Chapter 19
Exchange Rates and International Finance
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19.1 Introduction

• In this chapter, we learn:
  – How nominal and real exchange rates are determined, in both the short run and the long run.
  – The key role played by the law of one price in determining exchange rates.
  – How to incorporate exchange rates and a richer theory of the open economy into our short-run model.
• About international financial systems:
  – The gold standard
  – The Bretton Woods system
  – The current system of floating exchange rates

• The lessons from recent financial crises in Mexico, Asia, and Argentina.
• International trade of goods and services exceeds 20 percent of GDP in most countries.
19.2 Exchange Rates in the Long Run

The Nominal Exchange Rate

- The nominal exchange rate:
  - Is the rate that a currency trades for another
  - Is simply the price of the dollar
• A depreciation of the dollar:
  – Decline in the price of the dollar
  – Decline in the exchange rate

• An appreciation of the dollar:
  – The dollar rises in value.
  – The exchange rate rises.
FIGURE 19.1 The U.S. Exchange Rate versus the Yen and the Euro, 1971–2010
The Law of One Price

• The law of one price:

  – Says in the long run goods must sell for the same price in all countries
  – Implies that the exchange rate times the domestic price must equal the foreign price
  – If prices were different, the opportunity for arbitrage exists.
• In other words:

\[ EP = P^w \]

- Units on the exchange rate are foreign currency per domestic currency.
- Law may not hold exactly.
  - Different taxes, tariffs, and transportation costs
• The quantity theory of money
  – Pins down the price levels in the long run

• The law of one price
  – Pins down the exchange rate

• The nominal exchange rate:

\[ \bar{E} = \frac{\bar{P}^w}{\bar{P}} \]
• In the long run
  – The exchange rate is determined by the amount of money in one country relative to another.

• If the dollar depreciates
  – The price level in the foreign country must rise more slowly than in the United States
  – Inflation was higher in the domestic country than it was in the foreign country.
FIGURE 19.2 Inflation in the United States and Japan, 1975–2009
The Real Exchange Rate

- The real exchange rate (RER)
  - Computed by adjusting the nominal exchange rate by the relative price levels

\[ \text{real exchange rate} \equiv \frac{EP}{P^w} \]
• The units of the RER are foreign goods per domestic (U.S.) goods:

\[
\frac{E \text{ euros}}{P \text{ dollars}} \times \frac{P \text{ dollars}}{\text{U.S. good}} \times \frac{1 \text{ euros}}{Pw \text{ foreign good}} = \frac{\text{foreign good}}{\text{U.S. good}}
\]

• Equal to the number of foreign goods a single unit of the same U.S. good can purchase
• The nominal exchange rate
  – Gives the price at which currencies are exchanged

• The real exchange rate
  – Is the price at which goods are exchanged
  – If the law of one price holds, the real exchange rate should equal 1.

\[ RER = \frac{EP}{P_w} = 1 \]
Short Summary

• Real exchange rate
  – Pinned down by the law of one price in the long run
  – implies the long-run value of the RER is 1

• Nominal exchange rate
  – The long-run value follows from the law of one price and the quantity theory of money.
  – A key determinant is the relative supplies of different currencies.
19.3 Exchange Rates in the Short Run

The Nominal Exchange Rate

• Why trade currencies?
  – To facilitate international trade
  – Traders in financial markets demand currencies in order to make financial transactions.
  – The average foreign exchange traded around the world is $4 trillion per day.
• The supply of currency
  – Given by central banks

• The demand of currency
  – Created by international and financial market transactions

• The nominal exchange rate between currencies
  – Pinned down by the trading of foreign exchange in the global market
• When the Federal Reserve increases interest rates in the United States:

  – Foreign investors are attracted to purchase U.S. bonds.
  – Foreign traders need dollars to make these purchases.
  – Demand for dollars increases.
  – The exchange rate then appreciates.
  • The value of the dollar increases.
• Movements in the domestic nominal interest rate (holding the world interest rate constant) cause the nominal exchange rate to move in the same direction:

\[ \uparrow i^{US} \Rightarrow \uparrow E, \text{ and } \downarrow i^{US} \Rightarrow \downarrow E \]
The Real Exchange Rate

• The nominal exchange rate \((E)\)
  – Changes by the minute

• Sticky inflation implies that prices \((P \text{ and } P^w)\)
  – Adjust slowly over time

• Thus, in the short run
  – The real exchange rate can deviate from 1.
  – The law of one price need not hold.

