Real Exchange Rates and Nominal Exchange Rates

Sources

http://public.wsu.edu/~hallagan/EconS327/weeks/week11/week11.pdf

https://www.thoughtco.com/overview-of-real-exchange-rates-1146775

https://www.slideshare.net/dolaneconslide/real-and-nominal-exchange-rates-a-tutorial/3-Nominal_Exchange_Rates_The_exchange

http://www.investopedia.com/articles/basics/04/050704.asp

http://www.investopedia.com/exam-guide/cfa-level-1/global-economic-analysis/foreign-exchange-parity-influences.asp

x-rates.com

Terminology: Nominal vs. Real

Nominal: Values expressed in ordinary ways in terms of prices in which transactions actually take place

Real: Values that are adjusted for Inflation

Everyday example of Nominal and Real -

Your boss gives you a 20% raise from $40 an hour to $48 an hour, but inflation raises the price of things you buy by 20%

- Your ***nominal*** salary has gone up, but your ***real*** salary is no higher

Nominal Exchange Rates

Currency exchange rates seen on display in a bank or at an airport exchange kiosk are ***nominal exchange rates***

They can be expressed in two ways, for example:

18 Mexican Pesos (MXN) per 1 US Dollar (USD)

Or

0. 06 USD per 1 MXN

Nominal Exchange Rates: Bid, Ask and Spread

Nominal Exchange Rates: Bid, Ask and Spread

If not specified as Bid or Ask, a rate shown is typically the Ask rate.

RATES TABLE

1 US Dollar Rates table

Top 10 — Oct 09, 2017 21:39 UTC

US Dollar	1.00 USD	inv. 1.00 USD
Euro	0.851757	1.174043
British Pound	0.760731	1.314525
Indian Rupee	65.408124	0.015289
Australian Dollar	1.289675	0.775389
Canadian Dollar	1.255189	0.796693
Singapore Dollar	1.363302	0.733513
Swiss Franc	0.979735	1.020685
Malaysian Ringgit	4.232345	0.236276
Japanese Yen	112.655597	0.008877
Chinese Yuan Renminbi	6.626314	0.150913

Currency Appreciation and Depreciation: Terminology

If today a given amount of Currency A can buy more of Currency B than that given amount could yesterday, we say Currency A **appreciates** and Currency B **depreciates**

- *If today a lesser amount of Currency A is needed to buy the same amount of Currency B as yesterday, Currency A has **appreciated** and Currency B has **depreciated***

If today a given amount of Currency A buys less of Currency B than that given amount could yesterday, we say Currency A **depreciates** and Currency B **appreciates**

- *If today a greater amount of Currency A is needed to buy the same amount of Currency B as yesterday, Currency A has **depreciated** and Currency B has **appreciated***

Currency Appreciation and Depreciation: Terminology

Example:

Suppose yesterday the exchange rate was 18 MXN per 1 USD
- We could also say yesterday the exchange rate was $0.06 per 1 MXN

Today the exchange rate is 25 MXN per 1 USD
- We could also say the new exchange rate is $0.04 per 1 MXN

The MXN has **depreciated** from 18MXN to 25MXN

The USD has **appreciated** from $0.06 to $0.04

Determinants of Exchange Rates

Numerous factors determine exchange rates, and all are related to the **trading relationship between two countries**

Exchange rates are **relative** and are expressed as a **comparison of the currencies of two countries**

Determinants of Exchange Rates - Differentials in Inflation

A country with a relatively **low inflation** rate **(deflation)** will have an **appreciating** currency (an increasing nominal-exchange-rate value of its currency), as its purchasing power increases relative to other currencies

A country with a relatively **high inflation** rate will have a **depreciating** currency (a declining nominal-exchange-rate value of its currency), as its purchasing power decreases relative to other currencies

The **rate of appreciation or depreciation** will be approximately equal to the **percentage-point difference in the inflation rates**

Determinants of Exchange Rates - Differentials in Inflation (Relative Product Prices)

If a country's goods are **relatively** cheap (**low inflation** rate), foreigners will want to buy those goods

- In order to buy those goods, they will need to buy the nation's currency
  - The nation's currency will be in **demand**
  - A country with the **relative lowest price level** will tend to have the strongest currency (the currency will be **appreciating**) due to demand for their products and their currency

Example: Suppose the **price level of products decreases** by 40% in China, while the price levels of its trading partners remain relatively stable. The Chinese goods will be very inexpensive to foreigners, while Chinese citizens will decrease their purchase of relatively expensive foreign goods. The Chinese currency will **appreciate** as a result.

