

Open Economy Macroeconomics

Unit 1

The Foreign Exchange Market and the Balance of Payments

Aims

- Understanding the nature and operations of the foreign exchange market and a first approximation to the determination of the equilibrium exchange rate.
- Understanding how the international activity of a country is recorded in the balance of payments and how this information can be interpreted.

INTRODUCTION

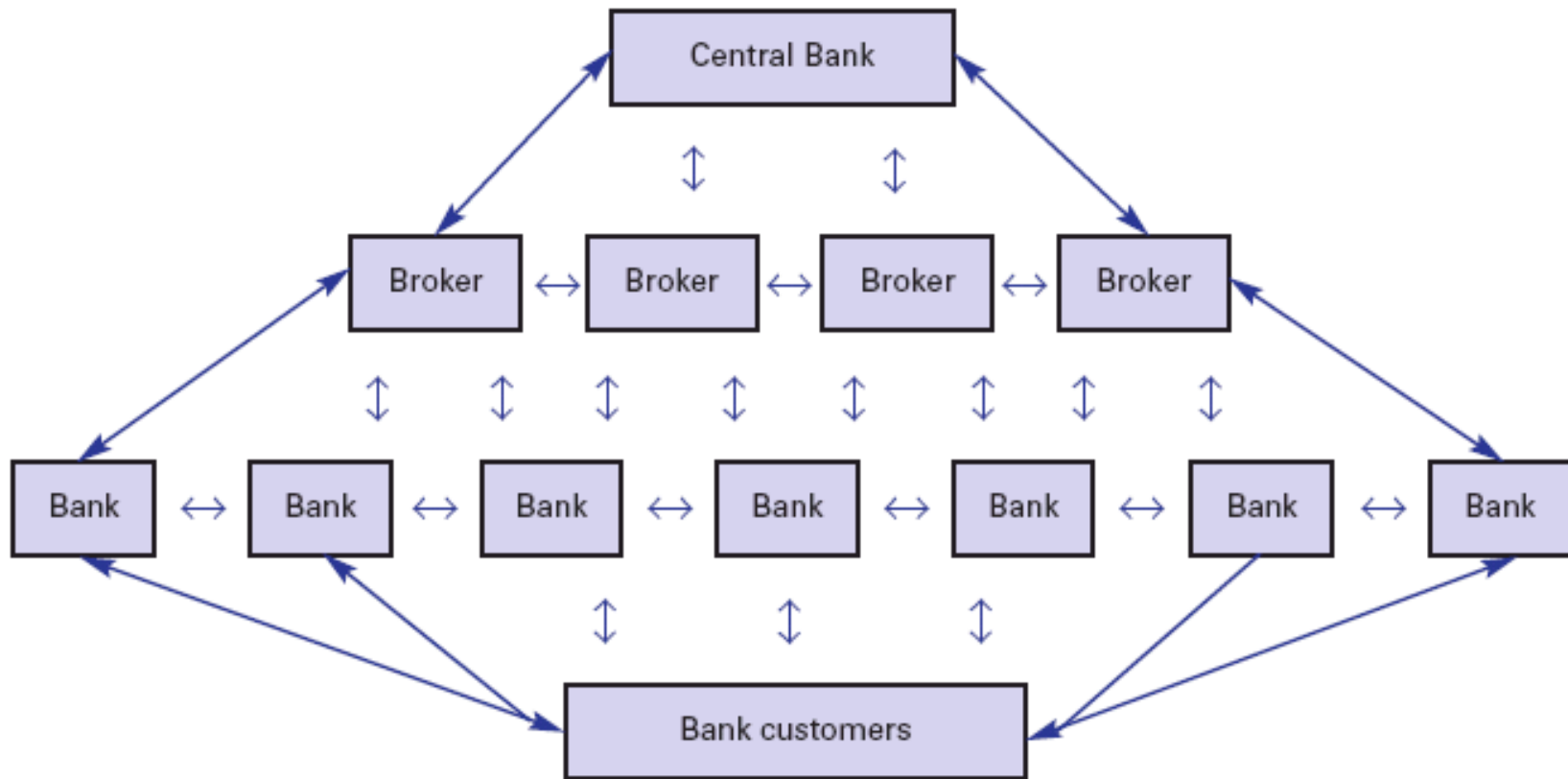
- Because each country participating in international trade possesses its **own national currency unit**, there is a need for a **foreign exchange market** to provide for the conversion of one currency into another.
- The **foreign exchange market**: It is the market where the various national currencies are bought and sold. It is the mechanism that brings together buyers and sellers of different currencies.
- The worldwide network of markets and institutions that handle the exchange of foreign currencies is commonly referred to as the **foreign exchange market**.

