Topic 14 – Exchange rates

You need to be able to:

- Calculate the value of one currency in terms of another currency.
- Plot demand and supply curves for a currency from linear functions and identify the equilibrium exchange rate.
- Using exchange rates, calculate the price of a good in different currencies.

Calculating the value of one currency in terms of another currency.
You may be asked to make various calculations relating to exchange rates and changes in exchange rates:

E.g.

1. The US dollar is currently trading against the Euro at a rate of US$1 = €0.8. What is the rate for €1 in US$?
   To change an exchange rate around, we simply take the reciprocal of the existing rate.
   So, if US$1 = €0.8, then €1 = $\frac{1}{0.8}$ = US$1.25

Now you have a go!!

Question 14.1
The table below shows the value of the Euro against five other currencies. Fill in column 3 to express the value of one unit of each of the currencies in Euros.

	Price of Euro in foreign currency	Price of foreign currency in Euros
US Dollar	€1 = 1.29 USD	1 USD =
British Pound	€1 = 0.81GBP	1 GBP =
Australian Dollar	€1 = 1.27 AUD	1 AUD =
Canadian Dollar	€1 = 1.26 CAD	1 CAD =
Emirati Dirham	€1 = 4.75 AED	1 AED =

Plotting demand and supply curves for a currency from linear functions and identifying the equilibrium exchange rate.
You may be asked to identify the equilibrium exchange rate using linear demand and supply functions. This is no different from finding the equilibrium price in a demand and supply question, so go to pages 3 to 7 to check the method.

Now you have a go!!

Question 14.2
Country X has a currency know as the 'Pesho'. The country is involved in international trade and the Pesho is a fully convertible currency that is allowed to float freely on the foreign exchange markets.

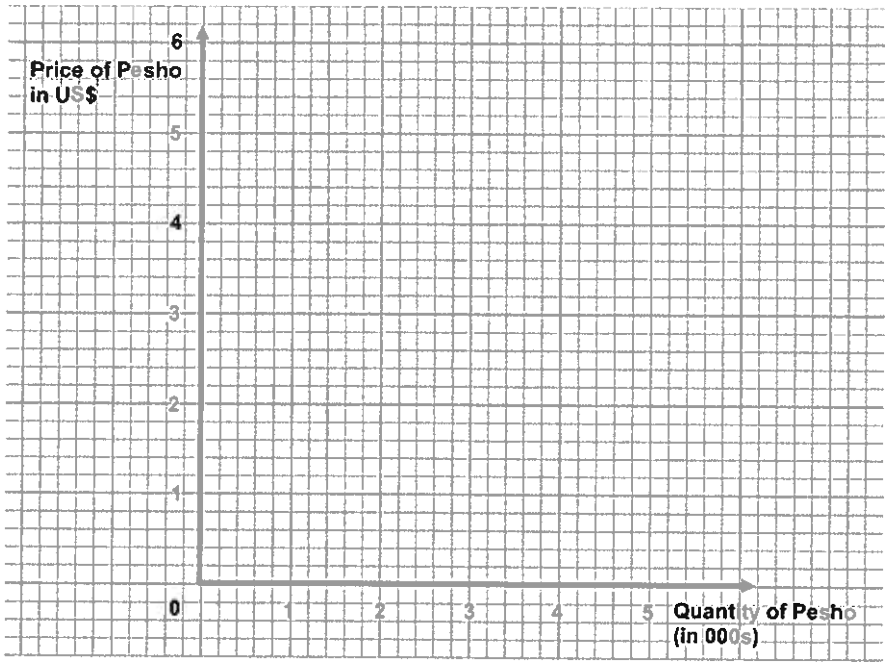
The demand and supply functions for the Pesho are given below:

$Q_D = 3200 - 400E$

$Q_S = -400 + 400E$

Where E is the exchange rate of the Pesho against the US dollar.

i. Make a table to show the demand schedule and supply schedule for the Pesho, when exchange rates are \$0, \$1, \$2, \$3, \$4 and \$5.



Using the axes above:

ii. Draw a diagram to show the demand curve and supply curves that represent the demand and supply schedules that you have made.

iii. Illustrate the exchange rate.

iv. Using simultaneous equations, calculate the exchange rate.

Now let us assume that the demand function for the Pesho changes to:

$$Q_D = 3\,600 - 400P$$

v. Explain **two** factors that might have caused the change in the demand function.

vi. Make a new table to show the demand schedule for the new demand function, when exchange rates are \$0, \$1, \$2, \$3, \$4 and \$5.

vii. Add the demand curve that represents the new schedule to the diagram that you drew in 2.

viii. Illustrate the new equilibrium exchange rate.

ix. Explain the likely effect that the change in the exchange rate will have upon the demand for exports and imports in Country X.

