Lecture 8: Exchange Rate Systems
5.1 Alternative Exchange Rate Arrangements and Currency Risk

• Exchange rate systems around the world
  • Floating currencies
    • Determined by the market forces of supply and demand (i.e., U.S., Japan, European Union, Australia, and Sweden)
  • Managed floating
    • Countries whose Central Banks intervene enough that the IMF can’t classify them as freely floating (i.e., Brazil, Columbia, India, Indonesia, Russia, and South Africa)
  • Fixed/pegged currencies
    • “Pegging” a currency to another or a basket of currencies (i.e., IMF’s SDR and the Chinese yuan)
    • Often implemented using a currency board
5.1 Alternative Exchange Rate Arrangements and Currency Risk

• Exchange rate systems around the world (cont.)
  • No separate legal tender
    • Adopt a currency (i.e., Ecuador, El Salvador, and Panama have adopted the U.S. dollar)
  • Target zone
    • Forex rate is kept within band
  • Crawling pegs
    • Changes are kept lower than preset limits that are adjusted regularly (with inflation)
## Exhibit 5.1 Exchange Rate Systems Around the World

<table>
<thead>
<tr>
<th>Rate System</th>
<th>Countries/Regions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No separate legal tender</strong></td>
<td>Ecuador, El Salvador, Marshall Islands, Micronesia, Palau, Panama, Timor-Leste, Zimbabwe</td>
</tr>
<tr>
<td><strong>Uses the US dollar</strong></td>
<td>European Monetary Union - Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovak Rep., Slovenia, Spain Kosovo, Montenegro, San Marino</td>
</tr>
<tr>
<td><strong>Uses the euro</strong></td>
<td>Brunei Darussalam</td>
</tr>
<tr>
<td><strong>Uses the Australian dollar</strong></td>
<td>Russia, Hong Kong</td>
</tr>
</tbody>
</table>

**Currency board**
- **Fixed in the US dollar**: ECCU – Antigua and Barbuda, Dominica, Grenada, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Brunei, Hong Kong
- **Fixed in the euro**: Bosnia and Herzegovina, Bulgaria
- **Fixed in the Singapore dollar**: Brunei Darussalam

**Conventional fixed rate**
- **Fixed in the US dollar**: Arab Emirates, Bahrain, Botswana, Brazil, Brazil, Burkina Faso, Burundi, Cape Verde, Comoros, Denmark, Djibouti, Eritrea, Estonia, Fiji, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Laos, Liechtenstein, Malawi, Maldives, Mauritius, Malta, Montenegro, Morocco, Nepal, New Zealand, Norway, Oman, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Samoa, San Marino, Serbia, Senegal, Seychelles, Singapore, South Africa, Sri Lanka, Sudan, Switzerland, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, United Arab Emirates, United Kingdom, United States, Uruguay, Uzbekistan, Vietnam, Yemen

**Crawling pegs and other stabilization arrangements involving active intervention**
- **Versus the dollar**: Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Bolivia, Cambodia, China, Costa Rica, Democratic Republic of Congo, Egypt, Ethiopia, Guatemala, Guinea, Guyana, Haiti, Honduras, Jamaica, Laos, Lebanon, Maldives, Nicaragua, Sri Lanka, Suriname, Tajikistan, Trinidad and Tobago, Uzbekistan
- **Versus the euro**: Croatia, Macedonia, Switzerland
- **Versus composite**: Algeria, Botswana, Iran, Lithuania, Singapore, Syria, Tonga, Venezuela, Vietnam
- **Versus composite**: Kazakhstan, Kyrgyz Republic, Malaysia, Mauritania, Myanmar, Nigeria, Rwanda, Sudan, Yemen

**Floating rates**
- **Managed floating**: Afghanistan, Albania, Brazil, Columbia, Gabon, Georgia, Ghana, Hungary, Iceland, India, Indonesia, Israel, Kenya, Rep. of Korea, Madagascar, Malawi, Moldova, Mongolia, Mozambique, New Zealand, Paraguay, Peru, Philippines, Romania, Russia, Serbia, Seychelles, Sierra Leone, South Africa, Tanzania, Thailand, Turkey, Uganda, Ukraine, Uruguay, Zambia
- **Free floating**: Australia, Canada, Chile, Japan, Mexico, Norway, Poland, Samoa, Sweden, United Kingdom, United States
5.1 Alternative Exchange Rate Arrangements and Currency Risk

• Special arrangements
  • Where a regional central bank controls the forex rate system for several countries
    • Euro
    • CFA franc zone

• Currency risks
  • Floating rate systems – movements generally symmetric
  • Target zones – less than floating but can be big due to devaluations/revaluations
  • Pegged – latent volatility
  • Currency board/Monetary unions – currency boards frequently collapse
5.1 Alternative Exchange Rate Arrangements and Currency Risk

