Chap. 4 (b) Parity Conditions and Currency Forecasting

- Forecasts based on the Law of One Price.
- The Big Mac Index
- Forecasts based on Relative Purchasing Power Parity.
- Inflation and the Real Rate of Interest
- The original Fisher Effect.
- The International Fisher Effect.

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The Law of One Price

- This is the assumption that identical goods sell for the same price worldwide.
- Suppose gold trades in NYC at $300/oz. and in London at $310/oz.
- Where will people trade their gold?
- The New York market would mostly attract buyers, while the London market would mostly attract sellers.
- Also, arbitrage would occur: trades could “short-sell” gold in London, and simultaneously buy gold in NYC.
- Gold prices in the two markets should soon equalize.

The Law of One Price and Purchasing Power Parity

- Purchasing power parity is often interpreted as, starting with a set amount of dollars, converting those dollars into another currency buys the same “market basket of goods” in the foreign country that it would in the U.S.A.
- This is the really just the law one price.
- However we will find that this “law” is true only in a very limited sense.

Violations of the Law of One Price

- Haircuts
- Taxi rides
- Restaurant Meals (Big Macs)
- Apartments
- Cement Blocks?
- Agricultural Products (most countries have protectionist policies).

Violations of the Law of One Price

- Law of one price does not hold for nontradable goods even within the United States!
- Rents in New York City vs Lochapoka, AL
- Big Macs in Alaska vs. Auburn
- Big factors: shipping considerations, perishability.
Purchasing Power Parity

• **In this text and this course** we will assume that the **strict PPP** only holds for tradable goods and **not for nontradable goods** that, say, a tourist pays for: rents, meals, transportation, personal services, etc.
• The strict PPP is sometimes called **absolute PPP**

Purchasing Power Parity

• (1) **Absolute PPP**: Prices should be about the same in different countries (at current exchange rates)
  • or a “market basket” of goods **should cost the same everywhere** in, say, dollar terms.
• (2) **Relative PPP**: Differences between countries’ price levels should be constant over time
  • or any **differences** in the cost of a “market basket”, between countries, **should persist** over time in, say, dollar terms.

Relative Purchasing Power Parity

• **The text refers to RPPP as just PPP**
• Based on converting Swiss francs & Pesos to some common currency (e.g. the $): if the cost of living in Switzerland is twice as expensive as Mexico today, then **RPPP says** Switzerland will be twice as expensive **next year**.
• **Relative PPP does not predict any convergence in the cost of living between two countries.**
• In fact it assumes there will be no convergence!

Forecasting with Absolute PPP

• The law of one price **extended to a market basket of goods** (including a Big Mac for lunch after shopping). **Absolute PPP** says the currency with the cheaper goods should appreciate or the the currency with the more expensive goods and services should depreciate.
• **The Economist’s Big Mac Index** is attempting to forecast future exchange rates based on the cost of the Big Mac.
• The magazine appears to assuming that **Absolute PPP** is valid for nontradable goods.

Forecasting with Absolute PPP

• **The Law of One Price**, using the the Big Mac Index, **predicts that the CHF will fall and the Argentine Peso will rise**.
• We will find that **Relative PPP** predicts the opposite.
  • Switzerland, like NYC, has been expensive for a long time and will probably remain so.
  • The Economist is ignoring Argentina’s inflation and political turmoil.
  • The Argentine Peso may fall further as **the weak government prints too many pesos**.

Forecasting with (Relative) PPP

• **RPPP says the currency with the higher inflation rate is expected to depreciate** relative to the currency with the lower rate of inflation.
• **Domestic inflation**: Remember, high inflation means a currency is losing local purchasing power.
  • It is not unreasonable to assume that the same currency will also lose purchasing power on overseas goods and services.
  • With PPP, this loss of overseas purchasing power is through a drop in the currency’s exchange rate.
### Forecasting with (Relative) PPP

- Suppose Mexico has 10% inflation next year. It now costs ten percent more pesos to buy Mexican cars, food, vacations, etc.
- Also, suppose the U.S. has no inflation, so cars, etc. still cost the same in the U.S. (in terms of the USD).
- If the exchange remains fixed, American consumers will now want to want U.S. goods and services over Mexican goods and services (which are now more expensive).
- Mexicans will want more American products and these still sell at the old peso price.
- Thus more demand for the USD, less demand for the peso. The price of the peso should fall until?....

