IFM 2014 Lecture 3

Uncovered interest parity and flex-price monetary models of the exchange rate

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Outline of lecture

Lecture 3

- Uncovered interest parity (UIP)
- Intorduction to monetary models of exchange rates
- The flex-price monetary model of the exchange rate
- Implications of the flex-price monetary model

Uncovered interest parity

- UIP is a theory about interest rates that relies on **bond market arbitrage**

- More specifically, UIP states that

$$\boxed{i = i^* + \frac{\Delta S^e}{S}}$$

where

$$i = \text{nominal interest rate on domestic bonds}$$

$$i^* = \text{nominal interest rate on foreign bonds}$$

$$\frac{\Delta S^e}{S} = \text{expected rate of depreciation of the home currency}$$

- That is, $\boxed{i = i^* + \text{Expected capital gain on } S}$

Uncovered interest parity

- The UIP formulas on the previous slide state that the return on home bonds is equal to the expected return on foreign bonds
- The latter includes the **expected** capital gain (or loss) on the exchange rate because exchange rates are **uncertain**
- An expected depreciation in the exchange rate is an expected capital gain from holding foreign bonds. An expected appreciation is an expected capital loss.
- Because it makes good economic sense for returns to be equalised across bonds, many models of exchange rates include UIP as one of the equations that must hold

UIP: a UK-China example

- Suppose Chinese interest rates are 4% and UK interest rates are 0.5%
- That is, $0.5\% = 4\% + \frac{\Delta S^e}{S} \Longrightarrow \frac{\Delta S^e}{S} = -3.5\%$
- So UK investors will be indifferent between home bonds and Chinese bonds if the Pound is expected to strengthen against the Yuan by 3.5% over the next year
- This is because they will receive 4% on Chinese bonds in a year's time, but this is expected to be worth less in terms of Pounds
- Investors expect to 'lose' 3.5% when they convert Yuan back into Pounds to spend their return in the UK

UIP assumptions

- Several assumptions are required for UIP to hold
  1. Perfect mobility of capital
  2. Bonds are not risky – i and i^* known with certainty
  3. Home and foreign bonds are viewed by investors as *perfect substitutes*
- Assumption 1 ensures that there is unrestricted **arbitrage**
- Assumptions 2 and 3 ensure that investors see home and foreign bonds as **identical**
- Monetary models with UIP are making assumptions 1, 2, 3