• Arbitrage is not likely to occur with daily fluctuations.
  – Transportation costs are not zero.
• The assumption of sticky inflation means that unanticipated movements in the nominal exchange rate translate into movements in the real exchange rate in the short run:

\[ \uparrow E \implies \uparrow \frac{EP}{P^w} \]
<table>
<thead>
<tr>
<th>Long run</th>
<th>Short run</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nominal exchange rate</strong></td>
<td>$E$</td>
</tr>
<tr>
<td><strong>Real exchange rate</strong></td>
<td>$\frac{EP}{P^w}$</td>
</tr>
</tbody>
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**TABLE 19.2 How the Exchange Rate Is Determined**
19.4 Fixed Exchange Rates

• Fixed exchange rates
  – Systems where the exchange rate for one currency is pegged to a particular level for some period

• To fix an exchange rate
  – The money supply must change by the same amount as the money supply in the country to which the currency is fixed.
• Why fix exchange rates?

  – In an attempt to “import” a disciplined monetary policy to overcome previous inflation problems
  – However, hyperinflations are usually caused by fiscal problems.
19.5 The Open Economy in the Short-Run Model

• Originally
  – The IS curve was derived assuming the trade balance was a constant fraction of potential output.

• Now
  – Movements in the real exchange rate can influence trade.
• If the RER is high and goods at home are expensive relative to goods abroad, then
  – Exports are likely to be low
  – Imports high

• Consumers buy goods from where they are cheapest.
  – Will purchase foreign goods
Net exports are determined by the medium-run trade balance and by short-run deviations that depend on the real interest rates:

\[
\frac{NX_t}{Y_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{R}^w)
\]
• Increases in the nominal interest rate in the United States will result in:
  – An increase in the real interest rate
  – An increase in the exchange rate

• Then, due to sticky inflation the real exchange rate rises.
  – Exports decline
  – Imports increase
  – Net exports fall

\[ \uparrow i \Rightarrow \uparrow R \text{ and } \uparrow E \Rightarrow \uparrow \frac{EP}{P^w} \Rightarrow \downarrow \frac{EX}{Y} \text{ and } \uparrow \frac{IM}{Y} \Rightarrow \downarrow \frac{NX}{Y} \]
• Domestic saving $S$ can be used for domestic investment or invested abroad.

\[ S = I + NX. \]

• Changes in the real interest rate in the rest of the world now cause an aggregate demand shock.

• The math for the IS Curve (and AS/AD Framework) remains unchanged.
Event #1: Tightening Domestic Monetary Policy and the IS Curve

• What happens when the central bank raises nominal interest rates to tighten monetary policy?
• Sticky inflation causes the real interest rate to rise.

• Since the real interest rate exceeds the MPK
  – Firms reduce demand for investment, lowering short run output.
The increase in the nominal interest rate also results in an increase in the demand for dollar-denominated financial assets:

- This causes the real exchange rate to appreciate.
- U.S. goods are now more expensive relative to foreign foods.
- Net exports decline.
- Short-run output falls even farther.
• The IS curve
  – Now has an additional mechanism by which changes in the interest rate will influence short-run output.
  – Is flatter in this new enriched model.
FIGURE 19.4 Increasing Interest Rates and the IS Curve
Event #2: A Change in Foreign Interest Rates

• What is the effect on the United States if the European Central Bank raises interest rates in the euro area?

