Openness in Financial Markets

EC 313, Macroeconomics

Alex Li

Book Chapter 18 & 20

Overview

Overview

Openness in financial markets

- Choices between **domestic assets** and **foreign assets**.
- Capital controls **lower the openness in financial market**
  - Restrictions on the foreign assets their domestic residents could hold
  - Restrictions on the domestic assets foreigners could hold.

Openness in financial markets

Openness in financial markets also means there is a **foreign exchange market** where people trade foreign currencies (also called foreign exchange).

People sell and buy foreign currencies because of

- **buying or selling foreign assets**.
- **trade**. (Less than 1%.)

Openness in financial markets

In 2010, for example, the recorded **daily volume** of **foreign exchange transactions** in the world was $4 trillion, of which 85%—about $3.4 trillion—involved U.S. dollars on one side of the transaction.

- **More than 99%** of the foreign exchange transactions are associated with **purchases and sales of financial assets**.
- **Less than 1%** of the foreign exchange transactions are associated with **trade**.

Openness in financial markets

For a country as a whole, openness in financial markets has another important implication: It allows the country to run trade surpluses and trade deficits.

- Recall **NX = -NCI**
- Hence **NX < 0** implies **NCI > 0**
- This means the economy is **borrowing money from the rest of the world** to pay for the difference between what it buys and what it sells.

Openness in Financial Markets

Domestic Asset or Foreign Asset?

Let's consider which bond to buy: one-year **US bond** or one-year **UK bond**.

Let i_t be the one-year US bond's interest rate.

Let i_t^* be the one-year UK bond's interest rate.

In year t, you are faced with two options. Which one would you choose?

Option 1: buy 1 dollar worth US bond

Option 2: buy 1 dollar worth of UK bond

Openness in Financial Markets

US Bonds

Option 1: buy 1 dollar worth US bond

After 1 year, you will have $(1 + i_t)$ dollars.

UK Bonds

Option 2: buy 1 dollar worth of UK bond

You can't buy UK bonds with American dollars. You need to first exchange this 1 dollar to British pounds.

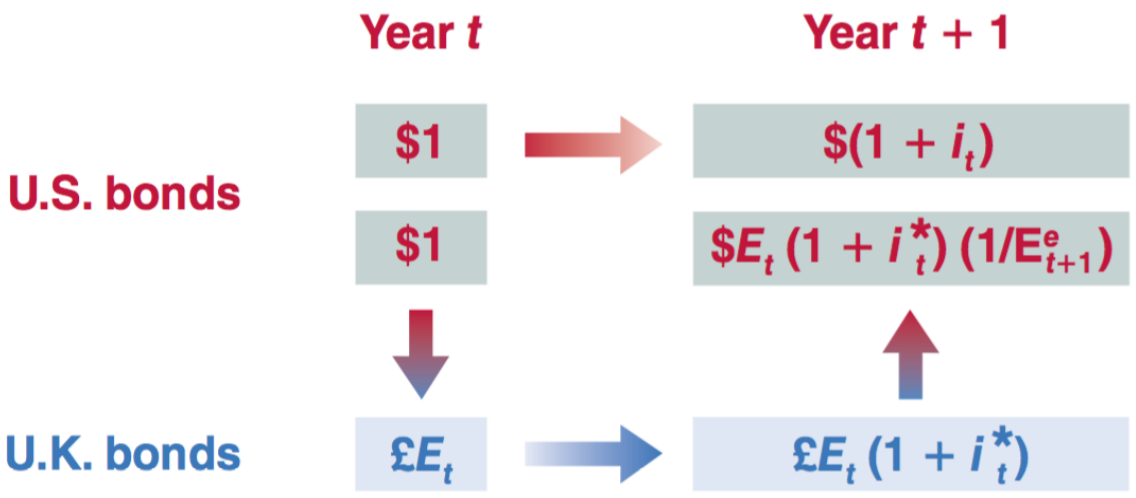
For 1 dollar, you can get E_t pounds. Recall that E_t is the nominal exchange rate in year t.

After 1 year, you will have $E_t(1 + i_t^*)$ pounds.