- The **exchange rate** is the **price** of one currency in terms of another currency.
 - **Direct quotation**: Number of domestic currency units per unit of foreign currency.
 - **Indirect quotation**: Number of foreign currency units per unit of domestic currency.

Domestic currency appreciated (depreciated) in value: Less (More) units of domestic currency are given per unit of foreign currency

- **Mid-point quotation**
- **Bid rate**: Price at which a dealer (bank) is currently willing to buy the foreign currency (dollars) against the national currency (euros)
- **Ask rate**: Price at which a dealer (bank) is willing to sell the foreign currency (dollars) against the national currency (euros)
- **Bid-ask spread**: Gross profit margin of the bank (in %)

The organization of the foreign exchange market and main participants



THE DETERMINATION OF THE EXCHANGE RATE (A SIMPLE MODEL)

As a price, the exchange rate can be viewed as the result of the interaction of the forces of demand and supply for the foreign currency in any particular period of time.

The **demand for foreign currency** is a derived demand reflecting:

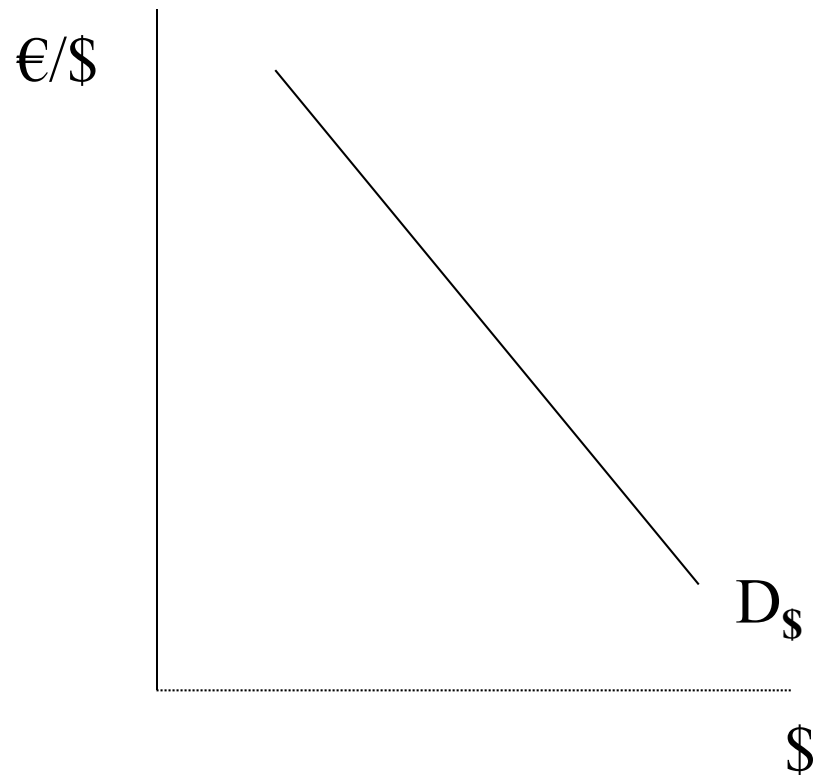
- The demand for foreign goods and services (and transfers abroad)
- The demand for foreign investment (Domestic investment in the foreign country)
- The demand based on risk-taking (speculation) or risk-avoidance (hedging)
- Central banks

The **supply of foreign currency** results from foreigners:

- Purchasing home goods and services (and transfers to the home country)
- Foreign investment in the home country
- Foreign speculation and foreign hedging
- Central banks

