

Exchange Rate Regimes

Prof. Lutz Hendricks

Econ520

April 19, 2012

- Exchange rates are highly volatile - a major source of instability.
- What are the costs and benefits of fixing the exchange rate?

Nominal exchange rate

- The exchange rate is the relative price of 2 currencies.
- \$1 - 116 yen
- It comes in 2 "directions":
 - 1 $E_{\$/yen}$: the price of yen: 1/116 \$/yen
 - 2 $E_{yen/\$}$: the price of \$: 116 yen/\$
- $E_{yen/\$}$ rises - dollar **appreciates**.

Nominal exchange rate

Exchange rates move a lot - short and long run

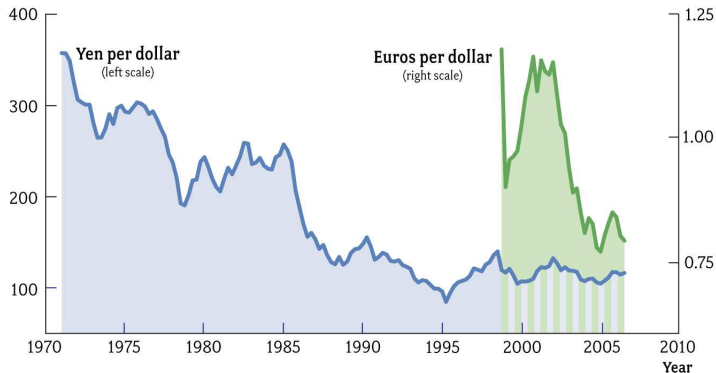


FIGURE 15.1 The U.S. Exchange Rate versus the Yen and the Euro, 1971–2006

Macroeconomics, Charles I. Jones
Copyright © 2008 W. W. Norton & Company

Definition

The real exchange rate answers the question: how much do the same goods cost in the U.S. relative to Japan?

- Form a "basket" of goods.
- Compute its cost in the U.S. ($\$P$) and Japan (P^* yen).
- Convert into dollars using the nominal exchange rate: the basket costs $E_{\$/yen}P^*$ in Japan.
- The ratio of dollar costs is the real exchange rate:

$$RER = P / (E_{\$/yen}P^*) \quad (1)$$

- The RER has no units:

$$[RER] = \frac{\$/good}{\$/yen \times yen/good} \quad (2)$$

- If $RER = 1.5$ this means: in the U.S. goods cost 50% more than in Japan.
- Note: some people denote RER the other way around: EP^*/P .

- Real exchange rates move a lot as well - long-run and short-run.
- Why?
- P and P^* move very slowly.
- E moves a lot.
- The RER closely follows the nominal exchange rate, except over long horizons.

Example: Real Exchange Rate

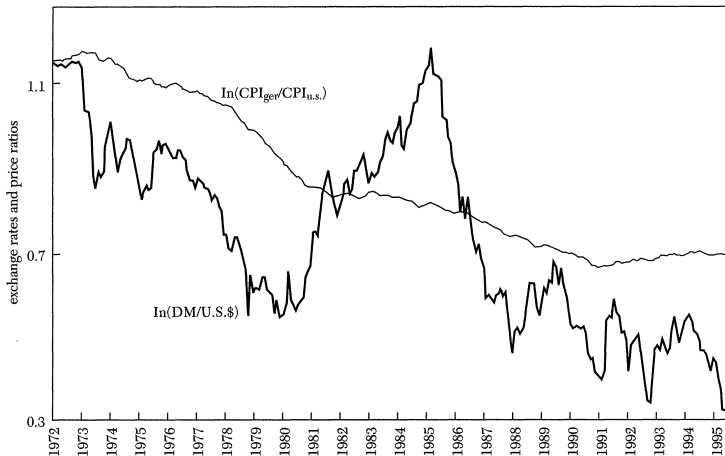


Figure 2. DM/U.S.\$ exchange rate and ratio of German to U.S. CPIs, Jan. 1972–May 1995

Source: Rogoff (1996)

What Determines Exchange Rates in the Long
Run?