If you **expect** the exchange rate next year (t+1) will be E_{t+1}^e, then you expect to exchange $E_t(1 + i_t^*)$ pounds to $\frac{E_t(1+i_t^*)}{E_{t+1}^e}$ dollars.

Domestic Asset or Foreign Asset?

Two Options - Diagram



Domestic Asset or Foreign Asset?

In reality, financial investors **hold both US bonds and UK bonds**.

This implies that the investors expect the returns on UK bonds equal to the returns on US bonds. This is called the **interest parity condition**. (Arbitrage Assumption)

$$(1 + i_t) = \frac{E_t(1 + i_t^*)}{E_{t+1}^e}$$

Openness in Financial Markets

Domestic Asset or Foreign Asset?

interest parity condition

$$(1 + i_t) = \frac{E_t(1 + i_t^*)}{E_{t+1}^e}$$

Note this parity ignores

- Transaction costs
- Risk

For the rich countries of the world, the arbitrage assumption is a good approximation of reality.

Interest Rates and Exchange Rates

Note we can simplify the **interest parity condition**

$$(1+i_t) = \frac{E_t(1+i_t^*)}{E_{t+1}^e}$$

$$(1+i_t) = \frac{(1+i_t^*)}{1+(E_{t+1}^e - E_t)/E_t}$$

$$i_t = i_t^* - (E_{t+1}^e - E_t)/E_t$$

Interest Rates and Exchange Rates

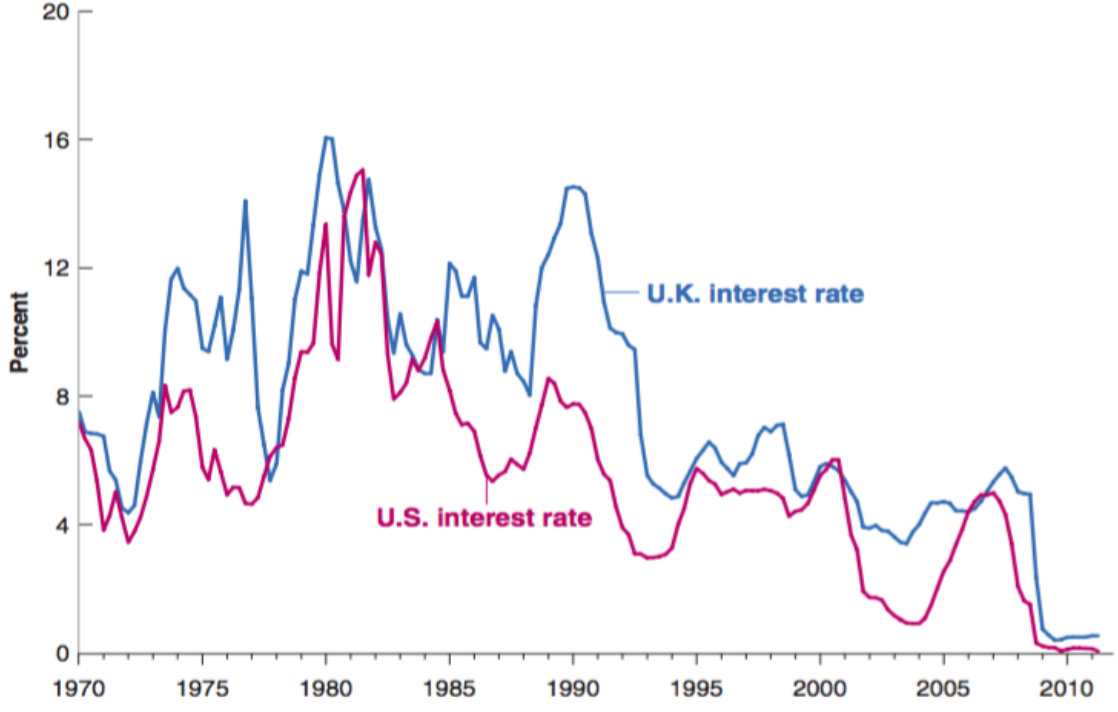
Question: If the interest rate in U.S. is lower than the interest rate in UK, does that mean the foreign exchange market signals that the exchange rate for dollars is increasing or decreasing?