Calculating the price of a good in different currencies, using exchange rates.
You may be asked to make various calculations relating to exchange rates and the prices of goods in different countries:

E.g.

i. If US$1 = €0.8, what would be the cost in Euros of a good that was selling for US$75?

   If a good is selling for US$75, then its cost in Euros will be 75 x €0.8 = €60.

ii. If the exchange rate changes from US$1 = €0.8 to US$1 = €0.9, explain what would happen to the Euro price of an American-manufactured dress shirt that was being exported to Europe from the USA at a cost of US$150.

   With the original exchange rate of US$1 = €0.8, the dress shirt would cost €120 (150 x €0.8). With the new exchange rate, the value of the Euro has depreciated. It now costs more Euros to buy the same amount of dollars, and so the price of the dress shirt increases to €135 (150 x €0.9).

Now you have a go!!

Question 14.3
The table below shows the exchange rate between the Euro and five other currencies:

	Price of Euro in foreign currency
US Dollar	€1 = 1.29 USD
British Pound	€1 = 0.81GBP
Australian Dollar	€1 = 1.27 AUD
Canadian Dollar	€1 = 1.26 CAD
Emirati Dirham	€1 = 4.75 AED

If a large beer costs €4 in Vienna, then what would be the cost in each of the currencies above?

Question 14.4
The table below shows the exchange rate between the Euro and five other currencies at an interval of 6 months:

	Price of Euro in foreign currency - January	Price of Euro in foreign currency - July
US Dollar	€1 = 1.29 USD	€1 = 1.35 USD
British Pound	€1 = 0.81GBP	€1 = 0.95 GBP
Australian Dollar	€1 = 1.27 AUD	€1 = 1.15 AUD
Canadian Dollar	€1 = 1.26 CAD	€1 = 1.10 CAD
Emirati Dirham	€1 = 4.75 AED	€1 = 4.15 AED

For each of the currencies above:

i. Calculate the cost of a €25 phone card in each time period – January and July.
ii. Using figures, explain whether the Euro has got weaker or stronger against the currency.

Comparing and contrasting fixed and floating exchange rate systems

- Compare and contrast a fixed exchange rate system with a floating exchange rate system, with reference to factors including the degree of certainty for stakeholders, ease of adjustment, the role of international reserves in the form of foreign currencies and flexibility offered to policy makers.

This topic will be discussed on page 402, below, after we have covered the necessary material on the balance of payments.

Test your understanding 14.5

1 **(a)** In what ways is the managed float an exchange rate system that lies between fixed and floating exchange rate systems? **(b)** Why is it closer to floating exchange rates?

2 What are the reasons for government intervention in a managed float?

3 What does it mean to peg a currency in the context of the managed float system?

4 **(a)** Distinguish between overvalued and undervalued exchange rates. **(b)** What are the reasons for overvaluing or undervaluing a currency? **(c)** What are the disadvantages of each?

5 **(a)** Why can overvalued and undervalued exchange rates not arise in a freely floating exchange rates system? **(b)** Why are undervalued currencies sometimes referred to as a 'dirty float'?

HL 14.3 Calculations using exchange rates (higher level topic)

Calculating the value of a currency in terms of another

- Calculate the value of one currency in terms of another currency.

Example 1 A hypothetical exchange rate of 1.5 US dollars = 1 euro gives us the price of one euro in terms of dollars. If we want to find the price of one dollar in terms of euros, we divide the unit currency (euro) by the other currency (dollars).

Therefore:

$$1 \text{ dollar} = \frac{1}{1.5} \text{ euro} = 0.67 \text{ euro}$$

The expressions 1.5 dollars = 1 euro, and 0.67 euro = 1 dollar are equivalent.

Example 2 The exchange rate 0.37 Russian rouble = 1 Japanese yen gives the price of 1 yen in terms of roubles. Find the price of 1 rouble in terms of yen.

$$1 \text{ rouble} = \frac{1}{0.37} \text{ yen} = 2.70 \text{ yen}$$

The expressions 0.37 rouble = 1 yen, and 2.70 yen = 1 rouble are equivalent.

In the real world, exchange rates are usually expressed to many decimal places. For example, we may find that 1 rouble = 2.70135 yen. Even a very small change in an exchange rate can amount to large differences in the total values being traded if large quantities of money are involved.

Calculating prices in different currencies

- Using exchange rates, calculate the price of a good in different currencies.

Suppose an importer in the United Kingdom imports wine from France (which is a euro zone country). The exchange rate between British pounds (£) and euros (€) is £1.22 = €1. The importer wants to import 1000 bottles at the price of €5 per bottle. Since the importer will supply £ to make the payment in €, she is interested in finding the cost in £.