Purchasing Power Parity

Purchasing Power Parity (PPP)

An old and plausible theory of long-run exchange rate determination:
absolute PPP.

Definition

Absolute PPP holds when the RER equals 1.

A basket of goods costs the same (in dollar terms) in both countries.

Absolute PPP generalizes the **law of one price (LOP)**

Definition

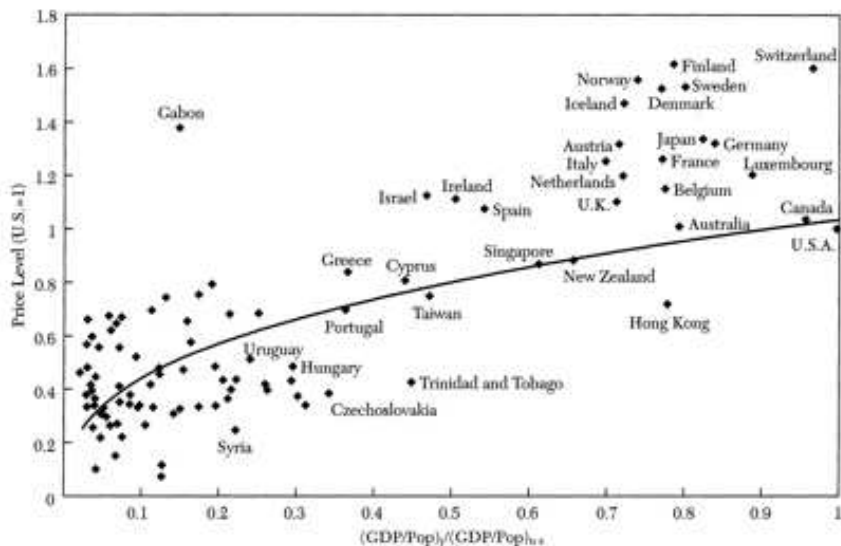
The LOP holds if the same good costs the same (in dollar terms) in all countries.

Why would LOP tend to hold?

- In reality, the LOP does not hold too well
- Why not?

- Absolute PPP claims that the LOP holds **on average** for a bundle of goods.
- Any given good may be a bit cheaper or more expensive in some country.
- But goods are not systematically cheap or expensive in some countries.

Absolute PPP Fails



Source: Rogoff (1996)

Why does absolute PPP fail?

Non-traded goods are systematically cheaper in poorer countries.

	Big Mac price in local currency	Exchange rate per dollar (\$)	Big Mac price in dollars
United States	3.10 dollars	1.00 dollars/\$	3.10
Euro area	2.94 euros	0.78 euros/\$	3.77
China	10.50 yuan	8.03 yuan/\$	1.31
Japan	250.00 yen	112.00 yen/\$	2.23
Mexico	29.00 pesos	11.30 pesos/\$	2.57
Argentina	7.00 pesos	3.06 pesos/\$	2.29
Brazil	6.40 reais	2.30 reais/\$	2.78
South Africa	13.95 rand	6.60 rand/\$	2.11

Source: "McCurrencies," *The Economist*, May 26, 2006.

TABLE 15.1 The Big Mac Index

Macroeconomics, Charles I. Jones
Copyright © 2008 W. W. Norton & Company

Definition

Relative PPP holds if the real exchange rate is constant over time.

- Think of this as a long-run statement.
- The RER tends towards a fixed value for each country.
- Temporary deviations are ok.

- The evidence supports relative PPP.
- But the RER can deviate from relative PPP for long periods of time.
- The tendency to revert to relative PPP is weak / gradual.
- Still, relative PPP is the best predictor of long-run exchange rates.

Relative PPP: Implications

- High inflation currencies should depreciate.
- To see this, write relative PPP in growth rates:

$$g(RER) = g\left(\frac{P}{E P^*}\right) = \pi - \pi^* - g(E) = 0 \quad (3)$$

- The rate of depreciation should match the inflation differential.

$$g(E) = \pi - \pi^*$$

- That means:

In the long-run, the exchange rate is completely determined by monetary policies.