Answer: $(E^e_{t+1} - E_t)/E_t = i^*_t - i_t > 0$ hence $(E^e_{t+1} - E_t) > 0$ hence $E^e_{t+1} > E_t$ which means the market expects the exchange rate for dollars to go up

Openness in Financial Markets

Interest Rates

U.S. and U.K. nominal interest rates have largely moved to- gether over the last 40 years. But US interest rate is consistently lower than the UK interest rate.



Openness in Financial Markets

How Many Markets?

In an open economy, there are **two financial markets**. People make choices between

- **(domestic) money and (domestic) bonds**
  - Domestic Money Market
- **domestic bonds and foreign bonds**
  - International Bonds Market

We want them both to be at equilibrium!

Openness in Financial Markets

How Many Markets?

In an open economy, there are **two financial markets**.

Right now we are building a economics model that covers **both markets**, and there are **two variables of interest**!

- Interest Rate
- Exchange Rate

The model we are building can describe the behaviors of both variables in equilibrium.

Equilibria

Equilibrium I - Domestic Money Market

To determine the interest rate, we need that the **supply of money be equal to the demand for money**.

Recall M is money supply, P is GDP deflator, Y is output, $L(i)$ is the liquidity function which is decreasing in i.

$$\frac{M}{P} = YL(i)$$

This relation pretty much holds in an open economy: the demand for domestic money is still **mostly a demand by domestic residents**.

Equilibrium II - International Bonds Market

The equilibrium in the international bonds market is charaterized by the **interest parity condition** which is nonarbitrary assumption.

$$(1 + i_t) = (1 + i_t^*)\frac{E_t}{E_{t+1}^e}$$

Reorganize this equation and mask the time index, we get the equilibrium condition

$$E = \frac{1 + i}{1 + i^*}\bar{E}^e$$

where we shall take the expected future exchange rate as given (exogeneous) and denote it as E^e.

Equilibrium II - International Bonds Market

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

- **An increase in the domestic interest rate** leads to **an increase in the exchange rate**.
- **An decrease in the foreign interest rate** leads to **an increase in the exchange rate**.
- **An increase in the expected future exchange rate** leads to **an increase in the current exchange rate**.

Equilibrium II - International Bonds Market

An increase in the domestic interest rate, or **an decrease in the foreign interest rate**, or **an increase in the expected future exchange rate**

- Dollars become more attractive
- People sell foreign currencies to buy dollars
- Dollars appreciate (increase in the exchange rate)

Equilibrium II - International Bonds Market

- Consider financial investors—investors, for short—choosing between U.S. bonds and Japanese bonds.
- Suppose that the one-year interest rate on U.S. bonds is 2%, and the one-year interest rate on Japanese bonds is also 2%.
- Suppose that the current exchange rate is 100 (one dollar is worth 100 yens), and the expected exchange rate a year from now is also 100.
- Under these assumptions, both U.S. and Japanese bonds have the same expected return in dollars, and the interest parity condition holds.

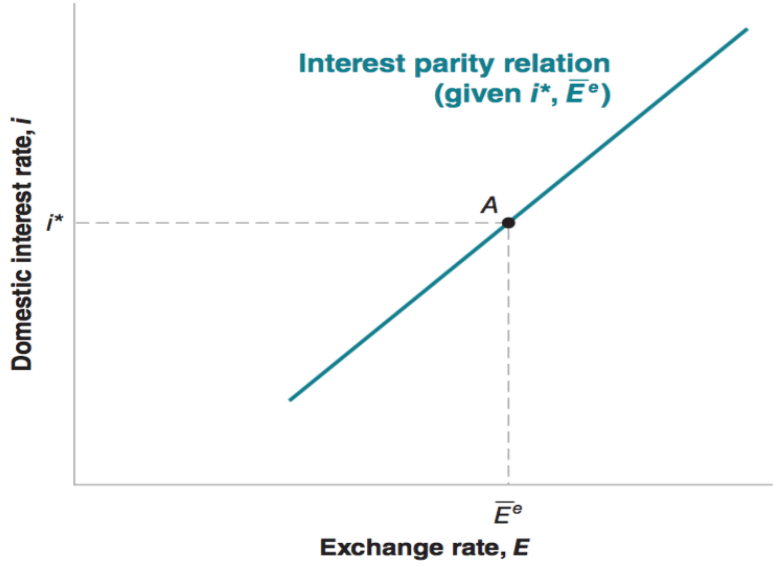
Equilibrium II - International Bonds Market