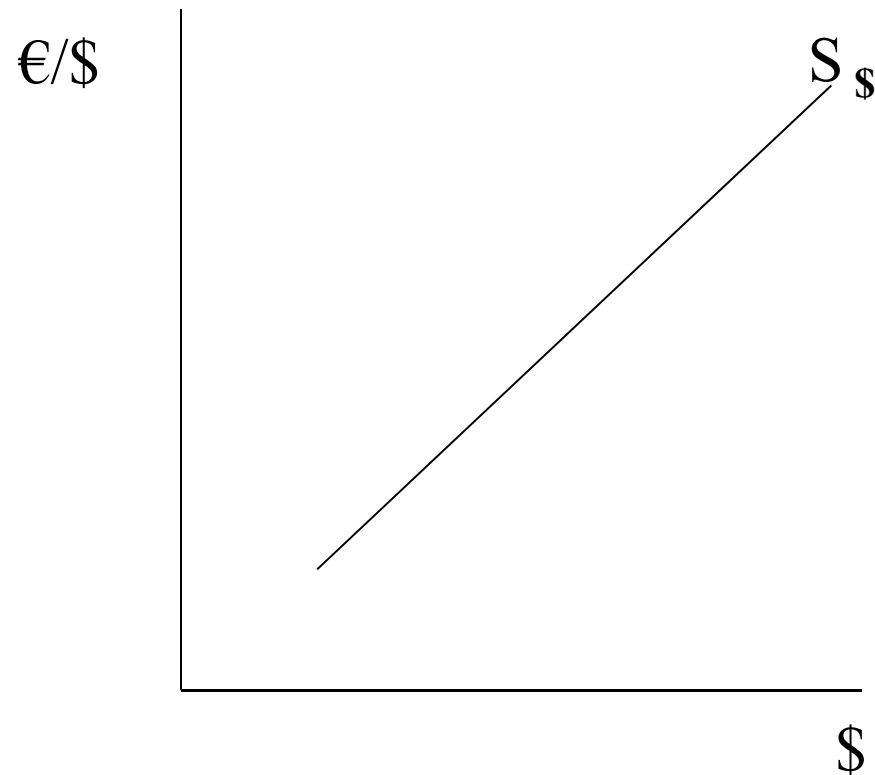
The demand for dollars

Product price (\$)	Exchange rate (DQ)	Product price (€)	Quantity of product	Demand for \$
10	0.5	5	50	500
10	0.75	7.5	40	400
10	1	10	30	300