• Recall the net exports equation of the short run model:

\[
\frac{NX_t}{Y_t} = \bar{a}_{nx} - \bar{b}_{nx}(R_t - \bar{R}^w)
\]
• Investors will demand more euros and fewer dollars.
  – The euro will appreciate.
  – The dollar will depreciate.
  – The RER in the United States will depreciate.
  – As the price of U.S. goods declines, net exports will increase.
  – The IS curve shifts out as the aggregate demand parameter is shocked.
• The international transmission of monetary policy
  – Changes in interest rates in one region of the world have effects in other regions.
FIGURE 19.5 An Increase in Foreign Interest Rates
• The increase in the real interest rate works through the exchange rate.
  – U.S. economy is stimulated.
  – Europe: tight monetary policy may induce a recession.
    • Which may have a negative impact on U.S. net exports
    • If so, the effect of interest rate changes abroad is uncertain.
19.6 Exchange Rate Regimes

• Exchange rate regimes
  – The institutions that set exchange rates around the world

• The three main phases
  – The era of the gold standard
  – The era of the Bretton Woods system
  – The modern era of floating exchange rates where exchange rates are allowed to move flexibly
FIGURE 19.6 The U.K.–U.S. Exchange Rate, 1791–2009
• The gold standard
  – Countries specified a fixed price in which they were willing to trade their currency for gold.

• The Bretton Woods system
  – The United States pegged the dollar to a specified price of gold.
  – Other countries pegged their currencies to the dollar.
• Floating exchange rates
  – Monetary policies are not coordinated.
  – Supply and demand for foreign exchange determine the value of the nominal exchange rate.
19.7 The Policy Trilemma

• The international monetary system has three main goals:
  – Stable exchange rates
  – Monetary policy autonomy
  – Free flows of international finance

• The policy trilemma:
  – The principle that at most only two of the three goals can be achieved simultaneously within a country
FIGURE 19.7 The Policy Trilemma in Open Economies
• Stable exchange rates
  – Make it easier for individuals and businesses to plan over time

• Large changes in exchange rates
  – Have costs similar to changes in inflation
• The ability of a country to set its own monetary policy is desirable.
  – Countries can smooth shocks to the economy.

• Free flows of international finance
  – Allow resources to be allocated most efficiently
• The United States cannot guarantee a stable exchange rate:
  – United States is on the bottom of the triangle
  – the exchange rate depends on monetary policy in the United States as well as in other countries

• If a country gives up monetary policy autonomy:
  – the exchange rate is fixed
  – the central bank must hold a supply of dollars
• Foreign exchange reserves
  – The reserves of dollars or gold such that the domestic currency is fully backed by the foreign exchange
  – A currency crisis can result when a central bank does not have enough foreign exchange reserves to defend its peg.
  – Example of a country on the right side of the triangle: Argentina (1991–2001)
• A country that gives up free financial flows
  – Maintains control of monetary policy
  – Keeps the exchange rate stable

• Capital controls
  – The restrictions on financial flows and on trading of the currency in order to maintain a fixed price
  – China (1996–2005) was on the left side of the triangle
Which Side of the Triangle to Choose?

• The costs and benefits of giving up a particular goal may differ across countries and time.
FIGURE 19.8 Depreciations during Several Currency Crises, 1991 – 2004
• The Mexican peso crisis of 1994
  – Mexico had large capital flows and a stable exchange rate, resulting in economic growth until 1994.
  – Political turmoil and foreign borrowing led to fears of devaluation
  – The Mexican central bank tried to maintain the exchange rate.
    • reserves fell very low
    • the government was forced to devalue and float the peso against the dollar.
• The Asian currency crisis of 1997
  – During the 1990s, Asian economies turned to foreign savings to finance part of their booming economic growth.
  – Currency speculation led to declines in exchange rates.
    • loans denominated in dollars were more costly to repay.
  – The result was large recessions in Asia.
• End of Argentina’s currency board in 2001:
  – Argentina created a currency board that was successful in overcoming hyperinflations.
  – Brazil’s currency value declined
    • negative shock to aggregate demand via net exports in Argentina.
  – Lenders worried about the ability of the country to repay its debt
    • interest rates rose substantially
    • government defaulted on its debt.
  – Argentina devalued and allowed the peso to float.
Case Study: Hedge Funds, Financial Flows, and Financial Crises