In terms of euros, the cost is 1000×€5 = €5000. To find this amount in pounds, we simply multiply it by 1.22 (since €1 = £1.22), and we find 1.22×5000 = £6100.

Calculating changes in the value of a currency from a set of exchange rate data

- Calculate the changes in the value of a currency from a set of data.

Interpreting exchange rate data

Suppose you are given a set of data on exchange rate changes over time, shown in Table 14.1.

The data show the value of 1 bople (the currency of a country called Bopland) in terms of US dollars ($). Has the bople appreciated or depreciated in the period from January to December 2010? In January, 1 bople was worth $1.22, while in December it was worth $1.69. The value of the bople increased, in other words the bople appreciated relative to the dollar. However,

January 2010	1.22	July 2010	1.40
February 2010	1.25	August 2010	1.37
March 2010	1.33	September 2010	1.45
April 2010	1.39	October 2010	1.58
May 2010	1.47	November 2010	1.63
June 2010	1.43	December 2010	1.69

Table 14.1 US$ per 1 bople; average monthly exchange rates

it did not appreciate every month. In June, July and August it depreciated (or lost some value) compared to the previous month.

Calculating percentage changes in the value of a currency

What was the percentage change in the value of the bople between January and December 2010? (For a review of percentage changes, see 'Quantatitive techniques' chapter on the CD-ROM, page 1.)

% change in the bople (January–December) =

$$\frac{1.69-1.22}{1.22}\times 100 = \frac{0.47}{1.22}\times 100 = 38.52\%$$

Therefore, the bople appreciated by 38.52% relative to the dollar during 2010.

The bople appreciation relative to the dollar corresponds to a dollar depreciation relative to the bople. To find the percentage change in the value of the dollar for this period, we must first find the 'price' of the dollar in terms of bople. In January, \$1.22 = 1 bople; therefore,

$$\$1 = \frac{1}{1.22 \text{ bople}} = 0.82 \text{ bople}$$

In December, \$1.69 = 1 bople; therefore,

$$\$1 = \frac{1}{1.69 \text{ bople}} = 0.59 \text{ bople}$$

We can now use this information to find the percentage change in the dollar:

% change in the \$ (January–December) =

$$\frac{0.59-0.82}{0.82}\times 100 = \frac{-0.23}{0.82}\times 100 = -28.05\%$$

The negative percentage change indicates a fall in the value of the dollar; therefore, the dollar depreciated by 28.05% relative to the bople in 2010.

This exercise indicates that although an appreciation of currency X relative to currency Y is equivalent to a depreciation of currency Y relative to currency X, the percentage changes *are not the same* (with one being positive and the other negative).[1]

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Currency demand and supply functions

Calculating the exchange rate from linear functions

- Calculate the exchange rate for linear demand and supply functions.

The exchange rate is the 'price' of a currency (measured in terms of another currency). Therefore, if we are given linear currency demand and supply functions of the form $Q_d = a - bP$ and $Q_s = c + dP$, the problem of calculating the exchange rate, or 'price' of the currency, is identical to what we did when we found the price of standard goods in Chapter 2 (see also 'Quantatitive techniques' chapter on the CD-ROM, page 29 for a review).

We will examine the market for bople, on the assumption that Bopland has adopted a freely floating exchange rate system, so the bople exchange rate is determined by supply and demand. The 'price' of the bople is the exchange rate in terms of dollars.

We are given the following demand and supply functions: $Q_d = 8 - 2P$, and $Q_s = 2 + 2P$, where Q_d and Q_s are in millions of bople per day, and P is the value of the bople in terms of dollars. We therefore have the following equations:

$Q_d = 8 - 2P$ (bople demand function)
$Q_s = 2 + 2P$ (bople supply function)
$Q_d = Q_s$ (at equilibrium)

Using the third equation, we can eliminate Q_s and Q_d, and solve for P:

$$8 - 2P = 2 + 2P \Rightarrow 6 = 4P \Rightarrow P = \$1.5 \text{ per bople}$$

Since P is the value of the bople in terms of \$, we have found that the equilibrium exchange rate is 1 bople = \$1.50.

If we want to also find the equilibrium quantity of bople bought and sold per day, we substitute the 'price' P into the demand equation:

$$Q_d = 8 - 2P \Rightarrow Q_d = 8 - 2(1.5) \Rightarrow Q_d = 8 - 3 = 5$$

[1] The reason for this is that percentage changes are calculated relative to an initial value. Since the initial values are different for the two currencies, their percentage changes are also different.

HL Therefore, the equilibrium quantity is 5 million boples bought and sold per day.

