EE432 Monetary Theory and Policy

Lecture 7 Foreign Exchange

Dr. Chamadanai Marknual
Faculty of Economics, Thammasat University

Semester 2/2018

Supplement

Foreign Exchange Basics

Exchange Rate

- The **exchange rate** is the ***price of one country's money in terms of another country's money***.
- The **"spot" exchange rate** is the ***price for immediate exchange.***
- The **"forward" exchange rate** is the ***price for exchange to take place at some specific time in the future.***

Exchange Rate Systems

- There are three exchange rate regimes:
  - **Fixed (or pegged) exchange rate system** – the government ***chooses an exchange rate*** and *offers to buy and sell currencies to* ***keep the exchange rate within a narrow band***.
  - **Flexible (floating) exchange rate system** – ***determination*** *of exchange rates* is left ***totally up to the market***, and is *determined entirely by supply and demand.*
  - **Partially flexible (dirty or managed float) exchange rate system** – the government *sometimes affects the exchange rate* and *sometimes leaves it to the market*.

Change in Exchange Rates

- **Under a floating-rate system**
  - ***Depreciation*** is the *fall in the market price (exchange rate)* of the currency
  - ***Appreciation*** is the *rise in the market price (exchange rate)* of the currency
- **Under a fixed-rate system**
  - ***Devaluation*** is the *official lowering of the par value of a currency*
  - **Revaluation** is the *official raising of the par value of a currency*

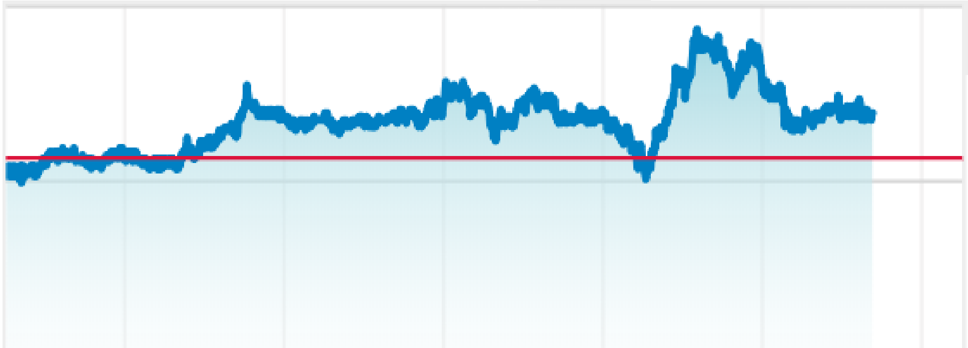
The nominal exchange rate

e = **nominal exchange rate,**
the ***relative price of***
domestic currency
in terms of foreign currency
(e.g. Yen per Dollar)

The nominal exchange rate

Markets

U.S. EUROPE ASIA **FX** RATES FUTURES



1D 5D 3M 6M 1Y

Euro	**1.1321**	**0.0014**	**0.12%**
Yen	111.48	-0.22	-0.20%
Pound	1.3280	0.0038	0.29%
Swiss Franc	1.0022	-0.0016	-0.16%
WSJ $ Index	89.72	-0.19	-0.21%

The real exchange rate

ε = **real exchange rate,**
the ***relative price of***
<u>domestic goods</u>
in terms of <u>foreign goods</u>

(e.g. Japanese Big Macs per U.S. Big Mac)

the lowercase Greek letter epsilon

Understanding the units of ε

$$\varepsilon = \frac{e \times P}{P^*}$$

$$= \frac{(\text{Yen per \$}) \times (\text{\$ per unit U.S. goods})}{\text{Yen per unit Japanese goods}}$$