Determinants of Exchange Rates - Differentials in Interest Rates

When a country's central bank changes interest rates, it impacts both inflation and currency values

Higher interest rates tend to **increase exchange rates (appreciation)**

- Higher interest rates offer a higher return for lenders relative to other countries
  - Therefore, higher interest rates **attract foreign capital** and **cause the exchange rate to rise (appreciation)**
    - The impact of higher interest rates is **mitigated**, however, if inflation in the country is much higher than in others (remember, a country with **higher inflation** typically sees **depreciation** in their currency)

Lower interest rates tend to **decrease exchange rates (depreciation)**

Determinants of Exchange Rates – Inflation and Interest Rates

Determinants of the Exchange Rate in the Short Run

In the **short run**, movements of currency respond to short run differences in **interest rates** so that short run **rates of return are equalized** across borders

Determinants of the Exchange Rate in the Long Run

In the **long run**, currency moves in response to **price differences (inflation)** so that long run **prices for the same goods are the same** across borders

Determinants of Exchange Rates – Monetary Policy and Public Debt

A country with an **expansionary (easy)** monetary policy will **increase the supply** of its currency

- This causes the currency to **depreciate**
- An expansionary monetary policy is financed through public debt
    - The country issues bonds
        - Foreigners buy the bonds, which increases the money supply
            - The country has to “print money” (increase the supply of its currency), so foreigners can buy the currency, and then buy the bonds with the currency
            - This increase in the supply of currency causes depreciation
            - (Increasing the money supply also causes inflation)

Large debt may result in the country defaulting on its obligations.

- For this reason, the country's debt rating (as determined by Moody's or Standard & Poor's, for example) is a crucial determinant of its exchange rate

Countries with **restrictive (hard)** monetary policies will be **decreasing the supply** of their currency

- causing the currency to **appreciate**

Determinants of Exchange Rates - Political Stability and Economic Performance

Foreign investors seek stable countries with strong economic performance in which to invest their capital

A country with such positive attributes will draw investment funds away from other countries perceived to have more political and economic risk

Political turmoil can cause a loss of confidence in a currency and a movement of capital to the currencies of more stable countries

Determinants of Exchange Rates - Terms of Trade

Terms of Trade = ratio comparing export prices to import prices

- Related to current accounts (balance of payments, or balance of trade)
  - The **current account is the balance of trade** between a country and its trading partners, reflecting all payments between countries for goods, services, interest and dividends

If the price of a country's exports rises by a greater rate than that of its imports, its terms of trade have favorably improved

- **Increasing terms of trade** shows greater demand for the country's exports. This, in turn, results in rising revenues from exports, which provides increased demand for the country's currency and currency **appreciation**

If the price of exports rises by a smaller rate than that of its imports, the currency's value will decrease in relation to its trading partners

- A **deficit in the current account** shows the country is spending more on foreign trade than it is earning (it is importing more than it is exporting)
  - Importing requires more foreign currency, in order to pay for the foreign goods
    - Excess demand for foreign currency and less relative demand for domestic currency results in domestic currency **depreciation**

Nominal versus Real Exchange Rates

Nominal exchange rate: How much of one currency can be traded for a unit of another currency

Real exchange rate: How many of a good or service in one country can be traded for one of that good or service in another country

- Comparing the cost of equivalent goods across countries
- How many European bottles of wine can be exchanged for one US bottle of wine?

The Intuition Behind Real Exchange Rates

$$\frac{\$20\,USD}{US\,bottle} \times \frac{0.8\,EUR}{USD} \times \frac{1\,Euro\,bottle}{15\,EUR} = 1.07\,\frac{Euro\,bottles}{US\,bottle}$$

$$real\,exchange\,rate = 1.07\,\frac{Euro\,bottles}{US\,bottle}$$

Real exchange rates can be thought of as answering the following question: If you took an item produced domestically, sold it at the domestic market price, exchanged the money you got for the item for foreign currency, and then used that foreign currency to purchase units of the equivalent item produced in the foreign country, how many units of the foreign good would you be able to buy?

