

International Finance 4832
Lecture 3: Exchange Rates in the Long Run - PPP and Monetary Model

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This Lecture: Exchange Rates

This lecture - Exchange Rates Fundamentals (Chapter 13)

1. Last lecture:

UIP, CIP : (interest rate) Parity Conditions based on financial asset prices

- ▶ CIP: with Forward ER → explains the forward rate
- ▶ UIP: with Spot ER → explains the spot rate

2. Now: Chapter 14

- ▶ Parity Conditions based on Goods Prices
- ▶ LOOP: Law of One Price → for single goods
- ▶ PPP: Purchasing Power Parity → for many goods

3. Later: Price levels and Monetary Approach to Exchange Rates in the long run (also Chp 14)

Law of One Price

LOOP: The price of an **identical good** in two countries should be the same when **expressed in a common currency**

Example: the dollar price of a coffee cup in US vs. the price, also in dollars, in the UK

If prices were not equal there could be arbitrage opportunities (in trading goods)

Let p_{us}^g : dollar price of good g in the US, p_{eu}^g : euro price of good g in France

$$\text{LOOP: } p_{us}^g = p_{eu}^g \times E_{\$/\epsilon}$$

If it does not hold: say $p_{us}^g > p_{eu}^g \times E_{\$/\epsilon} \implies$ Buy in US and Sell in EU
(i.e. not an equilibrium yet, there is more trade and prices chances)

Should this hold for every good? \rightarrow Not really, we need **several assumptions**:

Good should be Tradable, transportation costs low, market for the good is competitive (no monopoly or market power), market for good is not too regulated (e.g., patents in pharmaceutical companies)

i.e., we need this good's market to be relatively "frictionless"

Law of One Price: Most Famous Application, the Big Mac Index

The Economist calculates the Big Mac Index: compare the LOOP implied price of a big mac with the actual price to gauge whether the actual ER is over/under valued

Why Big Mac? → because the assumptions hold relatively well (very simple good)

Now we can compare the ER implied by the LOOP vs the actual one

LOOP Implied FX rate is $E_{F/\$} = P_{foreign} / P_{us}$

Then (Over/Under) Valuation = (Implied ER/Actual ER) – 1

If the valuation is negative then the ER is undervalued (actual ER should be lower)

	local currency price	fx rate (fx/\$)	dollar price	implied fx rate	over/under valuation
United State	4.9	1.00	4.93		
Argentina	33.0	13.81	2.39	6.69	-52.0
China	17.6	6.56	2.68	3.57	-46.0
Norway	46.8	8.97	5.21	9.49	??

e.g., for China, $E_{ch/\$} = 17.6/4.9 = 3.57 \implies$ Yuan is undervalued (actual is 6.56 yuan per dollar)

Purchasing Power Parity

Generalization of LOOP to a basket (bundle) of Goods

More interesting as we measure inflation in terms of a consumption basket

The parity refers to the **same basket** in both locations

Let: P_{us} : dollar price of basket of goods in US, P_{eu} : euro price of basket of goods in EU

$$\text{PPP:} \quad P_{us} = P_{eu} \times E_{\$/\epsilon}$$

This is the Absolute PPP: Absolute because is expressed in terms of Prices Levels
(relative will refer to inflation or growth rates)

If the LOOP holds for each good in the basket the PPP holds

(if LOOP does not hold for some goods the PPP may still hold though, PPP averages prices)

Relative PPP

Relative Purchasing Power Parity: PPP in growth rates

Prices growth rates: inflation; ER growth rate: depreciation

Now we must keep track of the timing (to measure the growth)

$$\text{For } t+1: \quad P_{us,t+1} = P_{eu,t+1} \times E_{\$/\epsilon,t+1}$$

$$\text{For } t: \quad P_{us,t} = P_{eu,t} \times E_{\$/\epsilon,t}$$

Then (one expression divided by the other):

$$\frac{P_{us,t+1}}{P_{us,t}} = \frac{P_{eu,t+1}}{P_{eu,t}} \times \frac{E_{\$/\epsilon,t+1}}{E_{\$/\epsilon,t}}$$

Now, apply logs, or notice that $\frac{P_{us,t+1}}{P_{us,t}} = 1 + \pi_{us}$, also, let the depreciation rate be $d_{\$/\epsilon}$.