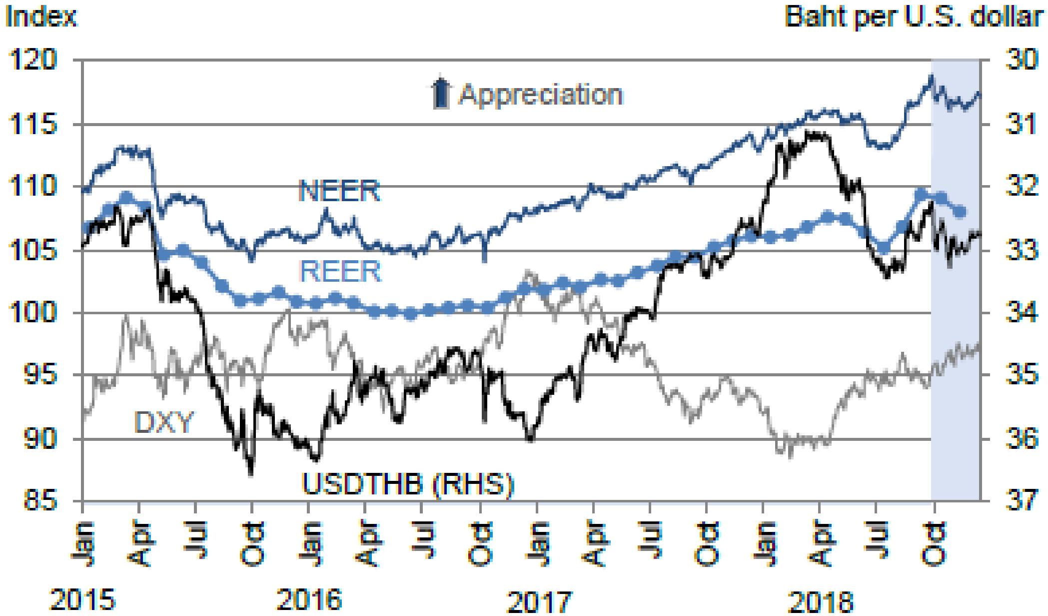
$$= \frac{\text{Yen per unit U.S. goods}}{\text{Yen per unit Japanese goods}}$$

$$= \begin{array}{c}\text{Units of Japanese goods}\\ \text{per unit of U.S. goods}\end{array}$$

Empirical foreign exchange rate: Thailand Case

Chart 2.12 The baht depreciated against the U.S. dollar as the U.S. dollar strengthened

USDTHB, NEER, DXY

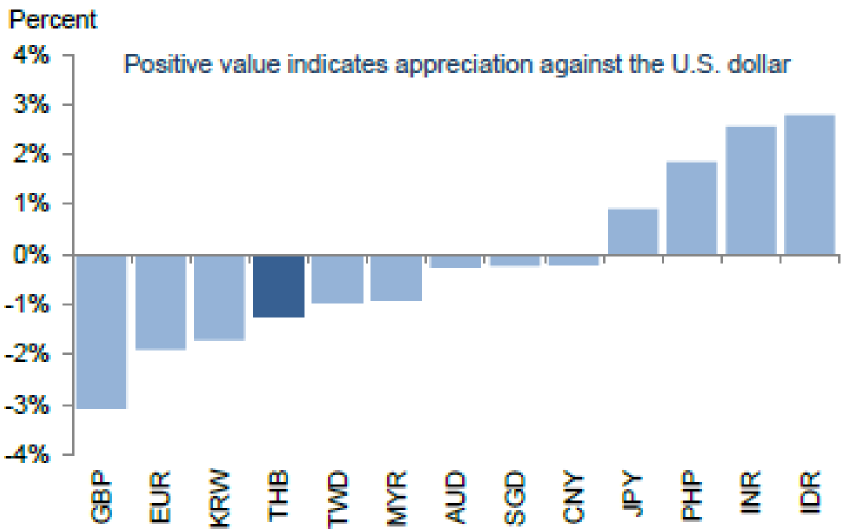


Source: Bank of Thailand and Reuters (data as of 18 December 2018)

- In the beginning of the fourth quarter of 2018, the **baht depreciated** against the U.S. dollar and **the nominal effective exchange rate also depreciated**
- As the end of November 2018, **the real effective exchange rate (REER) declined around 2.2 percent** from the end of the previous quarter.