• Hedge funds
  – Private investment funds that can accept money only from wealthy, accredited investors
  – Are free to undertake risky investments with little regulation.
  – Speculate using large sums of money
  – They can often start to trigger a financial crisis or a devaluation.
The Future of Exchange Rate Regimes

• Stable exchange rates and free international capital markets can be difficult to maintain together.

• Difficulty arises if there are
  – Problems with the government budget constraint
  – Diverse trading partners

• Economists tend to favor free flows of capital.
  – Some reason against this if currency speculators can create a currency crisis.
Case Study: The Euro

• Single currency advantages
  – Avoiding risks in exchange rate fluctuations
  – Transaction costs of trade in the currency region are reduced.
  – A single central bank can create credibility.

• Single currency disadvantages
  – Countries losing control of monetary policy
  – Reducing the ability to target particular regions that might be slumping.
19.8 The Adjustment of the U.S. Trade Balance

- Some elements of the currency crises examples are characteristics of the United States.
  - Using open capital markets to finance a trade deficit while running a budget deficit
- Countries with large trade deficits can experience substantial depreciations without macroeconomic instability.
Adjustment in the Short-Run Model

• If the U.S. trade deficit moves to a surplus
  – Exports will increase which may boost the economy.
Adjustment in the Short-Run Model

• If countries think the United States will not pay back its deficit
  – They could demand higher interest rates in the form of a risk premium.
  – Could reduce investment
  – Negative shocks could occur that would outweigh the positive shock from exports increasing.
• If the adjustment to a trade surplus occurs gradually
  – May not have significant consequences on short-run output or inflation

• If the adjustment needs to occur suddenly
  – Quantitative consequences could be quite severe.
Summary

- The nominal exchange rate
  - The price of the domestic currency in units of foreign currency

- The real exchange rate
  - The price of domestic goods in units of foreign goods
• In the long run, the value of the real exchange rate is pinned down by the law of one price: $EP = P^w$.

• The real exchange rate is just the ratio of prices at home and abroad, $EP/P^w$.

• The value of the real exchange rate is equal to 1 in the long run.
  – Goods have to sell for the same price.
  – Frictions in the real world, however, prevent this law from holding exactly.
• The nominal exchange rate is pinned down by the domestic and foreign price levels.
  – These in turn come from the quantity theory of money.

• Quantity theory of the nominal exchange rate
  – In the long run, the nominal exchange rate is pinned down by the relative supplies of different currencies.
• Sticky inflation
  – The law of one price can fail to hold in the short run.
  – Movements in the nominal exchange rate $E$ translate to movements in the real exchange rate $EP/w$ in the short run.

• Interest rates and exchange rates move together.
• A tightening of monetary policy raises the short-term nominal interest rate.
  – High interest rates attract financial investors.
    • increasing the demand for dollars
    • causing the exchange rate to appreciate
• **Real exchange rate**
  – The price of domestic goods (in units of foreign goods)
  – A key determinant of imports and exports is the real exchange rate.

• **If domestic goods become more expensive**
  – If the real exchange rate goes up
    • exports will fall.
    • imports will rise.

• **Net exports are a decreasing function of**
  – The real exchange rate
  – The real interest rate
• The international financial system, has been based on three different regimes in the last 150 years:
  – The gold standard
  – The Bretton Woods system
  – The current system of floating exchange rates

• The policy trilemma
  – Open economies can achieve at most two of the following three goals:
    • stable exchange rates
    • monetary policy autonomy
    • free flows of international finance
This concludes the Lecture Slide Set for Chapter 19

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