International Parity Conditions

Fall 2013

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Introduction

- The costs should be the same for buying and selling goods, services and financial assets in different countries when converted to a common currency.
 - For example, the price of an orange in Detroit should be the same as in Windsor when quoted in either US or Canadian dollars.

This forms the basis for the fundamental parity conditions used to link financial markets.

Parity Conditions

We will build on this intuition to develop the following international parity conditions:

- (1) Purchasing Power Parity (PPP)
- (2) Uncovered Interest Rate Parity (UIP)
- (3) Covered Interest Rate Parity (CIP)
- (4) Expectations Theory
- The most intuitive and frequently talked about is Purchasing Power Parity.

Purchasing Power Parity (PPP)

- It is based on the "Law of One Price":
 - in the long run the exchange rate should move to equalize the price of an identical basket of goods and services across countries.

Price_{Domestic} = Exchange Rate_{Dom Cur /For Cur} • Price_{Foreign} Or Price_{Canadian dollars} = Exchange Rate_{CAD/MXN} • Price_{Mexican Pesos}

MacParity: Price of a Big Mac (in US dollars)

| | Local Currency | US dollars |
|---------------|-------------------|------------|
| Switzerland | SFr6.5 | 6.72 |
| Sweden | SKr41.61 | 6.16 |
| Canada | C\$5.53 | 5.26 |
| Euro area | € 3.62 | 4.66 |
| Australia | A\$5.04 | 4.62 |
| United States | 4.56 | 4.56 |
| New Zealand | NZ\$5.50 | 4.30 |
| Britain | £2.69 | 4.02 |
| South Korea | Won 3,900 | 3.43 |
| Japan | ¥320 | 3.20 |
| Mexico | Peso 37 | 2.86 |
| Poland | Zloty 9.2 | 2.73 |
| Russia | Rouble 87 | 2.64 |
| China | RMB16 | 2.61 |
| Hong Kong | HK\$ 17 | 2.19 |



Source: *The Economist* July 2013



MacGDParity?

Our new improved recipe

Big Mac prices v GDP per person, July 2011







*At market exchange rate (July 25th) [†]Average of member countries [‡]Average of four cities [§]Maharaja Mac



Source: The Economist July 28, 2011

MacParity: Minutes to Earn a Big Mac





Source: *The Economist* August 20, 2009

MacParity:Over time



Source: *The Economist* August 20, 2009

Historic hamburgers

Big Mac index, local currency under(-)/over (+) valuation against the dollar, %



Global iPad shipments

Apple has sold a million iPads in the U.S. since its April 3 debut, exceeding even the most bullish pre-launch estimates. Demand was so heavy the company had to delay the international rollout by a month.

ESTIMATED SHIPMENT

Apple is expected to ship 8.1 million iPads in 2010. In thousands of units



CARRIE COCKBURN/THE GLOBE AND MAIL # SOURCE: REUTERS; RBC CAPITAL MARKETS



IPAD PRICES

16 GB WiFi-only model, in U.S. dollars

| Britain | \$617 | |
|-------------|-------|--|
| Germany | \$607 | |
| France | \$607 | |
| Italy | \$607 | |
| Spain | \$583 | |
| Switzerland | \$560 | |
| Japan | \$543 | |
| Australia | \$518 | |
| Canada | \$514 | |
| U.S. | \$499 | |
| | | |

* Launched May 28 ** To launch in July



Coffee with that Burger?

Our hot tips

Local currency under (-)/over (+) valuation against the dollar, %, using:

| | Starbucks tall-latte index | McDonald's Big Mac index |
|--------------------|-------------------------------|-----------------------------|
| Australia | -4 | -17 |
| Britain | +17 | +23 |
| Canada | -16 | -16 |
| China | -1 | -56 |
| Euro area | +33 | +24 |
| Hong Kong | +15 | -45 |
| Japan | +13 | -12 |
| Malaysia | -25 | -53 |
| Mexico | -15 | -21 |
| New Zealand | -12 | -4 |
| Singapore | +2 | -31 |
| South Korea | +6 | 0 |
| Switzerland | +62 | +82 |
| Taiwan | -5 | -21 |
| Thailand | -31 | -46 |
| Turkey | +6 | +5 |
| Source: The Econom | ist | |



Relative PPP

- In terms of *changes* in prices, we would expect the law of one price to continue to hold.
 - Any change in the inflation rates between countries will be offset, over the long run, by an equal and opposite change in the spot exchange rate.

Formally:

- % change in=% change in-% change inexchange ratedomestic pricesforeign prices
- Does this make sense?



The Verdict on PPP

- PPP is a poor guide to estimating the *short run* behaviour of exchange rates, but it has some usefulness for predicting where exchange rates should be in the long run.
 - Why?
- What does this mean for managers?
 - In the short-run?
 - In the long-run?





In London (UK) you are quoted:

One year Euro-dollar Interest Rate: 6%

One year Euro-Yen Interest Rate: 3%





Where Would You Invest? (cont'd)

- If investors are rational, it should not matter! (Why?)
- Assume the current spot exchange rate is 102 Yen/USD.
- The 6% Eurodollar rate means \$1US today is worth \$1.06US in a year.
- If we wanted to invest in Yen today, \$1 US could be converted to 102 Yen. Investing at the Euro-yen interest rate this would be worth 105.6 Yen in one year.
- For these investments to be equal, it must be that we are expecting the exchange rate in one year to be such that 105.6 Yen = \$1.06US, so the Yen/USD exchange rate should be 99.1 Yen/USD in one year.

Uncovered Interest Rate Parity

• Formally, this is:

$$\frac{(1+R_{CAD, t})}{(1+R_{US, t})} = \frac{E_t[S_{CAD/USD, T}]}{S_{CAD/USD, t}}$$

This is called "Uncovered Interest Parity".

• We can use this relationship to determine where we expect exchange rates to be in the future:

$$E_{t}[S_{CAD/USD,T}] = S_{CAD/USD,t}[(1+R_{CAD,t})/(1+R_{US,t})]$$



Where Would You Invest: Part II

- What if you could lock in the exchange rate you would be facing in one year? Would this change anything?
- Investing one Canadian dollar in Canada or in the U.S. should yield the same return.
- Assume: $R_{CDN} = 4.25\%$, $R_{US} = 5\%$, spot rate 0.85 USD/CAD
 - Invest \$100CAD in Canada:
 - (1.0425 x \$100CAD) = \$104.25CAD
 - Or, you can invest \$100CAD in US dollars:
 - (\$100CAD x 0.85USD/CAD) x (1.05) = \$89.25US
- These should be worth the same amount in 1 year (why?)



Where Would You Invest: Part II

- If you can lock in an exchange rate for 1 year it should be:
 89.25USD/104.25CAD = 0.8561USD/CAD.
- This relationship is called "Covered Interest Rate Parity".

$$F_{USD/CAD, t} = S_{USD/CAD, t} \frac{(1+R_{US, t})}{(1+R_{CAD, t})}$$

 \succ This is how the forward rate is determined.



Covered Interest Rate Parity: Example



Expectations Theory



"forward rates are 'unbiased' expectations of future spot rates"

note this implies that: $E[S_{CAD/USD}] = F_{CAD/USD}$

Note this is because both are equal to: $\frac{(1+R_{USD})}{(1+R_{CAD})}$

Predicting Future Spot Exchange Rates

- What would we do if we wanted to estimate the exchange rate in 60 days?
 - What does PPP tell us?
 - What does Uncovered Interest Rate Parity tell us?
 - What does Covered Interest Rate Parity tell us?
- \rightarrow A natural forecast is the 60 day forward rate.