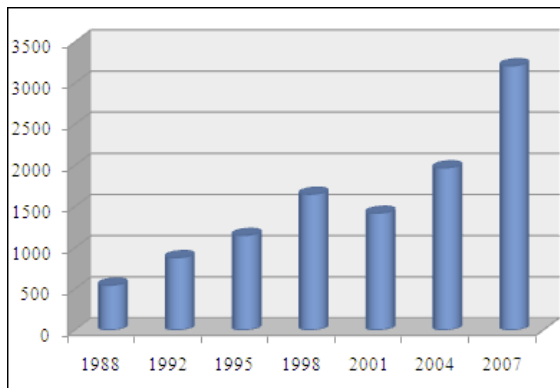
- Relative PPP is the best predictor of long-run exchange rates.
- But:
 - there are large short-run deviations from PPP
 - reversion to PPP is quite slow in the data.

Exchange rates in the short run

Exchange rates in the short run

Short-run exchange rates are **asset prices**.

- Almost all FX trade is due to short-term (often intra-day) asset trading.
- Trade in goods is too small to play a role.



Daily FX trading volume, billions of dollars

Exchange rates in the short run

- Asset prices (in liquid markets) tend to fluctuate a lot.
- The reasons for the fluctuations are not well understood.
- Modern asset pricing theory predicts that prices should be much smoother than the data.
- Therefore:
 - *We don't know how short-run exchange rates are determined.*
 - Much of the fluctuations are probably random noise.

What Determines Capital Flows?

- Most of the demand for dollars comes from international capital flows (not from trade).
- We can get an idea about what moves exchange rates, if we understand what moves capital.

What Determines Capital Flows?

- Capital flows into the U.S., if the risk adjusted rate of return of investing in dollars is higher than abroad.
- Factors that cause capital to flow into the U.S.:
 - ① high U.S. interest rate;
 - ② expected appreciation of the dollar;
 - ③ increasing risk of investing abroad: political instability, external debt, ...

Uncovered Interest Parity (UIP)

- UIP is one theory of short-run exchange rate determination.
- It does not hold all that well, but it has the right idea...

Definition

Uncovered interest parity holds, if the dollar returns of investing at home and abroad the same

The return of investing abroad

- Example: Invest \$100 in Euro
- Today's exchange rate is 2 Euro/\$ [$E(t) = \frac{1}{2}$]
 - Buy 50 Euro
- The Euro interest rate is $i_{Euro} = 0.05$
 - Earn $0.05 \times 50Euro = 2.50Euro$
- Next year the exchange rate is 2.2 Euro/\$ [$E(t+1) = 1/2.2$]
- Sell 52.50 Euro and buy $\$2.2 \times 52.50 = \115.5
- Rate of return: 15.5%
 - 5% interest + 10% Euro appreciation.

The dollar return of investing in Euro

Start with \$1
Convert into Euro Euro $1/E(t)$
Earn interest Euro $(1 + i_{Euro})/E(t)$
Convert back into \$ $\$(1 + i_{Euro}) E(t+1)/E(t)$
 $E(t)$ is in \$/Euro.
Total return:

$$1 + r_{Euro} = \underbrace{(1 + i_{Euro})}_{\text{interest}} \underbrace{E(t+1)/E(t)}_{\text{capital gain}}$$

$$1 + i_{\$} = (1 + i_{Euro}) E(t+1)/E(t) \quad (4)$$

- If currencies differ in risk, UIP subtracts a risk premium from the foreign currency return.
- The risk premium can be negative! (Why?)

How shocks affect the exchange rate

- Solve the UIP condition for today's spot rate:

$$E(t) = E(t+1) \frac{1 + i_{Euro} - RP_{Euro}}{1 + i_{\$}} \quad (5)$$

- The exchange rate responds to 3 types of shocks:
 - 1 The Euro becomes less risky: $RP_{Euro} \downarrow$. Then $E(t) \uparrow$ (Euro appreciates)
 - 2 The Euro interest rate rises or the dollar interest rate falls:
 $i_{Euro} \uparrow \implies E(t) \uparrow$.
 - 3 The Euro is expected to be more valuable in the future:
 $e(t+1) \uparrow \implies E(t) \uparrow$
- Intuition: Good news such as lower risk or a higher interest rate make the Euro attractive to investors. Its value rises.