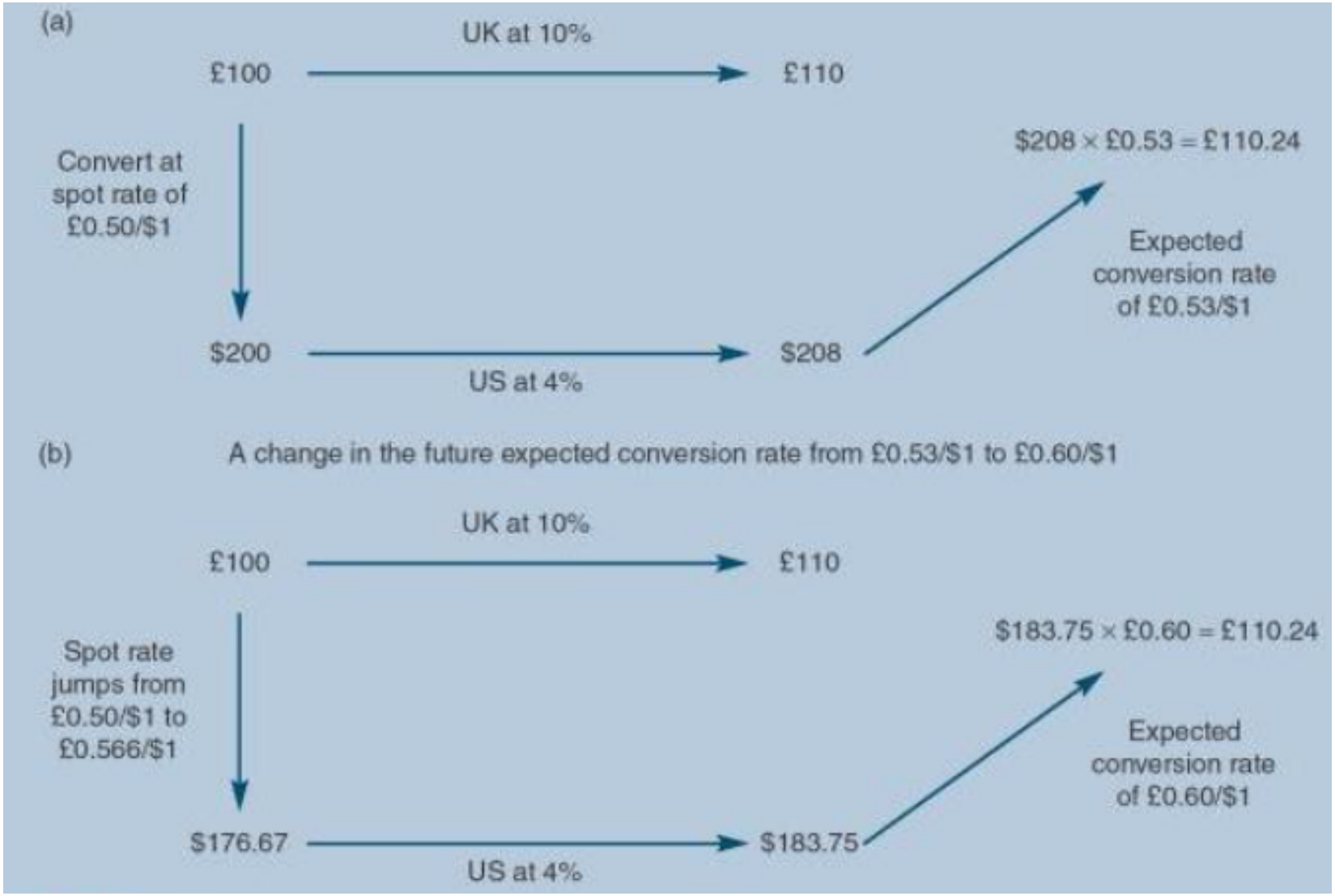
UIP and expectations

- The UIP condition implies future expectatations about exchange rates can have a significant impact on the current spot rate S
- We can see this by rearranging the UIP condition for S:

$$\boxed{S = \frac{\Delta S^e}{i - i^*}}$$

- Pilbeam Box 7.1 gives an excellent discussion of the impact of changes in exchange rate expectations on the spot rate
- UIP is an 'asset approach' to exchange rates because it recognises the importance of expectations about the future for exchange rates today

UIP and expectations (Pilbeam Box 7.1)



Intro to monetary models of exchange rates

- In monetary models of exchange rates money supply and money demand are important determinants of exchange rate movements
- The UIP condition is assumed to hold – ie this is a separate equation in the model
- Some of the models have perfectly flexible prices, but others have 'sticky' prices
- In monetary models with flexible prices, PPP will hold at all points in time – ie short run and long run. But in models with sticky prices, PPP will hold only in the long run.