The units on real exchange rates, therefore, are units of foreign good over units of domestic (home country) good, since real exchange rates show how many foreign goods you can get per unit of domestic good. (Technically, the home and foreign country distinction is irrelevant, and real exchange rates can be calculated between any two countries.)

The Intuition Behind Real Exchange Rates (continued)

The example above illustrates this principle- if a bottle of US wine can be sold for $20, and the nominal exchange rate is 0.8 Euro per US dollar, then the bottle of US wine is worth 20 x 0.8 = 16 Euro. If a bottle of European wine costs 15 Euro, then 16/15 = 1.07 bottles of European wine can be purchased with the 16 Euro. Putting all of the pieces together, the bottle of US wine can be exchanged for 1.07 bottles of the European wine, and the real exchange rate is thus 1.07 bottles of European wine per bottle of US wine.

The reciprocal relationship holds for real exchange rates in the same way that it holds for nominal exchange rates. In this example, if the real exchange rate is 1.07 bottles of European wine per bottle of US wine, then the real exchange rate is also 1/1.07 = 0.93 bottles of US wine per bottle of European wine.

Calculating the Real Exchange Rate

$$\frac{\$20\ USD}{US\ bottle} \ x\ \frac{0.8\ EUR}{USD} \ x\ \frac{1\ Euro\ bottle}{15\ EUR} = 1.07\ \frac{Euro\ bottles}{US\ bottle}$$

$$domestic\ price\ x\ nominal\ exchange\ rate\ x\ \frac{1}{foreign\ price} = real\ exchange\ rate$$

$$real\ exchange\ rate = \frac{nominal\ exchange\ rate\ x\ domestic\ price}{foreign\ price}$$

Mathematically, the real exchange rate is equal to the nominal exchange rate times the domestic price of the item divided by the foreign price of the item. When working through the units, it becomes clear that this calculation results in units of foreign good per unit of domestic good.

The Real Exchange Rate with Aggregate Prices

$$real\ exchange\ rate = \frac{nominal\ exchange\ rate\ x\ domestic\ aggregate\ price\ level}{foreign\ aggregate\ price\ level}$$

In practice, real exchange rates are usually calculated for all goods and services in an economy rather than for a single good or service. This can be accomplished simply by using a measure of aggregate prices, such as the consumer price index (CPI) or GDP deflator, for the domestic and the foreign country in place of the prices for a particular good or service.

Using this principle, the real exchange rate is equal to the nominal exchange rate times the domestic aggregate price level divided by the foreign aggregate price level.

Real Exchange Rates and Purchasing Power Parity

When the real exchange rate is equal to 1, this means a given amount of monetary resources can buy the same amount of goods in different countries

This principle, where the real exchange rate is equal to 1 is referred to as purchasing-power parity

There are various reasons why purchasing-power parity need not hold in practice

Real Appreciation – Three Scenarios

A Mexican farmer sells avocados in a local market

The farmer wants to buy a pound of premium coffee, which is priced in USD in a worldwide market

To understand real exchange rates, we need to ask:

- How many pounds of avocados for one pound of coffee?

Scenario 1: Real Appreciation without Inflation

Suppose,

- The local (Mexico) price of avocados per pound is 18 MXN
- The world price of premium coffee per pound is $10 USD

If yesterday's nominal exchange rate was 18 MXN per 1 USD, then

- it would take 10 pounds of avocados to buy 1 pound of premium coffee

Today, if **prices of avocados and coffee don't change** but the **nominal exchange rate changes** such that the MXN **appreciates** to 15 MXN per 1 USD, then:

- It only takes about 8 pounds of avocados to buy 1 pound of coffee

We say the **MXN appreciates in both nominal and real terms**

If local and world prices remain unchanged, a change in the nominal exchange rate means an equal change in the real exchange rate

Scenario 2: Real Appreciation with Inflation (How Inflation causes Real Appreciation)

Again, suppose:

- The local (Mexico) price of avocados per pound is 18 MXN
- The world price of premium coffee per pound is $10 USD