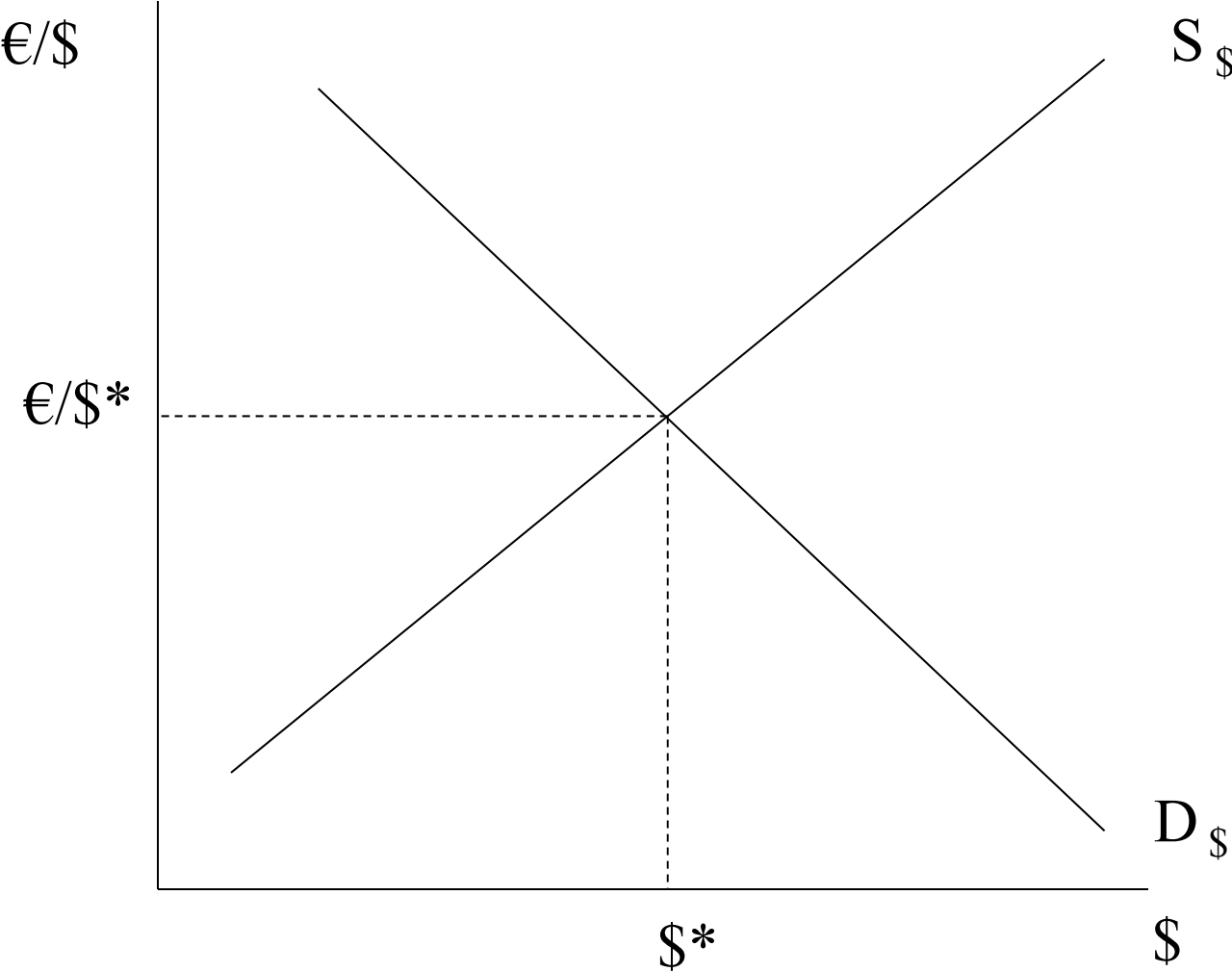


The supply of dollars

Product price (€)	Exchange rate (DQ)	Product price (\$)	Quantity of product	Supply of \$
20	0.5	40	15	600
20	0.75	26.6	30	798
20	1	20	45	900

