  - The nominal exchange rate is determined in the foreign exchange market by supply and demand for the currency.
  - Demand and supply are plotted against the nominal exchange rate, just like demand and supply for any good.

The supply of and demand for the dollar

- Supplying dollars means offering dollars in exchange for the foreign currency.
- The supply curve slopes upward, because if people can get more units of foreign currency for a dollar, they’ll supply more dollars.

- Demanding dollars means wanting to buy dollars in exchange for the foreign currency.
- The demand curve slopes downward, because if people need to give up a greater amount of foreign currency to obtain one dollar, they’ll demand fewer dollars.
How Exchange Rates Are Determined

• Why do people demand or supply dollars?
  ➢ People want to buy dollars for two reasons:
    • To be able to buy U.S. goods and services (U.S. exports).
    • To be able to buy U.S. real and financial assets (U.S. financial inflows)

• Factors that increase demand for U.S. exports and assets will increase demand for dollars, shifting the demand curve to the right and increasing the nominal exchange rate:
  ➢ For example, an increase in foreign income will lead to an appreciation of the dollar.

• Why do people demand or supply dollars?
  ➢ People want to sell dollars for two reasons:
    • To be able to buy foreign goods and services (U.S. imports)
    • To be able to buy foreign real and financial assets (U.S. financial outflows)
An increase in foreign income

\[ \text{P}_f \text{ or } \text{e}_{\text{nom}} \]

How Exchange Rates Are Determined

- Macroeconomic determinants of the exchange rate and net export demand:
  - Effects of changes in output (income):
    - A rise in domestic output raises demand for goods and services, including imports, so net exports decline.
    - To increase purchases of imports, people must sell the domestic currency to buy foreign currency, increasing the supply of foreign currency, which reduces the exchange rate.
  - The opposite occurs if foreign output (income) rises.
    - Domestic net exports rise.
    - The exchange rate appreciates.

Generates an open-economy IS-LM model.
How Exchange Rates Are Determined

- Macroeconomic determinants of the exchange rate and net export demand:

  ➢ Effects of changes in **real interest rates**:

    • A rise in the *domestic* real interest rate causes foreigners to want to buy domestic assets, increasing the demand for domestic currency and raising the exchange rate.
    
    • The rise in the exchange rate leads to a decline in net exports.

How Exchange Rates Are Determined

- Macroeconomic determinants of the exchange rate and net export demand:

  ➢ Effects of changes in **real interest rates**:

    • If the *foreign* real interest rate rises:
      - Domestic net exports rise.
      - The exchange rate depreciates.

Determinants of the Exchange Rate

<table>
<thead>
<tr>
<th>Determinants of the Exchange Rate [Real or Nominal]</th>
<th>Causes the exchange rate to</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Increase in Domestic output (income), Y</td>
<td>Fall</td>
<td>Higher domestic output raises demand for imports and increases supply of domestic currency.</td>
</tr>
<tr>
<td>Foreign output (income), Y</td>
<td>Rise</td>
<td>Higher foreign output raises demand for exports and increases demand for domestic currency.</td>
</tr>
<tr>
<td>Domestic real interest rate, r</td>
<td>Rise</td>
<td>Higher real interest rate makes domestic assets more attractive and decreases demand and increases supply of domestic currency.</td>
</tr>
<tr>
<td>Foreign real interest rate, r_{f}</td>
<td>Fall</td>
<td>Higher foreign real interest rate makes foreign assets more attractive and decreases demand for domestic currency.</td>
</tr>
<tr>
<td>World demand for domestic goods</td>
<td>Rise</td>
<td>Higher demand for domestic goods increases demand for domestic currency.</td>
</tr>
</tbody>
</table>

Determinants of Net Exports

<table>
<thead>
<tr>
<th>Determinants of Net Exports</th>
<th>Causes net exports to</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>An Increase in Domestic output (income), Y</td>
<td>Fall</td>
<td>Higher domestic output raises demand for imports.</td>
</tr>
<tr>
<td>Foreign output (income), Y</td>
<td>Rise</td>
<td>Higher foreign output raises foreign demand for exports.</td>
</tr>
<tr>
<td>Domestic real interest rate, r</td>
<td>Fall</td>
<td>Higher real interest rate appreciates the real exchange rate and makes domestic goods more expensive relative to foreign goods.</td>
</tr>
<tr>
<td>Foreign real interest rate, r_{f}</td>
<td>Rise</td>
<td>Higher foreign real interest rate depreciates the real exchange rate and makes domestic goods cheaper relative to foreign goods.</td>
</tr>
<tr>
<td>World demand for domestic goods</td>
<td>Rise</td>
<td>Higher demand for domestic goods directly increases net exports.</td>
</tr>
</tbody>
</table>