

## Issues in International Finance

### *Exchange rates in the long run: PPP*

UW – Madison // Fall 2018

## Roadmap

- ▶ Where we have been
  - ▶ Asset price (interest rate) parity conditions
- ▶ Currently (*Exchange Rates I*)
  - ▶ Goods price parity conditions
    - ▶ Law of one price
    - ▶ Purchasing power parity
- ▶ Coming up: Price levels, exchange rates and money
  - ▶ Read: *Exchange Rates I* (Chapter 14 or Chapter 3 )

## The law of one price

- ▶ The price of an **identical good** in two countries should be equal when **expressed in a common currency**

- ▶  $p_{us}^g$  = dollar price of good  $g$  in US

- ▶  $p_{eu}^g$  = euro price of good  $g$  in EU

$$p_{us}^g = p_{eu}^g \times E_{\frac{\$}{\text{€}}}$$

- ▶ What happens if this doesn't hold?
  
- ▶ Should this hold for every good you can think of?

## The law of one price: Big Macs

- ▶ The Economist magazine's Big Mac index (Jan 2016)

	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	??

- ▶ The implied fx rate is  $E_{F/\$} = p_F/p_{US}$
- ▶ Under/over valued is implied rate / actual rate -1
- ▶ More here: [https:](https://www.economist.com/news/2018/07/11/the-big-mac-index)

[//www.economist.com/news/2018/07/11/the-big-mac-index](https://www.economist.com/news/2018/07/11/the-big-mac-index)

## Purchasing power parity

- ▶ Generalize the law of one price to a basket of goods
- ▶  $P_{us}$  = dollar price of basket of goods in US
- ▶  $P_{eu}$  = euro price of basket of goods in EU
- ▶ Absolute purchasing power parity (PPP) condition

$$P_{us} = P_{eu} \times E_{\frac{\$}{\text{€}}}$$

- ▶ Absolute means “in levels” compared to in growth rates
- ▶ If the law of one price holds for each good in the basket, then PPP holds
- ▶ IF LOOP does not hold for some goods, PPP may still hold: PPP is a statement about average prices

## Relative PPP

---

- ▶ PPP in growth rates is called relative purchasing power parity

$$P_{us,t+1} = P_{eu,t+1} \times E_{\frac{\$}{\text{€}},t+1}$$

$$P_{us,t} = P_{eu,t} \times E_{\frac{\$}{\text{€}},t}$$

$$\frac{P_{us,t+1}}{P_{us,t}} = \frac{P_{eu,t+1}}{P_{eu,t}} \times \frac{E_{\frac{\$}{\text{€}},t+1}}{E_{\frac{\$}{\text{€}},t}}$$

- ▶ Same In math as before... what is the growth rate of the price level called?

$$\pi_{us,t} = \pi_{eu,t} + d_{\frac{\$}{\text{€}},t}$$

$$\pi_{us,t} - \pi_{eu,t} = d_{\frac{\$}{\text{€}},t}$$

## Relative PPP

---

- ▶ Relative PPP connects inflation rates to currency depreciation rates

$$\pi_{us,t} - \pi_{eu,t} = d_{\frac{\$}{\text{€}},t}$$

- ▶ Suppose  $\pi_{us,t} = 4\%$  and  $\pi_{mx,t} = 1.5\%$
- ▶ What is happening to the dollar? (and the peso)
  
- ▶ Suppose  $\pi_{us,t} = 4\%$  and  $\pi_{tk,t} = 10\%$
- ▶ What is happening to the dollar? (and the lira)

## Relative PPP

---

- ▶ Relative PPP predicts:
- ▶ Countries with higher inflation rates have depreciating currencies
- ▶ Countries with lower inflation rates have appreciating currencies

$$\pi_{us,t} - \pi_{eu,t} = d_{\frac{\$}{\text{€}},t}$$



## Relative PPP: Evidence

---

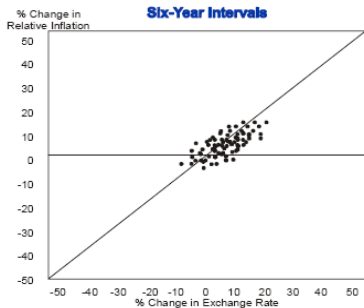
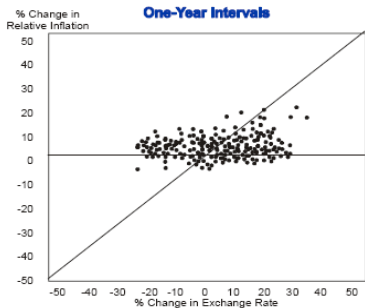
- ▶ How well does RPPP work?
- ▶ Plot the left and right hand side of

$$\pi_{us,t} - \pi_{eu,t} = d_{\frac{\$}{\text{€}},t}$$

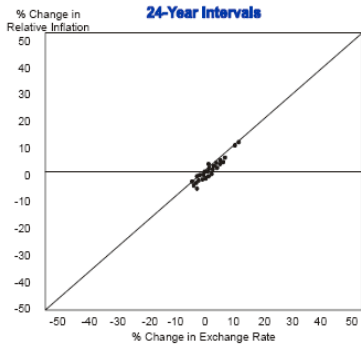
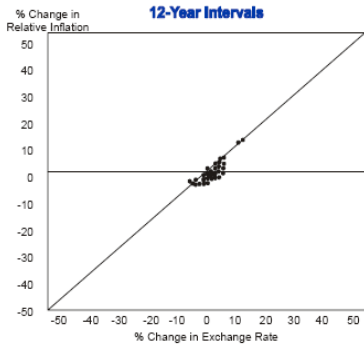
- ▶ if RPPP holds, should be on 45-degree line

# Relative PPP

## The Impact of Relative Inflation Rates on Exchange Rates Over Different Time Horizons



## Relative PPP



## Summary

- ▶ Law of one price
  - ▶ Works well for some goods, not for others
  - ▶ Depends on how “tradable” the good
- ▶ Purchasing power parity
  - ▶ Works well over long time horizons
  - ▶ Adjustment is slow
  - ▶ Takes about 4 years to close the gap half way
  - ▶ Does not work well over short horizons
- ▶ In the long run, inflation differentials determine exchange rates
- ▶ What determines inflation differentials?
  - ▶ Money. That’s up next.