Empirical foreign exchange rate: Thailand Case

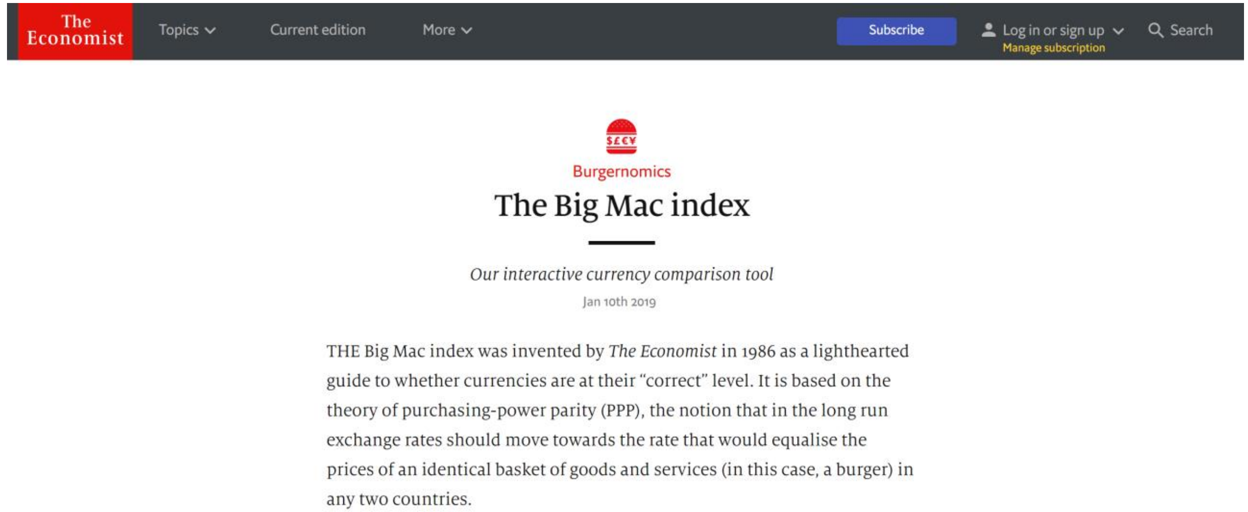
Chart 2.13 The baht depreciated against the U.S. dollar, while some regional currencies appreciated
(18 Dec 18 compared to 28 Sep 18)



Source: Bank of Thailand and Reuters (data as of 18 December 2018)

- The **baht depreciation** was more pronounced ***than regional currencies***, partly due to its appreciation at a faster pace than these currencies in the previous period.
- However, **since November**, the baht strengthened slightly as the U.S. dollar weakened after concerns over the U.S. trade protectionism

Exchange Rates in the Long Run


The Economist Topics Current edition More Subscribe Log in or sign up Manage subscription Search

Burgernomics

The Big Mac index

Our interactive currency comparison tool

Jan 10th 2019

THE Big Mac index was invented by *The Economist* in 1986 as a lighthearted guide to whether currencies are at their "correct" level. It is based on the theory of purchasing-power parity (PPP), the notion that in the long run exchange rates should move towards the rate that would equalise the prices of an identical basket of goods and services (in this case, a burger) in any two countries.