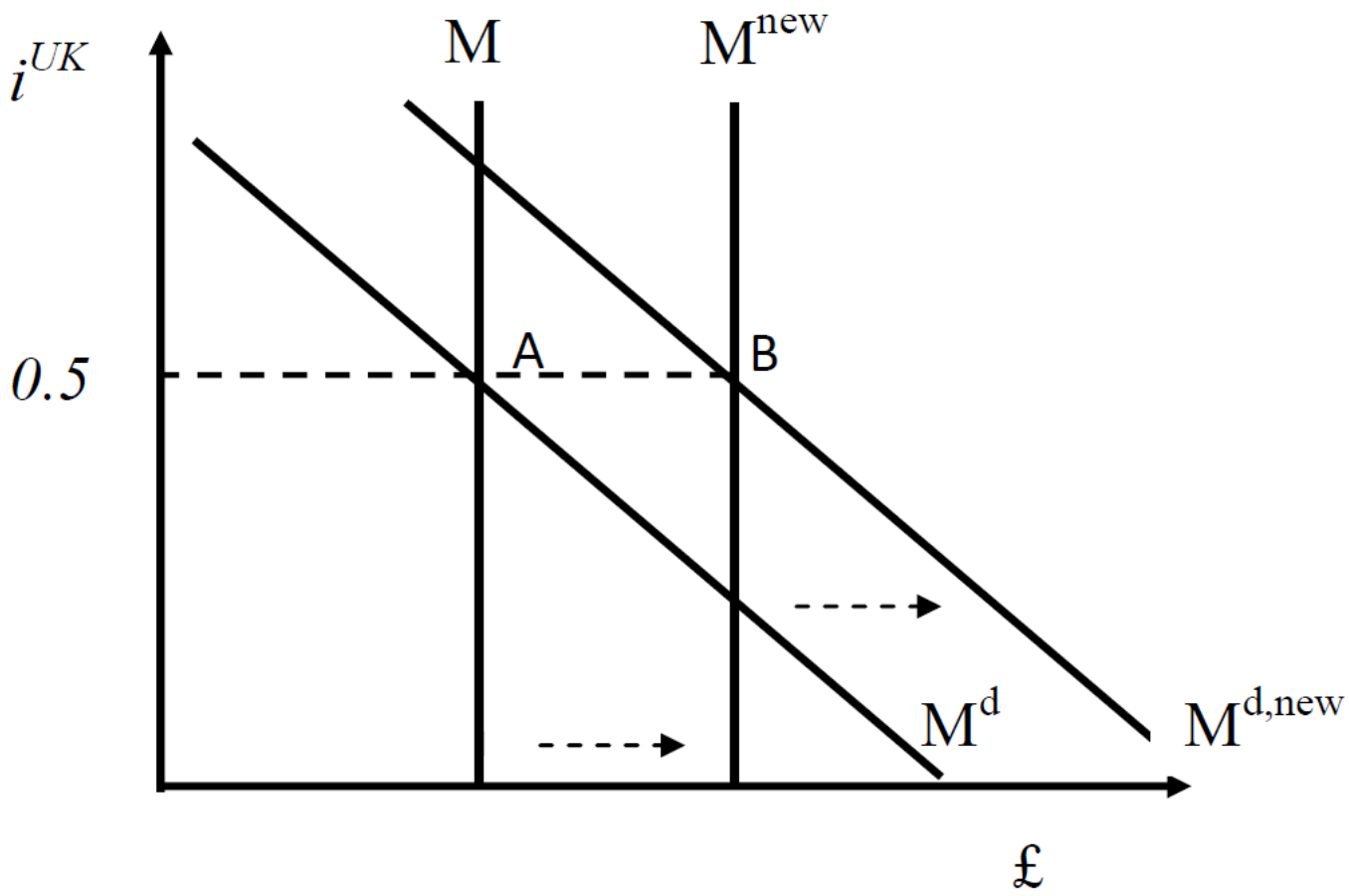
Intro to monetary models of exchange rates

- All monetary models start from a definition of money demand
- Money demand is negatively related to interest rates – the **opportunity cost** of holding money
- Since money supply and money demand must be equal in equilibrium, interest rates can be related back to the money supply
- Since interest rates affect exchange rates by UIP, the exchange rate will depend upon the money supply

Monetary example: BoE

- Suppose the Bank of England wishes to maintain interest rates at 0.5% well into the recovery
- As the economy recovers, the demand for money will rise because households will wish to carry out more transactions
- The BoE will therefore have to increase money supply in pace with money demand in order to keep interest rates at 0.5%
- If it doesn't do this, the likely outcome is that interest rates will rise
- Monetary models of exchange rates are consistent with these predictions

Monetary example: BoE



- M = money supply and M^d = money demand

The flex-price monetary model of the exchange rate

- The flex-price monetary model of the exchange rate has perfectly flexible prices
- As discussed in Lecture 1, this is a reasonable assumption only in times of high inflation or hyperinflation, or in the long run
- Nevertheless, the simple flex-price model is important because it attempts to explain nominal exchange rate movements by relating the exchange rate to money supplies
- For example, it can help to explain why countries with high money supply growth tend to have depreciating currencies

The flex-price monetary model of the exchange rate

Assumption 1

- The domestic demand for real money balances is

$$\boxed{m^d - p = \eta y - \sigma i}$$

where

$$i = \text{nominal interest rate on domestic bonds}$$
$$y = \text{domestic real GDP (expressed in logs)}$$
$$m^d - p = \text{real domestic demand for money (in logs)}$$

- In the foreign country,

$$\boxed{m^{d*} - p^* = \eta y^* - \sigma i^*}$$

where 'starred' variables are foreign prices or quantities

The flex-price monetary model of the exchange rate

Assumption 2

- There is equilibrium in the money market:

