Exchange Rates

15.012 Applied Macro and International Economics

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February 2011
Class Outline

• Nominal exchange rates $E$
  – Short-run: market for local currency
    • Interest-rate parity
  – Long-run:
    • “Law of one price” and PPP

• Real Exchange rates $\rightarrow E$ and Prices
Nominal Exchange Rate

• Exchange Rate $\rightarrow$ key price in open economies $\rightarrow$ effect on trade and financial flows
• Nominal Ex. Rate = $E = \text{price of one currency in terms of another}$
• Two ways of expressing it:
  – Local currency per unit of foreign currency.
    Eg Brazil: $5 \text{ reals per dollar (↑E depreciation of local currency)}$
  – MORE INTUITIVE: Foreign currency per unit of local currency.
    Eg Brazil: 0.2 $\text{ dollars per real (↑E is appreciation of local currency)}$

• From now on, I will use the “intuitive” form...
Reals per 1USD

Last year....
Is the Real appreciating /depreciating?

Less Reals to buy dollar.....

Real is **appreciating**

Dollars per 1 Real

More dollars to buy real.....
Euros per 1USD

Last 5 days....
Is the Euro appreciating /depreciating?

Less Euros to buy dollar.....

Dollars per 1EUR

Euro is **appreciating**

More dollars to buy euro.....
Market for Local Currency

- The “price” is E (foreign currency per unit of local currency)
- ↑E means local currency is more valuable (appreciates)

What affects E?
- Exports & Imports
- Financial Flows
Market for Local Currency

• Example: Brazil

  – Imports $\rightarrow$ need to buy dollars to purchase goods abroad $\rightarrow$ supply reals
  – Exports $\rightarrow$ bring dollars from abroad, need to exchange them for reals $\rightarrow$ demand reals

  – Capital Outflows (away from brazil) $\rightarrow$ supply reals
  – Capital Inflow (coming to brazil) $\rightarrow$ demand reals
Short-run: Currency Market

Market for Reals (local currency)

$E(US$/reals)$ or Value of Real

↑ Appreciation
↓ Depreciation

Net Capital Outflow ($i^{US}, i^{BR}$, Expectations)

- Net Export ($E$, taste, trade policy)

Current Account
What affects the nominal $E$?

- Exports are more desirable $\rightarrow \uparrow NX \rightarrow \uparrow E \rightarrow$ appreciation
What affects the nominal $E$?

- If interest rates go down $\rightarrow$ capital outflows $\rightarrow$ $\downarrow E \rightarrow$ depreciation
- If investors leave in panic $\rightarrow$ capital outflows $\rightarrow$ $\downarrow E \rightarrow$ depreciation
Short-run

• In the short-run → mostly about financial transactions → capital outflows and inflows
• Depend on interest rates + current and expected exchange rates
Interest Rate Parity

1 US$ = \frac{1}{E_t} * (1+i_{BR}) * E_{t+1}

If ↓ i^{US}, ↑ i^{BR} or expect appreciation or real ↑ (Et+1/Et)
→ 1+i^{US} < (1+i^{BR})*(E_{t+1}/E_t)→ more capital flows to Brazil (example of “carry trade”)

Note: E is dollars per real, so 1/E is reals per dollar
Long Run Theories

• Purchasing Power Parity (PPP)

• Based on “Law of one price”
  – same good should sell for the same amount
    (expressed in same currency) in two countries
  – Otherwise \( \rightarrow \) arbitrage opportunity

\[
P^\text{US} = P^\text{BR} \cdot E_{\text{(US$/Real)}}
\]

Cost US (dollars) \quad \text{Cost in Brazil (dollars)}
PPP

• If PPP holds, in the long run:

\[ E(\text{US$/Real}) = \frac{P^{US}}{P^{BR}} \]

• Intuition: If \( \uparrow \frac{P^{US}}{P^{BR}} \rightarrow \) US is expensive, Brazil cheap\( \rightarrow \) buy goods in brazil, sell in US\( \rightarrow \) demand for real goes up (think exports)\( \rightarrow \) \( \uparrow \) \( E(\text{US$/Real}) \)
Does PPP hold in the data?

• “Big Mac” Index
  
  US vs UK
  US$3.73 = £ 2.29*1.61(dollars/pound)=US$3.61

  Us vs Norway
  US$3.73 = K45* 0.175(dollars/kroner)= US$7.87

  Find it online.....for US and UK
  – Ipod classic 160gb
    http://store.apple.com/us/browse/home/shop_ipod/family/ipod_classic?mco=MTM3NTMxMzA
  – Apple TV
    http://store.apple.com/uk/browse/home/shop_ipod/family/apple_tv?mco=MTkxMTAxNTI
  – Top selling MP3 Song in Amazon
PPP fails because

- Non-tradable goods
- Transport Costs
- Taxes
- Items not identical to consumers
- Market conditions (taste, competitors)
  ➔ “Pricing-to-market”
Long Run Theories

• PPP $\rightarrow$ use as an approximation
• Another long-run theory: BB-NN $\rightarrow$ not in this class. Roberto teaches it in 15.014 next year
Real Exchange Rate

- Exports and Imports are affected by $E$ and the price level in each country

$$\text{Real } E^{\text{BR}} = \frac{E_{\text{(US$/real)}} \cdot P^{\text{BR}}}{P^{\text{US}}}$$

- If ↓ $E$ or ↓ $P^{\text{BR}}$ or ↑ $P^{\text{US}}$ → real depreciation → brazil relatively cheaper → exports more
Depreciation as a policy tool

• In the short-run $\rightarrow P^R$ fixed
• Expansionary Monetary Policy $\uparrow M \rightarrow \downarrow i \rightarrow \downarrow E \rightarrow$ real depreciation $\rightarrow$ more exports
• In long-run $\rightarrow$ inflation $\rightarrow \uparrow P^R \rightarrow$ real appreciation
• So? $\rightarrow$ more printing, nominal depreciation, inflation $\rightarrow$ again $\rightarrow$ can spiral out of control
Remember

• E is determined....
  – Short-run: capital flows $\rightarrow$ currency market
  – Long-run: PPP

• Real E matters for trade
  – E and Prices