ビッグマック

単品

¥390

バリューセット

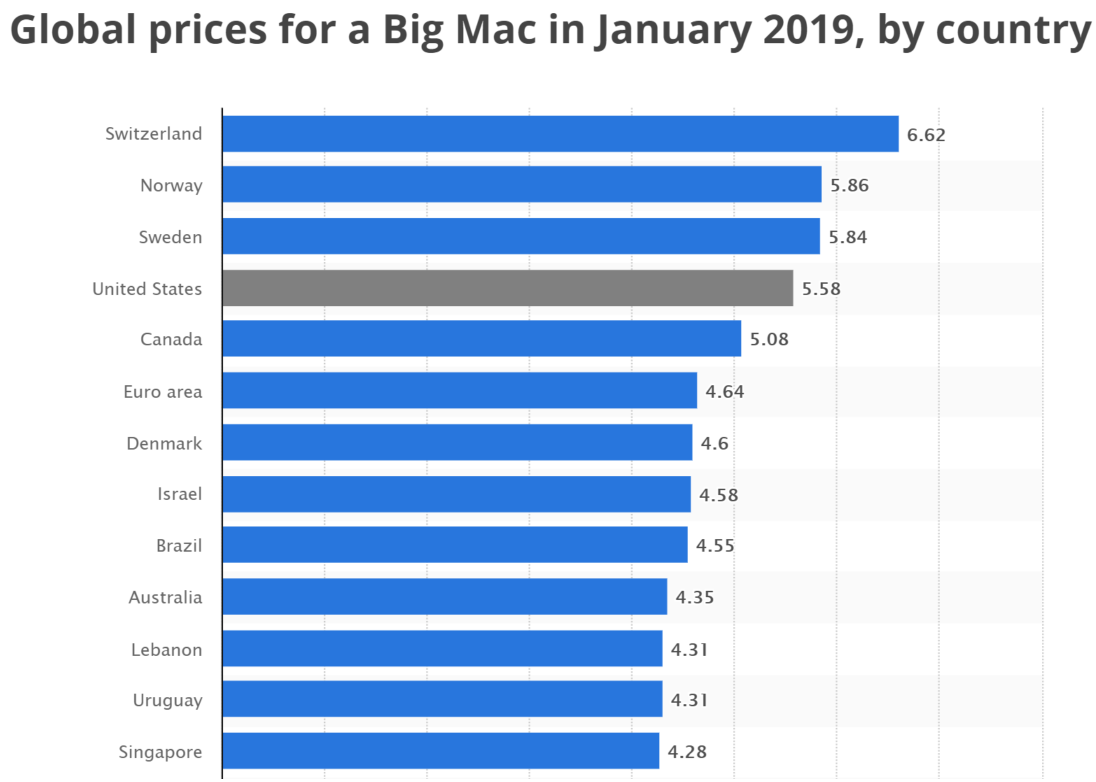
¥690

In class activity

"Calculate Big Mac index; price for a Big Mac around the globe, then compare with the US one"

https://www.youtube.com/watch?v=yHK07C3v3yo


The Big Mac index
Local currency under(-)/over(+) valuation against the dollar, %
July 2017
January 2018
Big Mac price*, $
60 40 20 - 0 + 20 40
Switzerland 6.76
Norway 6.24
Sweden 6.12
United States† 5.28
Canada 5.26
Brazil 5.11
Denmark 4.93
Euro area‡ 4.84
Australia 4.71
New Zealand 4.51
Britain 4.41
Czech Republic 3.81
Japan 3.43
China§ 3.17
Poland 2.97
Turkey 2.83
South Africa 2.45
Russia 2.29
*At market exchange rates (Jan 17th 2018)
†Average of four cities ‡Weighted average of member countries §Average of five cities
Sources: McDonald's; The Economist
Economist.com


Global prices for a Big Mac in January 2019, by country
Switzerland 6.62
Norway 5.86
Sweden 5.84
United States 5.58
Canada 5.08
Euro area 4.64
Denmark 4.6
Israel 4.58
Brazil 4.55
Australia 4.35
Lebanon 4.31
Uruguay 4.31
Singapore 4.28

~ McZample ~

- one good: Big Mac
- price in Japan:
  P^* = 200 Yen
- price in USA:
  P = \$2.50
- nominal exchange rate
  e = 120 Yen/\$

$$\varepsilon = \frac{e \times P}{P^*} = \frac{120 \times \$2.50}{200 \text{ Yen}} = 1.5$$

To buy a U.S. Big Mac, someone from Japan would have to pay an amount that could buy 1.5 Japanese Big Macs.

Real exchange rate ε in the real world

- *In the real world:*
  We can think of ***ε*** as the **relative price of a basket of domestic goods *in terms of a basket of foreign goods***

- There's just **one good, "output."**
  So ***ε*** is the ***relative price of one country's output*** in terms of the ***other country's output***

Exchange Rates in the Long Run

- The model of **long-run exchange rate behavior** *provides the framework* that actors in asset markets **use to forecast future exchange rates.**
- **Predictions about long-run movements** in exchange rates are ***important even in the short run.***

Exchange Rates in the Long Run

- In the *long run*, **national price levels** play a key role in **determining** both ***interest rates*** and the ***relative prices at which countries' products are traded***.
- The theory of **purchasing power parity (PPP)** explains ***movements in the exchange rate between two countries' currencies*** by changes in the countries' price levels.

Purchasing Power Parity (PPP)

- **Goods must sell at the *same*** *(currency-adjusted)* ***price* in all countries**.
- The **nominal exchange rate *adjusted to equalize*** *the cost of a basket of goods across countries*.
- *Reasoning: arbitrage, the law of one price*

Purchasing Power Parity (PPP)

- PPP: $\underbrace{e \times P}_{} = P^*$

Cost of a basket of foreign goods, in foreign currency.

Cost of a basket of domestic goods, in foreign currency.

Cost of a basket of domestic goods, in domestic currency.

- Solve for ***e***: $\boldsymbol{e = P^*/P}$
- **PPP** implies that the ***nominal exchange rate between two countries*** **<u>equals</u>** the ***ratio of the countries' price levels***.