Money demand = Money supply

- Mathematically, $m^d = m$ in the home country, where m is the domestic money supply (in nominal terms)
- Likewise, we have $m^{d*} = m^*$ in the foreign country, where m^* is the foreign money supply
- We can therefore say that

$$(1) \quad m - p = \eta y - \sigma i \qquad \text{and} \qquad (2) \quad m^* - p^* = \eta y^* - \sigma i^*$$

The flex-price monetary model of the exchange rate

Assumption 3

- Purchasing power parity holds:

$$\boxed{\textbf{PPP: } s = p - p^*}$$

- Now, subtract (2) from (1) to get

$$m - m^* - (p - p^*) = \eta(y - y^*) - \sigma(i - i^*)$$

- Rearranging this equation gives

$$p - p^* = m - m^* - \eta(y - y^*) + \sigma(i - i^*)$$

The flex-price monetary model of the exchange rate

- Now, substitute for $p - p^*$ using PPP:

$$\boxed{\textbf{FPMM: } s = m - m^* - \eta(y - y^*) + \sigma(i - i^*)}$$

- This equation predicts that the nominal exchange rate is affected by
  1. Relative money supplies
  2. Relative levels of real GDP
  3. Nominal interest rate differential
- Both (1) and (3) have a positive effect on the exchange rate, but a rise in relative GDPs lowers the exchange rate (ie an appreciation)

The flex-price monetary model of the exchange rate

Assumption 4 – UIP holds

- The FPMM equation is known as a **'reduced-form'** equation
- This is because it contains variables on the RHS which are determined inside the model
- In particular, the interest rate differential is given by **UIP in logs**:

$$i - i^* = \Delta s^e$$

where Δs^e is the expected rate of depreciation

- Substituting in the FPMM equation we have a **forward-looking** equation:

$$\boxed{s = m - m^* - \eta(y - y^*) + \sigma \Delta s^e}$$

Implications of the FPMM (1)

- Suppose for simplicity that GDPs and interest rates are constant
- The rate of depreciation in the home currency is then

$$\boxed{\Delta s = \Delta m - \Delta m^*}$$

- **Rate of dep. = home money growth − foreign money growth**
- **Example:** if UK money growth is 10% and US money growth is 2%, what rate of depreciation in the Pound does FPMM predict?

Implications of the FPMM (2)

- Now suppose instead that money supplies and interest rates are constant but GDPs are growing

- The FPMM predicts that

$$\boxed{\Delta s = -\eta(\Delta y - \Delta y^*)}$$

- **Example:** if Chinese growth is 7%, US growth is 2% and $\eta = 0.5$, what is the rate of appreciation of the RNB against the Dollar?

Implications of the FPMM (3)

- Our forward-looking equation for the nominal exchange rate predicts that the expected future rate of depreciation affects the current exchange rate

- **Example:** suppose that the expected rate of depreciation rises from zero to $\Delta s^e = 5\%$

- The predicted impact on the exchange rate is $\Delta s = \sigma \times 5\%$. Notice that the impact of expectations on the current exchange rate depends crucially on σ.

- The parameter σ determines the sensitivity of money demand to the nominal interest rate

Implications of the FPMM (4)

- The variables on the RHS of the FPMM equation are **economic fundamentals**
- The FPMM predicts that only economic fundamentals and the parameters of the money demand function matter for exchange rates
- Consequently, there is no allowance for the potential impact of 'bubbles' or currency speculation for the exchange rate
- The fact that the exchange rate is the outcome of trading on FOREX markets is also ignored
- However, the FPMM does allow exchange rate expectations to affect the current exchange rate – albeit that these expectations are assumed to be **rational expectations**

Testing the FPMM

- In order to test the flex-price monetary model, we can compare its predictions against data
- Data is readily available for exchange rates, money supplies, GDPs and interest rates
- The basic idea of these tests is to see whether the models can explain real-world movements in exchange rates over various horizons
- In Lecture 5 we will consider how well the flex-price monetary model does in these tests
- We will also look at the empirical performance of the sticky price monetary model, which we will discuss in the next lecture

Next time...

- We will look at the sticky-price monetary model of the exchange rate, ie the Dornbusch 'overshooting' model
- In addition, we will study the implications of Frankel's real interest rate differential model
- This is a general monetary exchange rate model that incorporates the flex-price model and the Dornbusch model as special cases
- **Advance reading:**
  1. The same as last week, if you haven't already read it!
  2. Pilbeam, Ch. 7.5 to 7.13 or Rogoff (2001) from the Reading List