### Forecasting with (Relative) PPP

- Suppose the peso is currently worth $0.10 ($e_0 = 0.10$)
- In Mexican terms, the USD ‘costs’ ten pesos.
- If Mexico’s 10% inflation extends to foreign currency, then the USD should rise in cost to 11 pesos.
- The new spot rate (in American terms) will fall to $1USD/Peso = 0.099$.
- $e_1 = e_0 (1 + i_h)/(1 + i_f)$ or $e_1 = e_0 (1 + .02)/(1 + .10) = 0.091$.
- Exhibit 4.5 shows a relationship between changes in exchange rates and relative inflation rates. Yen: lowest inflation, held value best.

### Forecasting with Relative PPP

- The general version for “t” periods is $e_t = e_0 (1 + i_h)^t/(1 + i_f)$.
- In the previous example, if the Peso is worth ten cents today, we would estimate that the peso would be worth $0.10(1.02)/(1.10) = 0.0927$ in one year.
- $0.10(1.02)^2/(1.10)^2 = 0.0856$ in two years.
- $0.10(1.02)^3/(1.10)^3 = 0.0797$ in three years.

### PPP: Real Exchange Rates

- PPP is based on the assumption that real exchange rates ($e_i$) stay the same.
- That is, the barter exchange rate of goods stays the same between countries, so exchange rates adjust to differences in inflation.
- $e_i = e_0 (1 + i_h)/(1 + i_f)$ is constant.
- This property is usually violated in the short run but appears to hold up in the long run.
PPP: Real Exchange Rates

- It is important that you understand, at least intuitively, the logic of these three outcomes.
- Again, real exchange rates are rarely constant in the short run but appears to be steady in the long run.
- Look at the 9 graphs in Exhibit 4.6: the dark steady lines represent a constant real (inflation-adjusted) exchange rate.
- The blue, wiggly lines are the actual rates.
- The real rate acts like a ‘magnet’ for the actual exchange rate.

Inflation and “Real” Interest Rates

- We often make a distinction between the normal everyday contract rate of interest, and the interest rate that is adjusted for any loss of purchasing power caused by inflation.
- The everyday contract rate is called the nominal interest rate, denoted in the text as “r”.
- The rate adjusted to any reflect loss of purchasing power is the real rate, denoted in textbook as “a”.
- Irving Fisher popularized the use of the real rate and thus the relationship was named after him.

Inflation and “Real” Rates

- A simple version of this “Fisher Effect” is \( a = r - i \), where \( a \) is the expected real rate, \( r \) is the nominal rate, and \( i \) is expected inflation.
- Under current conditions this would be: the T-bond YTM is 3.9%, inflation is expected to be 1.5%, therefore the expected real rate on the T-bond is 2.4%.
- Note: the real rate is usually the residual of the nominal rate and inflation. That is, you start with some nominal rate and inflation and compute the real rate.

Inflation and “Real” Rates

- The T-bill rate is more like 1.7%, so the real T-bill rate is expected to be 0.2%.
- Note that each nominal rate has its own corresponding real rate.
- There is, however, an interaction effect that is reflected in the full, more correct formula:
  \[
  (1+a) = (1 + r)/(1 + i)
  \]
  or \( (1+r) = (1 + a)(1 + i) = 1 + a + i + a*i \)
  \[
  r = a + i + a*i
  \]
  where \( a*i \) is similar to compounding between \( i \) and \( a \).

Inflation and “Real” Rates

- Example: Suppose we expect Russia to have 100% inflation next year and we want an investment that will increase our purchasing power by 5% (the real return).
- What nominal rate does a Russian bank need to offer you?
  \[
  (1+r) = (1 + a)(1 + i)
  \]
  \[
  r = (1 + a)(1 + i) -1
  \]
  \[
  r= (1 + .05)(1 + 1.00) - 1 = 2.10 - 1 = 1.10
  \]
  \[
  = 110%
  \]
  You need
  - 100% to buy what you bought last year,
  - 5% to buy 5% more goods, and
  - another 5% to pay for the 100% inflation on the extra goods.
Inflation and “Real” Rates

- The Fisher Effect says that the real rate is somewhat steady over time: at least steadier than the nominal rate. We find that most of the changes in interest rates can be explained by changes in inflation.
- In the U.S. the real T-bill rate has historically averaged about one percent.
- Lower real rates, seen during slow economic times, encourage people to borrow, but can lead to inflation.
- Higher real rates should encourage saving, and thus reduce inflation.