- Suppose now that investors now expect the exchange rate to be 10% higher a year from now, so Ee is now equal to 110.
- At an unchanged current exchange rate, U.S. bonds are now much more attractive than Japanese bonds.
- At the initial exchange rate of 100, investors want to shift out of Japanese bonds into U.S. bonds.
- To do so, they must first sell Japanese bonds for yens, then sell yens for dollars, and then use the dollars to buy U.S. bonds. As investors sell yens and buy dollars, the dollar appreciates.

Equilibrium II - International Bonds Market

- **An increase in the domestic interest rate** leads to **an increase in the exchange rate**.

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$



Two Markets Combined

Now we can analyze how equilibirum interest rate and equilibrium exchange rate by combining both markets equilibrium equations.

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Exogeneous variables: M, P, Y, i^*, E^e

Endogeneous variables: E and i

We can use the financial markets model to explain how E and i change in response to changes in M, P, Y, i^*, or E^e

Equilibrium

Higher M - Math

If money supply M is higher

- equilibrium interest rate i goes down.
- equilibrium exchange rate E goes down.

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Equilibrium

Higher M - Intuition

- Higher money supply M leads to higher domestic bonds demand, which leads to a decrease in domestic interest rate (bonds price increases).
- A lower domestic interest rate makes the domestic bonds less attractive which leads to a decrease in demand for domestic currency.
- Hence the exchange rate decreases.

Equilibrium

Higher P - Math

If GDP deflator P is higher

- equilibrium interest rate i goes up
- equilibrium exchange rate E goes up

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Equilibrium

Higher P - Intuition

- Higher GDP deflator P leads to a lower domestic money supply.
- A lower domestic money supply leads to a lower demand for bonds, which leads to an increase in domestic interest rate (bonds price decreases).
- A higher domestic interest rate makes the domestic bonds more attractive which leads to a higher demand for domestic currency.
- Hence the exchange rate increases.

Equilibrium

Higher Y - Math

If output $\boldsymbol{Y}$ is higher

- equilibrium interest rate $\boldsymbol{i}$ goes up
- equilibrium exchange rate $\boldsymbol{E}$ goes up

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Equilibrium

Higher Y - Intuition

- Higher output Y leads to a higher domestic money demand.
- A higher domestic money demand leads to a higher supply for bonds, which leads to an increase in domestic interest rate (bonds price decreases).
- A higher domestic interest rate makes the domestic bonds more attractive which leads to a higher demand for domestic currency.
- Hence the exchange rate increases.

Equilibrium

Higher i^* - Math

If foreign interest rate i^* is higher

- equilibrium interest rate i doesn't change
- equilibrium exchange rate E goes down

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Equilibrium

Higher i^* - Intuition

- Changes in the foreign interest rate do not affect the domestic bonds market. The interest rate i does not change.
- Higher foreign interest rate i^* makes foreign bonds more attractive, which leads to a higher supply of domestic currency.
- Hence exchange rate decrease.

Equilibrium

Higher $\bar{E}^e$ - Math

If expected future exchange rate $\bar{E}^e$ is higher

- equilibrium interest rate i doesn't change
- equilibrium exchange rate E goes up

$$\frac{M}{P} = YL(i)$$

$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

Equilibrium

Higher $\bar{E}^e$ - Intuition

- Changes in the future expectation of exchange rate do not affect the domestic bonds market. The interest rate i does not change.
- Higher expected future exchange rate $\bar{E}^e$ makes domestic currency more attractive, which leads to a higher demand of domestic currency.
- Hence exchange rate increases.

Equilibrium

Numerical Example

Let $L(i) = \frac{1}{a+bi}$. We have the financial markets equilibrium for the open economy as follows

$$\frac{M}{P} = Y\frac{1}{a+bi}$$
$$E = \frac{1+i}{1+i^*}\bar{E}^e$$

The first equation implies

$i = \frac{PY-aM}{bM}$

Plug this to the second equation we get

$E = \frac{PY-aM+bM}{bM(1+i^*)}\bar{E}^e$