The expression above is then: $(1 + \pi_{us}) = (1 + \pi_{eu})(1 + d_{\$/\epsilon})$

$$\text{then: } \pi_{us} = \pi_{eu} + d_{\$/\epsilon,t}$$

That is, the depreciation is given by the differential in inflation rates:

$$\pi_{us} - \pi_{eu} = d_{\$/\epsilon,t}$$

Relative PPP (cont)

Relative PPP: If inflation is higher at home the home currency **depreciates**

This is intuitive: the home currency is less valuable now (can buy fewer goods)

$$[\text{Relative PPP}] : \quad \pi_{us} - \pi_{eu} = d_{\$/\epsilon, t}$$

in other words: ER grows according to the Inflation differentials across locations

Example: $\pi_{us,t} = 4\%$ and $\pi_{mx,t} = 1.5\%$

Then: $4\% - 1.5\% = 2.5\%$... the Dollar depreciates and the Peso appreciates

Example 2: $\pi_{us,t} = 4\%$ and $\pi_{tk,t} = 10\%$

What happens to the US dollar and to the lira?

Relative PPP: Predictions

Prediction made by the Relative PPP:

- ▶ For countries with higher inflation → the (home) currency depreciates
- ▶ For countries with lower inflation → the currency appreciates

$$\pi_{us} - \pi_{eu} = d_{\$/\epsilon, t}$$

PPP: Evidence

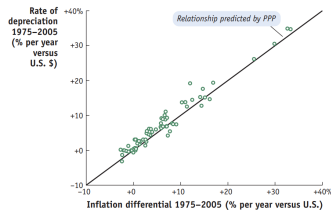
How to tell whether the Relative PPP holds in the data?

Plot each side of the main equation:

$$\pi_{US} - \pi_{EU} = d_{\$/\epsilon, t}$$

If the Relative PPP holds, the data points should lie on a 45-degree line (as each side of the equation is supposed to be equal to the other)

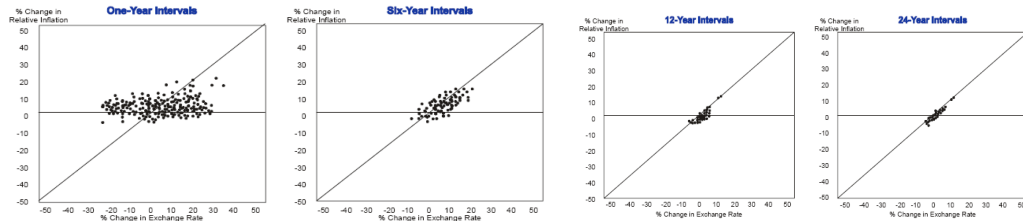
Figure: Inflation differentials and ER 1975-2005



Does it always work?

No, the **PPP holds relatively well in the Long Run** (when prices are able to adjust) but is not a good approximation for the Short Run

Figure: Inflation differentials at different horizons



Summary

Law of One Price:

- ▶ Individual goods should have the same price in different locations (in same currency)
- ▶ Holds for some goods, not for others
- ▶ depends on how tradable the good is (and other market assumptions)

Purchasing Power Parity (PPP):

- ▶ Works well in the Long Run (long horizons)
- ▶ Adjustment of Prices is slow (sticky prices)
- ▶ Half life of prices gap: Around 4 years \implies does not work for Short Horizons

In the long run: Inflation Differentials determine the Exchange Rates

We'll see next what determine the Prices (inflation) differentials

(for that we must think about money and monetary policy)