Again, if yesterday's nominal exchange rate was 18 MXN per 1 USD, then

- it would take 10 pounds of avocados to buy 1 pound of premium coffee

Now suppose, today, if the **nominal exchange rate does not change**, and the **price of coffee does not change**, but Mexican **inflation** raises the price of avocados per pound to 20 MXN, then

- the Mexican farmer only has to trade about 9 pounds of avocados for a pound of coffee

We say the **MXN appreciates in real terms** even though there is **no change in the nominal exchange rate**

If nominal exchange rates and world prices remain unchanged, inflation causes a country's real exchange rate to appreciate

Scenario 3: How Nominal Depreciation Can Cancel the Effects of Inflation

Again, suppose:

- The local (Mexico) price of avocados per pound is 18 MXN
- The world price of premium coffee per pound is $10 USD

Again, if yesterday's nominal exchange rate was 18 MXN per 1 USD, then

- it would take 10 pounds of avocados to buy 1 pound of premium coffee

Now suppose, today, the **nominal exchange rate depreciates** to 30 MXN per 1 USD, and **at the same time inflation raises the price per pound of avocados** to 30 MXN, then

- it still takes 10 pounds of avocados to buy a pound of coffee

In this example, there is a **depreciation in the nominal exchange rate** of the MXN, but **no change in the real exchange rate**

If world prices remain unchanged, and a country's nominal exchange rate depreciates, and inflation raises prices at the same rate, then the real exchange rate is unchanged

Real Exchange Rate Formula

$h = H (Pf / Pd)$

h: Real Exchange Rate
H*: nominal exchange rate stated in units of domestic currency per units of foreign currency
Pd: domestic price level
Pf: foreign price level

When the real exchange rate (h) is expressed as in the formula above, a decrease in h indicates an appreciation of the domestic currency

*If the nominal exchange rate (H) is stated in units of foreign currency per units of domestic currency, then Pf and Pd in the formula need to be reversed

Real Exchange Rate as an Index

The RER is often expressed as an index relative to some base year

- Both the price levels and the RER are arbitrarily given the value of 100 for the base year

$h_t = 100 (H_t / H_0) (Pf_t / Pd_t)$

h: Real Exchange Rate
H*: nominal exchange rate stated in units of domestic currency per units of foreign currency
Pd: domestic price level
Pf: foreign price level
subscript 0: values in the base year
subscript t: values in some other year, t

When the real exchange rate (h) is expressed as in the formula above, a decrease in h indicates an appreciation of the domestic currency

*If the nominal exchange rate (H) is stated in units of foreign currency per units of domestic currency, then Pf and Pd in the formula need to be reversed

Example: Exchange Rate as an Index

Formula for Index:

$h_t = 100 (H_t / H_0) (Pf_t / Pd_t)$

Say, MXN is the domestic currency.

- MXN depreciates from 18 MXN per 1 USD in base year 0 to 30 MXN per 1 USD in year t
- The price level in Mexico rises from 100 to 120 (20% inflation) while the US price level does not change