Purchasing Power Parity (PPP)

- If $\boldsymbol{e} = \boldsymbol{P^*/P}$

  then

$$\boldsymbol{\varepsilon} = \boldsymbol{e} \times \frac{\boldsymbol{P}}{\boldsymbol{P}^*} = \frac{\boldsymbol{P}^*}{\boldsymbol{P}} \times \frac{\boldsymbol{P}}{\boldsymbol{P}^*} = 1$$

Purchasing power parity *implies that the* ***real exchange rate*** *is* ***<u>always equal to one</u>****.*

The Law of One Price

- **Identical goods *sold in different countries* must sell for the same price** when their *prices are expressed in terms of the same currency*.
- It implies that the **dollar price of good *i*** is the same wherever it is sold
- This law *applies **only** in **competitive markets**, **free** of **transport costs** and **no barriers*** to trade.

Purchasing Power Parity

- The **exchange rate between two counties' currencies** ***<u>equals</u>*** the **ratio of the counties' price levels.**

- It **compares** ***average prices*** **across countries**.
- It **<u>predicts</u> exchange rate.**

Purchasing Power Parity

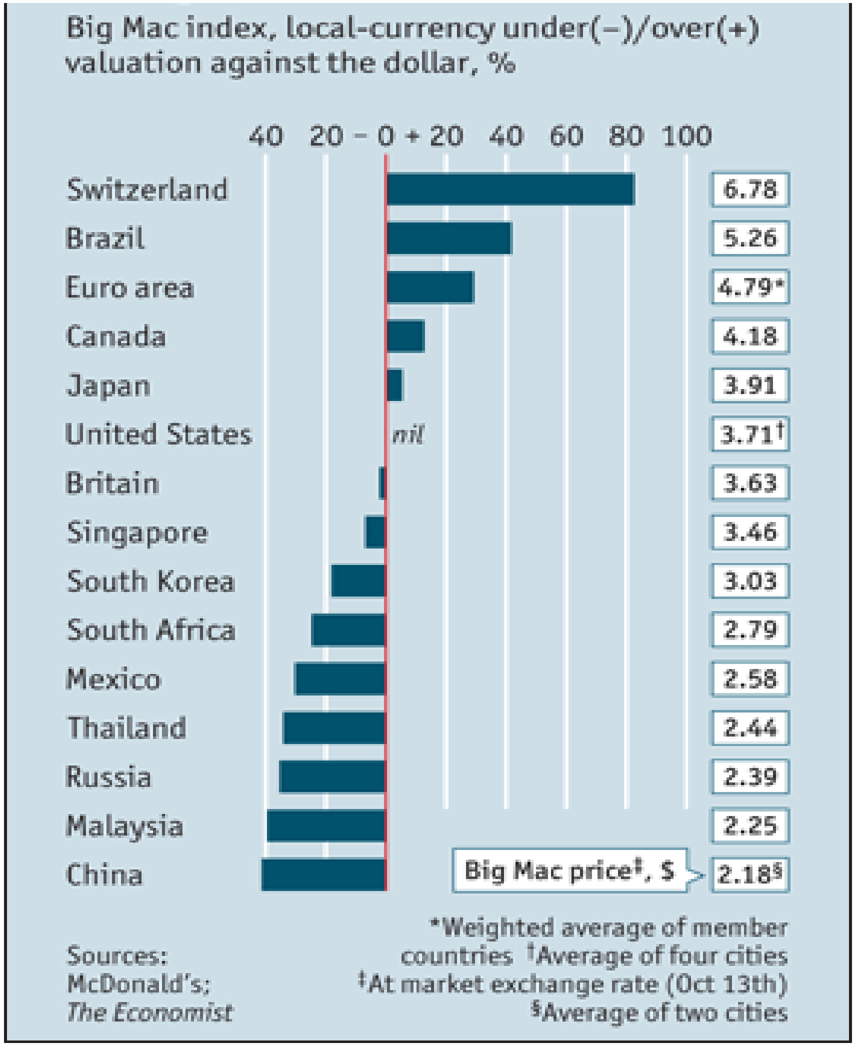
- The Relationship Between PPP and the Law of One Price
  - The **law of one price** *applies to* **individual commodities**, while ***PPP*** *applies to* the ***general price level.***
  - **If the law of one price holds** true for every commodity, **PPP must hold automatically <u>for the same reference baskets</u>** *across countries*.