The International Fisher Effect (IFE)

- A syllogism: all men are mortal. Socrates is a man. Therefore Socrates is mortal.
- The inflation rate differential between two countries predicts the future exchange rate. (PPP)
- The differences in nominal interest rates reflect the expected inflation rate differential between two countries (Fisher Effect).
- Therefore, differences in nominal interest rates predict future exchange rates. (International Fisher Effect: IFE)

The International Fisher Effect (IFE)

- IFE requires both PPP and FE
- Another way of stating IFE is we assume that PPP holds and that the real rate “a” is the same in all countries.
- Thus, we have two questionable assumptions: PPP is true and real rates are the same everywhere.
- We know PPP doesn’t hold in the short-term.
- Exhibit 4.8 Shows the relationship between the level of inflation and the level of nominal rates in various countries.

Forecasting With the IFE

- The IFE says the currency with the higher interest rate is expected to depreciate relative to the currency with the lower rate of interest.
- A simple (rule-of-thumb) version of the IFE is
  \[ \frac{e_1 - e_0}{e_0} = r_h - r_f \]
  where \( e_1 \) = expected future spot rate, \( e_0 \) = spot rate, \( r_h \) = home interest rate, and \( r_f \) = foreign interest rate. Uncertainties are represented by italics.

Forecasting With the IFE

- The more accurate version of the IFE for the one-period spot rate is
  \[ e_1 = e_0 \left(1 + r_h\right) / \left(1 + r_f\right) \]
  or
  \[ \frac{e_1}{e_0} - 1 = \frac{1 + r_h}{1 + r_f} - 1 \]
  where
  - \( e_1 - e_0 \) is the percent change
  - The Mexican view: the dollar appreciates by \( \frac{1.19}{1.05} - 1 = 0.0980 = 13.33\% \).

Forecasting With the IFE

- E.g., if you see that Mexico has 19% interest and the U.S. only 5%, the difference is what you expect the Peso to depreciate by: 14%.
- Note that reversing the home currency means that Mexicans would expect the Dollar to appreciate by 14%!
PPP and IFE

- To see why IFE is a combination of Fe and PPP replace $(1 + r)$ below with $(1 + a)(1 + i)$
- $e_1 = e_0 (1 + r_h)/(1 + r_f)$
- $e_1 = e_0 (1 + a)(1 + i_h)/(1 + a)(1 + i_f)$
- canceling the $(1 + a)$ we get
- $e_1 = e_0 (1 + i_h)/(1 + i_f)$

Forecasting with the IFE

- The general version for “t” periods is
  - $e_t = e_0 (1 + r_h)^t/(1 + r_f)^t$ or
  - $e_t/e_0 - 1 = (1 + r_h)^t/(1 + r_f)^t - 1$
- In the previous example, if the Peso was worth ten cents today, we would estimate that the peso would be worth
  - $0.10(1.05)/(1.19) = 0.08824$ in one year
  - $0.10(1.05)^2/(1.19)^2 = 0.07785$ in two years
  - $0.10(1.05)^3/(1.19)^3 = 0.06870$ in three years

Forecasting with the IFE

- Note: the future spot rate predicted by IFE is lower than the rate predicted by PPP. This was of course a function of the examples’ choices of values for “r” and “i”. However, we normally find that real rates tend to be higher in LDCs like Mexico and Brazil, where the political risk and the chances of currency controls, poor financial policies is thought to be higher than in developed countries.
- This means that IFE-based predictions for the Peso and Real will be lower than PPP-based predictions.

Forecasting with the IFE

- Another source of violation of the same real rate assumption is monetary policy. If the local central bank is “fighting” an overheating economy (Mexico?), real rates may tend to be higher than the usual. Rates would be lower if the central bank was dealing with a sluggish economy (Japan and Switzerland).
- Exhibit 4.10 demonstrates how the constant “a” assumption is violated for less stable nations.
- “According to this exhibit, countries with higher nominal rates (‘r’) (implying higher expected inflation and greater currency risk) tend to have higher real interest rates (‘a’).” - from the text on page 135.