• Bottom line:
  • Currency risk of exchange rate regimes other than freely floating may not be summed up accurately through historic exchange rate volatility
Exhibit 5.2 Currency Risk in Alternative Exchange Rate Systems

<table>
<thead>
<tr>
<th>Exchange rate volatility</th>
<th>Central bank objective</th>
<th>Historical Variability</th>
<th>Latent Variability</th>
<th>Inflation Variability</th>
<th>Countries adhering to system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pure floating</td>
<td>Domestic</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>Dirty float</td>
<td>Domestic and exchange rate</td>
<td>Large</td>
<td>None</td>
<td>Large</td>
<td>46</td>
</tr>
<tr>
<td>Target zone or crawling bands/ Pegs</td>
<td>Domestic and exchange rate</td>
<td>Small</td>
<td>Large</td>
<td>Small</td>
<td>47</td>
</tr>
<tr>
<td>Pegged exchange rates</td>
<td>Exchange rate</td>
<td>None</td>
<td>Large</td>
<td>Small</td>
<td>30</td>
</tr>
<tr>
<td>Currency board</td>
<td>Exchange rate</td>
<td>None</td>
<td>Small</td>
<td>Small</td>
<td>5</td>
</tr>
<tr>
<td>Dollarized</td>
<td>Domestic</td>
<td>None</td>
<td>Small</td>
<td>Small</td>
<td>13</td>
</tr>
<tr>
<td>Monetary union</td>
<td>Domestic</td>
<td>None</td>
<td>Very small</td>
<td>Small</td>
<td>19</td>
</tr>
</tbody>
</table>
Exhibit 5.3 Contrasting the FRF/DEM and CAD/USD Exchange Rates
Exhibit 5.3 Contrasting the FRF/DEM and CAD/USD Exchange Rates (cont)
Exhibit 5.4 Exchange Rate Arrangements
5.2 Central Banks

• To understand how exchange rate systems operate, you must first understand how central banks function.

• The central bank’s balance sheet (Exhibit 5.5)

<table>
<thead>
<tr>
<th>Exhibit 5.5 Central bank balance sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
</tr>
<tr>
<td>Official international reserves</td>
</tr>
<tr>
<td>Domestic credit</td>
</tr>
<tr>
<td>• Government bonds</td>
</tr>
<tr>
<td>• Loans to domestic financial institutions</td>
</tr>
<tr>
<td>Other</td>
</tr>
</tbody>
</table>

Sum of these two is called The “monetary base” or “base money”

Influences money supply through open market operations.
5.2 Central Banks

• Official Reserves
  • Foreign exchange reserves (88%)
    • Usually dominated by USD assets but other currencies becoming more common
    • China has substantial reserves ($3.192 trillion)
  • Gold reserves (9%)
  • IMF-related reserve assets (3%)
5.2 Central Banks

• Money creation and inflation
  • Seigniorage – the value of the real resources that the central bank obtains through the creation of base money
  • Setting money supply growth has implications on GDP growth, unemployment, etc.
    • Theorised to have real economy effects in the short-run, but negligible in the long-run (money neutrality)
Exhibit 5.6 Foreign Exchange Reserves
5.2 Central Banks

- The impossible trinity – only two of the following three are possible
  - Perfect capital mobility (no capital controls)
  - Fixed exchange rates
  - Domestic monetary autonomy

- Foreign Exchange Interventions
  - Non-sterilized – increased money supply
  - Sterilized – no change in money supply
Exhibit 5.7 Sterilized and Non-Sterilized Foreign Exchange Intervention

- **Panel A**
  - Fed buys ForEx from the bank
    - Asset for the bank
    - Asset and liability for the Fed

- **Panel B**
  - Sterilization of the original transaction by selling government bonds to financial intermediaries.

### Exhibit 5.7 Sterilized and non-sterilized foreign exchange intervention

#### Panel A: A non-sterilized intervention

<table>
<thead>
<tr>
<th>Central bank balance sheet</th>
<th>Financial intermediary balance sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>International reserves</td>
<td>Deposits of financial institutions</td>
</tr>
<tr>
<td>Domestic credit</td>
<td></td>
</tr>
<tr>
<td>+50</td>
<td>+50</td>
</tr>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Reserves at Federal Reserve</td>
<td></td>
</tr>
<tr>
<td>Foreign currency interbank deposits</td>
<td>-50</td>
</tr>
<tr>
<td>Government bonds</td>
<td>0</td>
</tr>
</tbody>
</table>

#### Panel B: A sterilized intervention

<table>
<thead>
<tr>
<th>Central bank balance sheet</th>
<th>Financial intermediary balance sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>International reserves</td>
<td>Deposits of financial institutions</td>
</tr>
<tr>
<td>Domestic credit</td>
<td></td>
</tr>
<tr>
<td>+50</td>
<td>+50</td>
</tr>
<tr>
<td>-50</td>
<td>-50</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td><strong>Liabilities</strong></td>
</tr>
<tr>
<td>Reserves at Federal Reserve</td>
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<td>Foreign currency interbank deposits</td>
<td>-50</td>
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<tr>
<td>Government bonds</td>
<td>+50</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
5.2 Central Banks