Is the Euro strong when the interest rate is high?

Today: $i_{\$} = i_{Euro} = 10\%$; $E(t) = 1$ [\$/Euro]

UIP: Investors must expect E to remain constant

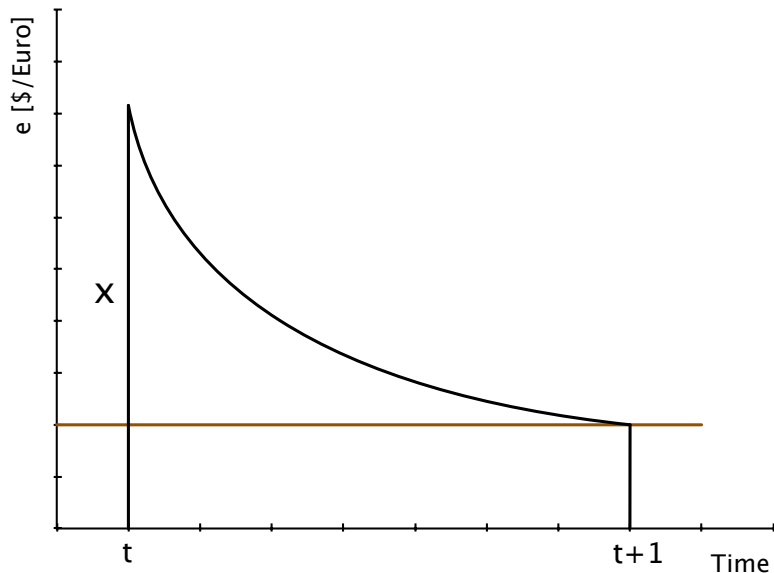
Shock: Euro interest rate rises to 15%

Key assumption: No change in $E(t+1)$!

Result:

- Euro appreciates when i_{Euro} rises
- Euro depreciates while i_{Euro} is high

Is the Euro strong when the interest rate is high?



x is the expected appreciation of the dollar: $x(t) = E(t)/E(t+1)$.

Expectations Matter

Fact

UIP determines $E(t)$ only relative to the future $E(t+1)$.

Changes in expectations about $E(t+1)$ are reflected immediately in the spot rate.

Example

Investors doubt stability of the peso. Lower $E(t+1)$ or higher RP imply $x < 0$.

Violation of UIP: $i_{\$} > i_{Peso} + x - RP$.

Traders sell pesos until UIP is restored.

Peso depreciates up to the point where $x = 0$.

Possibility of self-fulfilling prophecies

- Without an anchor to pin down the long-run exchange rate, any E can be an equilibrium
- Mean-reversion to PPP provides an anchor, but it is weak.
- This is generally true for asset prices.
- This is one reason why asset prices are so volatile.

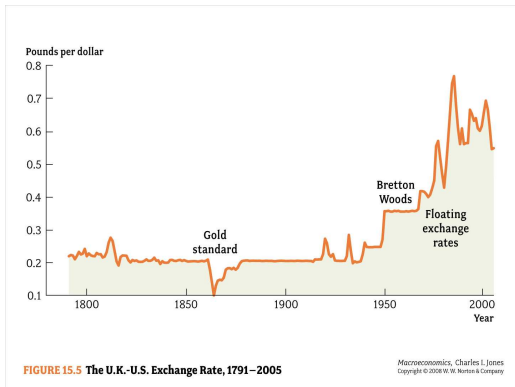
Exchange rate regimes

Exchange rate regimes

Three episodes:

- 1 Gold standard: until WW1
 - Central banks exchange currency for gold at fixed rates.
- 2 Bretton Woods: until 1970s
 - The U.S. in on a gold standard.
 - Everybody else pegs to the dollar.
- 3 Floating: since 1970s

Exchange rate regimes



Exchange rates are much more volatile during the floating period.
But capital flows have increased as well.