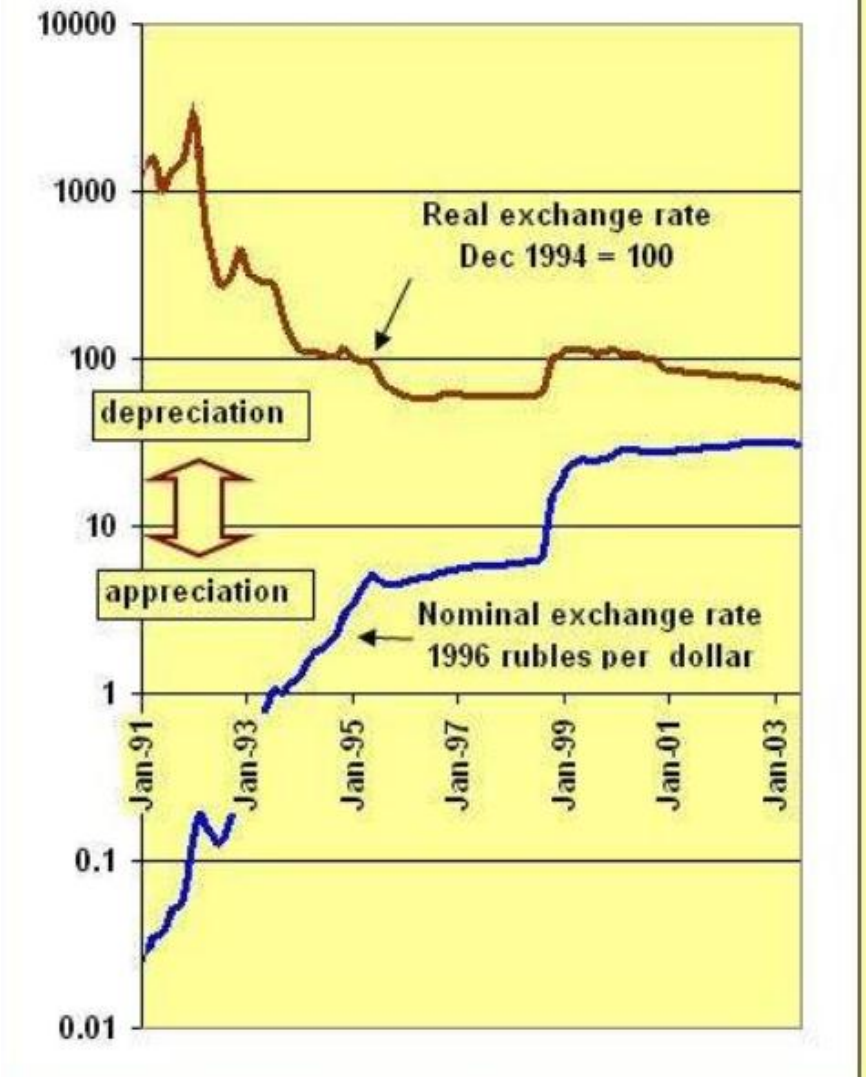
50 = 100 * (18 / 30) * (100 / 120)

Real Exchange Rate as an Index, Year t = **50**

RER Indexes are often graphed, showing year to year changes

- Be aware: When graphed, sometimes appreciation is shown in an upward line, sometimes it is shown downward.
- It depends on how the rate is expressed. For example:
  - 18 Mexican Pesos (MXN) per 1 US Dollar (USD), or
  - 06 USD per 1 MXN

Examples: Russia 1991-2003



- In 1992-1995, Russian inflation exceeded the rate of nominal depreciation relative to the dollar so the ruble *appreciated* in real terms
- In 1995-1998, nominal depreciation matched the rate of inflation so that the real rate was *constant*
- After 1998, the ruble depreciated about 400% in nominal terms while prices roughly doubled, so the ruble *depreciated* in real terms
- From 1999 to 2003, Russian inflation continued while the nominal exchange rate stabilized so the ruble again *appreciated* in real terms

Traded and Nontraded Goods

Traded Goods

- Prices are set in international markets
- Exports, imports
- Goods produced at home are close substitutes for imported goods
- Prices don’t vary much from country to country, except for factors like transportation and taxes

Non-traded Goods

- Education, financial services, healthcare, haircuts, other personal services, fresh food for local use
- Prices can vary widely from country to country

Appreciation, Depreciation and Relative Prices

When Country A's currency **appreciates** in real terms

- Its consumers can more easily afford to buy imported traded goods
- Prices of imported traded goods will fall relative to prices of domestic nontraded goods
- The currency of its trading partner, Country B, (the exporter) is **depreciated**

When Country B's currency **depreciates** in real terms

- It is harder for its consumers to afford to buy imported traded goods
- Prices of imported traded goods will rise relative to prices of domestic nontraded goods

"By devaluating its currency, China makes exports cheaper and gains a competitive advantage in the international markets. A weaker currency also makes China's imports costlier, thus spurring production of substitute products at home and so aiding domestic industry."
http://www.investopedia.com/articles/investing/012516/chinese-currency-devaluation-hits-global-economy.asp

How Exchange Rate Movements affect a Nation's Trading Relationships with other Nations

Summary with Example of China and US

- A depreciated currency (China) makes a country's exports cheaper and its imports more expensive, relative to its trading partner (US)
- An appreciated currency (US) makes a country's exports more expensive and imports cheaper, relative to its trading partner (China)
- A depreciated currency (China) can be expected to increase the country’s balance of trade
- An appreciated currency (US) can be expected to lower the country’s balance of trade