- How do Central Banks peg a currency?
  - Pegging the exchange rate (Exhibit 5.8)
  - Make a market in its currency

In order to peg, the Central Bank has to supply this excess demand – this is where reserves come in.
5.3 Flexible Exchange Rate Systems

• Intervention
  • Money supply / interest rates
  • Attempt to restrict capital movements
  • Tax/subsidize international trade to influence demand for foreign currency

• The effects of central bank interventions
  • Debate – increased volatility or calming of markets?
  • Direct effects of interventions – supply/demand of currency
    • Effect is argued negligible due to small amount (i.e., $20 billion versus $5 trillion overall trade in a day)
    • Changes in portfolio composition – bond portfolio effect
  • Indirect Effects of Interventions
    • Affect the exchange rate through altering expectations
5.3 Flexible Exchange Rate Systems

- Empirical evidence on the effectiveness of intervention
  - Coordinated efforts are more effective than unilateral
  - Efforts consistent with market fundamentals more effective
  - However, not effective in the long-run
  - Overall, has not decreased exchange rate volatility
  - There is conflicting evidence on whether or not the intervention is profitable
Exhibit 5.9 The Effects of Foreign Exchange Interventions
5.4 Fixed Exchange Rate Systems

- The International Monetary System before 1971
  - The Gold Standard
  - WWI, hyperinflation (Germany) and the Interwar Period
    - Gold Standard was suspended by many
    - Interwar – some countries allowed float
  - The Bretton Woods System (1944)
    - Participating countries agreed to link their currency to $ (which was pegged to gold)
5.4 Fixed Exchange Rate Systems

• The International Monetary System before 1971 (cont.)
  • Individual incentives versus aggregate incentives
    • Potential problems with a “bank run” on gold in U.S. with no solution; not sustainable
  • Special Drawing Rights (1968)
    • An alternative reserve asset created by IMF with the same gold value as the dollar
    • Stayed pegged to gold until 1976, when it was then pegged to a basket of currencies
  • Due to incessant BOP deficits, U.S. abolished gold standard in 1971
  • 1973 Bretton Woods system collapsed and major currencies transitioned into freely-floating currencies
5.4 Fixed Exchange Rate Systems

• Pegged exchange rate systems in developing countries
  • Usually set at a level that overvalues the local currency
  • Situation not tenable indefinitely, foreign reserves will dwindle fast
  • Only way to sustain this system is to implement exchange controls
  • Private market usually responds with an illegal or parallel currency market
Exhibit 5.10 Pegging an Exchange Rate in a Developing Country

Peg > market rate; there is an excess supply of ringgit – a everyone wants to sell ringgit and buy dollars to invest abroad (capital flight)
5.4 Fixed Exchange Rate Systems

• Why not simply float?
  • Economists do not agree – some believe that pegged forex regimes offers stability
  • Many economists believe, however, that pegged regimes are not ultimately sustainable – the average duration is only 4.67 years
5.4 Fixed Exchange Rate Systems

• Currency Boards
  • Have money-making capabilities
  • independent of government but the money is fully backed by a foreign reserve currency and fully convertible into the reserve currency at a fixed rate
  • Mentioned as a miracle cure for cutting inflation without high cost to the economy (e.g., Hong Kong)
  • Cannot monetize fiscal deficits; cannot rescue banks!

• Dollarization
Exhibit 5.11 The Balance Sheet of a Currency Board

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>International reserves</td>
<td>Currency in circulation</td>
</tr>
<tr>
<td></td>
<td>Required reserves of financial institutions</td>
</tr>
</tbody>
</table>
5.5 Limited-Flexibility Systems: Target Zones and Crawling Pegs

• Target zones
  • Speculative attacks, and how to defend the target zone
    • Intervene through open market operations (i.e., buy / sell)
    • Raise interest rates (discourages speculation)
    • Limit foreign exchange transactions through capital controls
  • Lead-lag operations
    • Lag operation: postpones the inflow of foreign currency to increase the value of their receivable (which is stronger once the local currency is devalued)
    • Lead operation: domestic importers prepay for goods to beat an increase in cost when devaluation goes into effect
    • Puts pressure on central banks of small economies as foreign reserves are small relative to the volume of foreign trade

• Crawling peg
Exhibit 5.12 An Example of a Target Zone
Exhibit 5.13 A Tight Target Zone
Exhibit 5.14 An Example of a Crawling Peg

Crawl usually adjusts for the inflation differential between the domestic inflation and the inflation of the currency to which they are pegged so the domestic firms don’t lose competitiveness.