- Most countries manipulate their exchange rates.
 - Central banks buy and sell foreign currencies.
- One reason: smooth out exchange rate fluctuations.
- Some countries go further and fix their exchange rates against another currency.
 - Argentina 1991-2001
 - China 1998-2005

How to fix the exchange rate

- Central banks announce that they are willing to buy or sell any amount of dollars at a fixed exchange rate.
- Key point: Buying dollars means selling pesos.

Fact

Every intervention in the FX market changes the domestic money supply.

Can the exchange rate be fixed?

- As long as there is excess demand for pesos, the CB can always print more.
- A peg that keeps the currency "**cheap**" can be maintained forever.
- But it causes inflation.

Can the exchange rate be fixed?

- When the fixed exchange rate is too "high", the CB must buy its own currency and **sell dollars**.
- At some point, the CB runs out of dollar reserves.
- A "high" peg is not sustainable.

Speculative attacks

- What happens if investors doubt whether a peg will hold?
- The dollar return of holding pesos is

$$(1 + i_{peso}) \frac{E_t}{E_{t+1}} \quad (6)$$

- If the peg holds: no risk - earn i_{peso} .
- If the peg fails, the peso depreciates by a large amount in a single day.
- The return on holding pesos is very negative.
- The investor might lose 10% in a day.

- If there is even a small doubt that the peg may fail, investors start selling pesos.
- The only way of compensating investors for the possibility of losing 10% in a day is to offer an enormous interest rate i_{peso} .
- For this reason, all fixed exchange rate systems are vulnerable.
- Any doubts in the investors' minds start a self-fulfilling run on the currency.
- There are many historical examples.

Speculative attacks

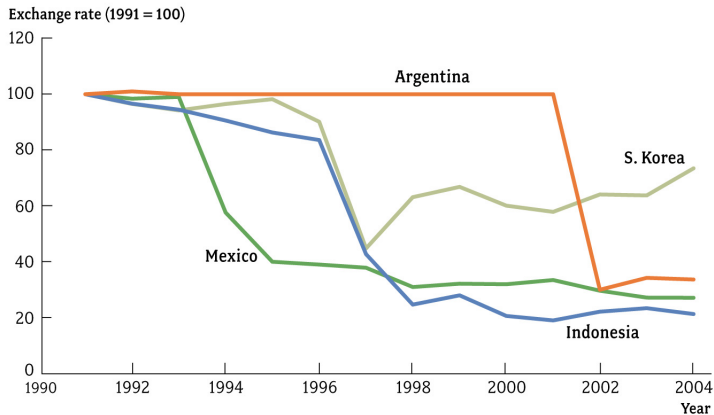
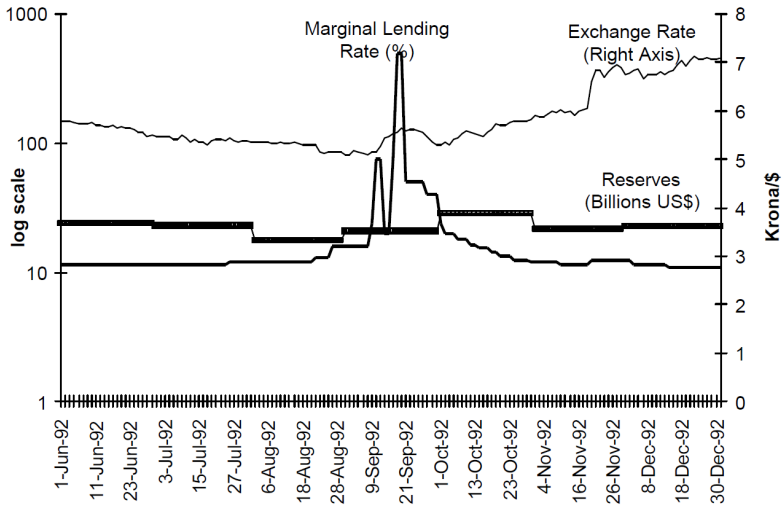