Alternatively, substituting into the supply equation, we have:

$$Q_s = 2+2P \Rightarrow Q_s = 2+2\,(1.5) \Rightarrow Q_s = 2+3 = 5$$

(which is the same as above).

(Note that it is not necessary for you to do this calculation both ways, as the result is the same.)

Plotting currency demand and supply curves from linear functions

- Plot demand and supply curves for a currency from linear functions and identify the equilibrium exchange rate.

Given currency demand and supply functions such as the above, it is a simple matter to plot the corresponding demand and supply curves, using the method described in the 'Quantitative techniques' on the CD-ROM, page 29, and applied in Chapter 2. Once we plot both the demand and supply curves, we can read off the equilibrium price (and quantity) that result at market equilibrium.

Figure 14.5 plots the currency demand and supply functions given above. The vertical axis measures dollars per bople (or the price of one bople in terms of dollars), and the horizontal axis measures the quantity of boples traded per day in millions of boples. The equilibrium 'price' of boples is \$1.50 per bople, where 5 million boples are demanded and supplied. At any higher exchange rate, such as \$1.70, there would be an excess demand for boples, and in a freely floating exchange rate system the bople would appreciate. At any lower exchange rate, such as \$1.30 boples, there would be an excess supply of boples, resulting in a bople depreciation.

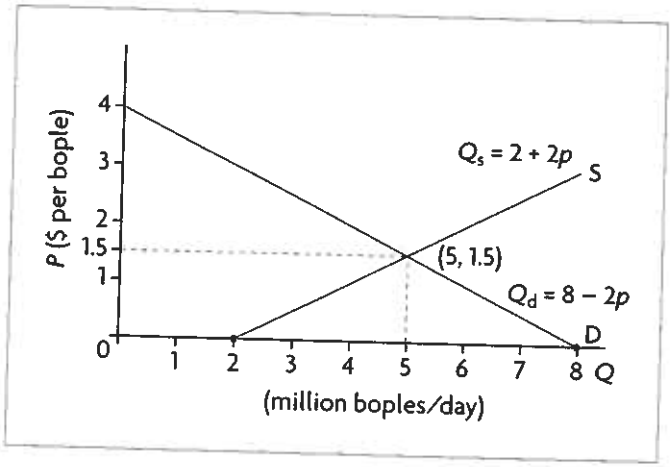

Figure 14.5 Plotting currency demand and supply curves from linear functions

Test your understanding 14.6

1 **(a)** 1 Canadian dollar = 0.99 US dollar. What is the value of 1 US dollar in terms of Canadian dollars? **(b)** 1 Indian rupee = 1.84 Japanese yen. Calculate the 'price' of 1 Japanese yen in terms of Indian rupees. **(c)** 1 Japanese yen = 1.34 Sri Lankan rupee. What is the value of 1 Sri Lankan rupee in terms of Japanese yen? **(d)** 1 British pound = 1.62 Canadian dollars. Find the value of 1 Canadian dollar in terms of British pounds.

2 The price of item X in India is 50 Indian rupees. Using the exchange rates in question 1, find its price in **(a)** Japanese yen, and **(b)** Sri Lankan rupees. **(c)** Importers in Japan and Sri Lanka want to import 1000 units of item X. What is their cost in yen and Sri Lankan rupees, respectively?

3 The price of item Y in Canada is 75 Canadian dollars. Using the exchange rates in question 1, find its price in **(a)** US dollars, and **(b)** British pounds. **(c)** What is the cost of 5000 units of item Y in US dollars and pounds?

4 On 1 June 2010, 1 British pound was worth US \$1.46; on 1 November, 1 British pound was worth US \$1.60. **(a)** Which currency appreciated and which depreciated? **(b)** Calculate the percentage appreciation of the appreciating currency. **(c)** Calculate the percentage depreciation of the depreciating currency.

5 **(a)** Using the table below, determine which currency appreciated, and which depreciated from 1–30 September. **(b)** Calculate the percentage appreciation of the appreciating currency. **(c)** Calculate the percentage depreciation of the depreciating currency.

Euros to 1 US\$ (value of 1 US dollar per euro)

1 Sept. 2010	1.2800
8 Sept 2010	1.2697
16 Sept 2010	1.2989
23 Sept 2010	1.3364
30 Sept 2010	1.3611

6 **(a)** In the equations $Q_d = 7-3P$ and $Q_s = -5+3P$, Q_d and Q_s refer to quantity of \$ demanded and supplied in millions per day, and P is the value of the \$ in terms of €. Assuming a freely floating exchange rate system, calculate the equilibrium exchange rate for the \$ in terms of €. **(b)** Plot the demand and supply curves, and determine the equilibrium exchange rate on your graph. Does it match your calculations?