Using the Absolute PPP

- In theory, the **“absolute” PPP Spot exchange rate** can be used to **assess the “correctness” of a current spot rate** on the basis of ***similar goods in different countries.***
- It **suggests** the **possibility** that a currency is **overvalued or undervalued**, *and by how much*
- We can **use** this model **for *forecast* the future move of a currency.**

Big Mac Index

October 14, 2010



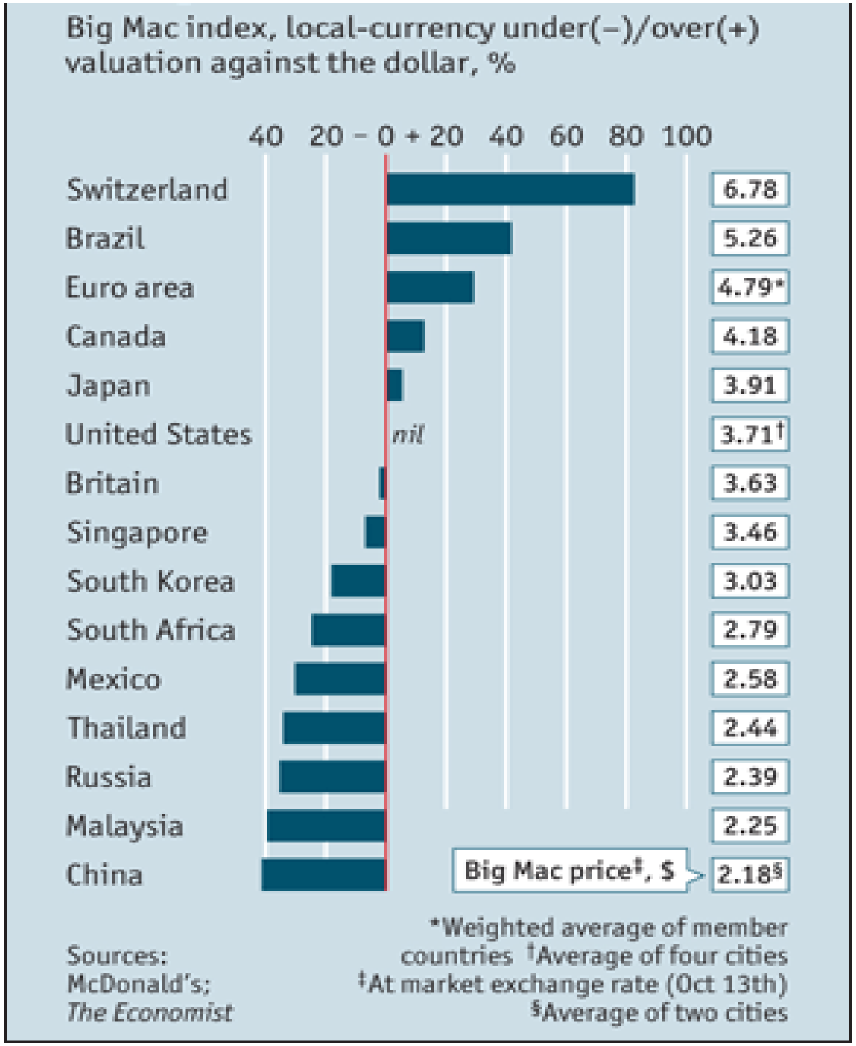
- In the **United States**, a ***Big Mac costs $3.71 as shown in chart***
- While in **China**, a ***Big Mac costs 14.5 yuan***.
- **Given the Oct 2010 exchange rate (USD/CNY):**

  6.6514 Yuan per Dollars
- Then, a **Big Mac in China** worked out *in terms of Dollars*

  14.5/6.6514 = $2.18
- *As seen the Big Mac price on the chart*

Big Mac Index

October 14, 2010



- The **<u>Absolute PPP for the yuan</u>** is the *ratio of the yuan cost to the dollar cost,*

  or: 14.5/3.71 = 3.9084

- Comparing **spot (6.6514)** to **PPP (3.9084)** suggested that the **<u>yuan was undervalued</u>** by 41%

6.6514-3.9084/6.6514 = 41%

Rules for the Absolute PPP

- The **Absolute PPP** can be ***used to "estimate"*** whether a *foreign currency's spot rate* is **overvalued or undervalued** and ***possible future move*** by using the following rules:

- **Absolute PPP :**

  – If **PPP Spot < Current Spot**, then the **currency is undervalued;** thus **currency may appreciate**

E.g.: PPP = **3.9084**; Current Spot = **6.6514**

Examining Discrepancies Between Absolute PPP and Actual FX Rates

- When the **actual FX rate** <u>**differs**</u> from the **Absolute PPP rate**,
- One <u>needs ***to*** **examine reasons**</u> **for the discrepancy** to ***determine*** *whether the* ***spot rate will****, or will not,* ***move towards the Absolute PPP***.

Examining Discrepancies Between Absolute PPP and Actual FX Rates

- (1) **Examine the exchange rate regime** and *the* ***commitment*** *of the government for that regime*.
- (2) Are there **economic or financial conditions** which *could account for the observed discrepancy* and *how long might they dominate the spot rate?*
  - Relative economic performance, interest rates, trade balances, capital flows, safe haven effects, etc.

Nominal and Real Effective Exchange Rate Indices

- ***Individual national currencies*** *often need to be* ***evaluated against*** **all other currency values** to determine relative purchasing power
- The objective is **to discover** whether a **nation's exchange rate** is ***"overvalued" or "undervalued"*** in terms of PPP
- This problem is often dealt with ***through the calculation of exchange rate indices*** such as the **nominal effective exchange rate index (NEER)** and the **real effective exchange rate index (REER)**

Nominal and Real Effective Exchange Rate Indices

- **Nominal effective exchange rate index (NEERI)** uses nominal exchange rates to create an index, on ***a weighted average basis***, of the *value of the main trading currencies over a period of time*, which is defined as follows

$$\text{NEERI}_t = \sum_{i=1}^{n} W_i \times \left(\frac{(1/S_{N,i,t})}{(1/S_{N,i,0})} \times 100\right)$$

  - n: number of major trading currencies for the domestic country
  - W_i: weight of a foreign currency, depending on the trading volume between the domestic country and that foreign country
  - $S_{N,i,t}$: nominal exchange rates for the i-th foreign currency at time t ($1/S_{N,i,t}$ measures the domestic currency value in terms of foreign currencies)

Nominal and Real Effective Exchange Rate Indices

- **Real effective exchange rate index (REERI)** indicates how the ***weighted average purchasing power of the domestic currency*** has **changed** *relative to selected base period*, which is defined as follows

$$\mathrm{REERI}_t = \sum_{i=1}^{n} W_i \times \left(\frac{(1/S_{R,i,t})}{(1/S_{R,i,0})} \times 100\right)$$

  – $S_{R,i,t}$: real exchange rates for the i-th foreign currency at time t

Nominal and Real Effective Exchange Rate Indices

- The meaning of real effective exchange rate index (REERI):
  - **$REERI_t$ > $REERI_0$**: *Real exchange rate of the* ***domestic currency*** *against foreign currencies* **appreciates** relative to the base period, so the **competitive power of domestic products decreases** relative to the base period
  - $REERI_t < REERI_0$: Real exchange rate of the **domestic currency** against foreign currencies **depreciates** relative to the base period, so the **competitive power of domestic products increases** relative to the base period

Purchasing Power Parity

- **Absolute PPP and Relative PPP**
  - **Absolute PPP**
    - It states that **exchange rates** equal **relative price levels**.
  - **Relative PPP**
    - It states that the ***percentage change* in the exchange rate** between two currencies over any period **equals** the ***difference between the percentage changes* in national price levels**.

Purchasing Power Parity

- **Absolute PPP and Relative PPP**
  - **Absolute PPP**
    - At a point in time, the **equilibrium spot exchange rate** is that ***rate which results in*** the **prices of similar goods in two different countries being equal**
    - This form of the PPP can be **used to test how "appropriate" a current spot exchange rate** is and to **indicate a future move in the exchange rate.**

Purchasing Power Parity

- **Absolute PPP and Relative PPP**
  - **Relative PPP**
    - At the time, **the change in the exchange rate between two currencies** should be ***equal*** to the **rate of change** in the ***prices of similar goods between the two countries.***
    - This form of the PPP is used to **forecast the equilibrium spot exchange rate** in the future and generally *over a long time horizon*.

End of lecture