FIGURE 15.7 Depreciations During Several Currency Crises, 1991–2004

Macroeconomics, Charles I. Jones
Copyright © 2008 W. W. Norton & Company

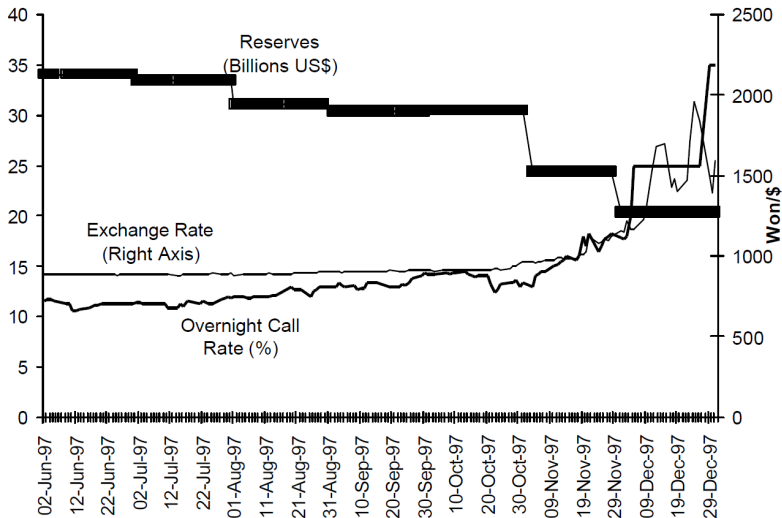
Speculative attacks: Sweden

Sweden, 1992



Speculative attacks: Korea

Korea, 1997



- LDCs often peg against the dollar, but have higher inflation than the US
- The real exchange rate gradually appreciates.
- The result: Trade deficits and loss of FX reserves
- The end result is often a speculative attack

Example: Mexico 1994

- A "typical" Latin American crisis
- "Crawling peg" starting in 1989



The costs of fixing the exchange rate

- 1 Loss of monetary autonomy.
 - Import the U.S. inflation rate
- 2 Risk of speculative attacks.
- 3 Volatile interest rates.
- 4 Loss of automatic adjustment to certain shocks.

Benefits of fixing the exchange rate

- ❶ Loss of monetary autonomy.
 - Import the U.S. inflation rate
- ❷ Incentives for fiscal discipline.
 - Cannot print money to finance budget deficits.
- ❸ Stable exchange rate

The Impossible Trinity

- Exchange rate regimes pursue 3 goals:
 - ① Stable exchange rates
 - ② Monetary autonomy
 - ③ Free capital flows.
- Only 2 of the 3 goals are attainable.

The Impossible Trinity

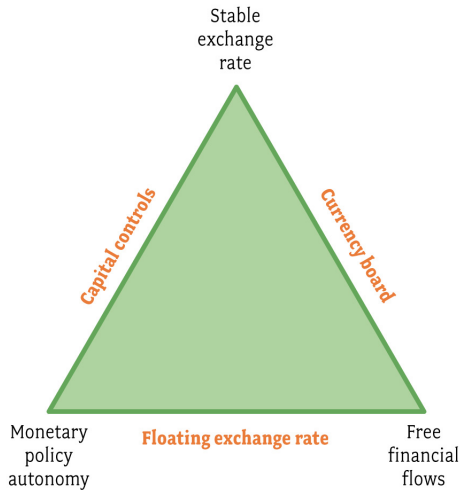


FIGURE 15.6 The Policy Trilemma in Open Economies

Macroeconomics, Charles I. Jones
Copyright © 2008 W. W. Norton & Company

Which regime is best?

- The answer depends on the characteristics of the country.
- Large, relatively closed countries can handle volatile currencies - they usually float.
- Small countries with a major trading partner may want to peg
 - But beware of pegging against the wrong country (Argentina).
- Countries with questionable central banks may want to peg

- If the exchange rate is fixed, why not get rid of it?
- Main example: Euro
- Benefits:
 - lower transactions costs
 - credibility
 - speculative attacks no longer possible.
- Costs:
 - irreversible: cannot devalue in response to shocks
 - loss of monetary policy

- Jones, Macroeconomics, ch. 15.

Advanced reading:

- Rogoff, Kenneth (1996). "The Purchasing Power Parity Puzzle." *Journal of Economic Literature* 34. [More detail than you want to know.]