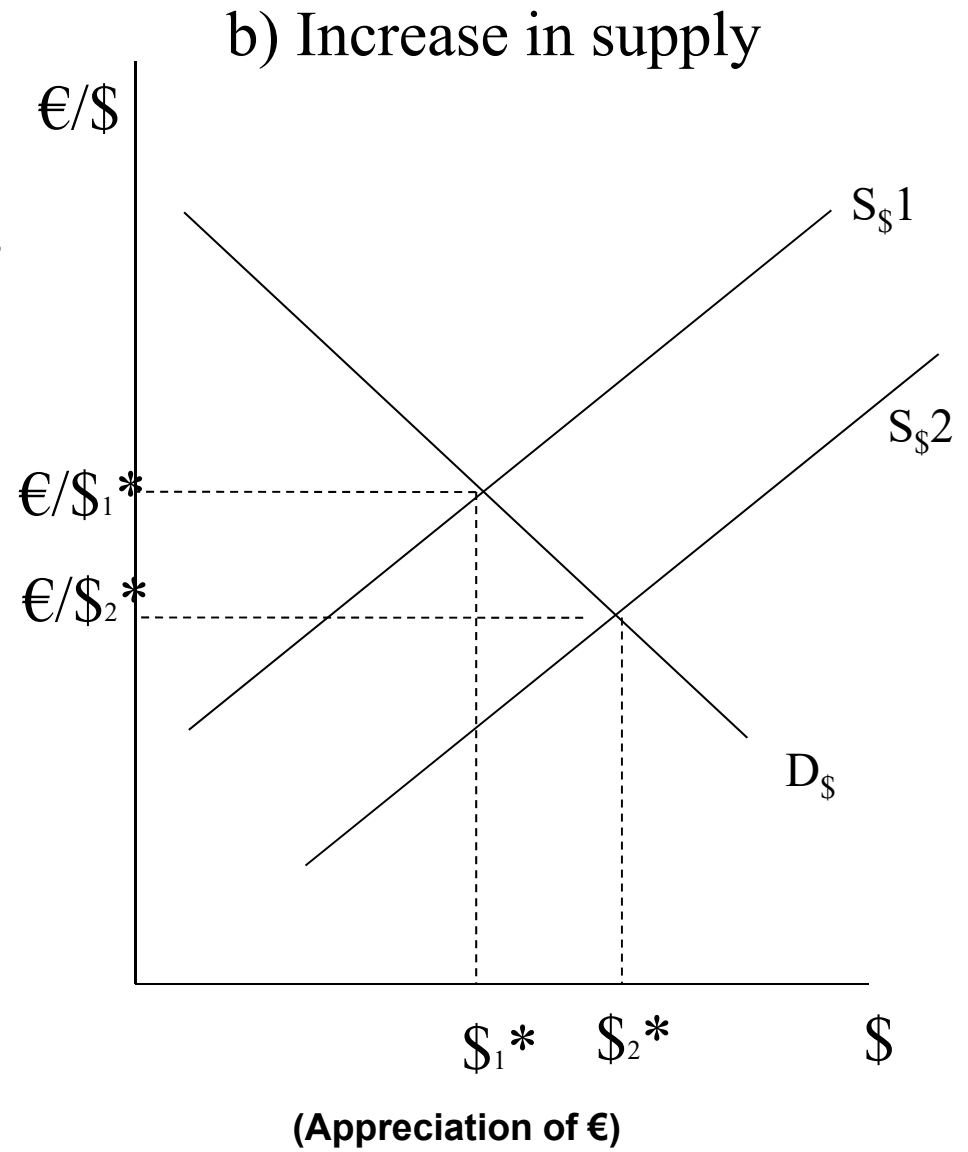
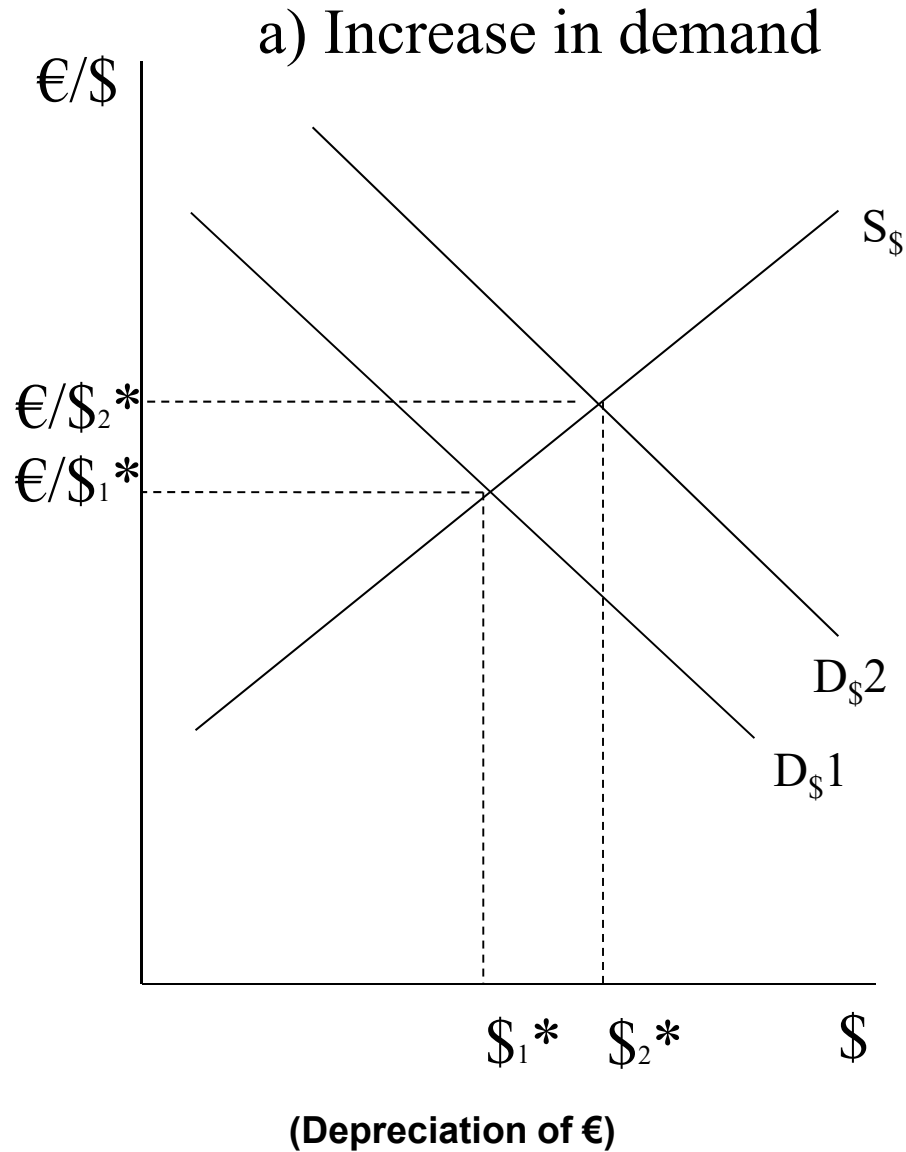


Determination of the euro-dollar exchange rate



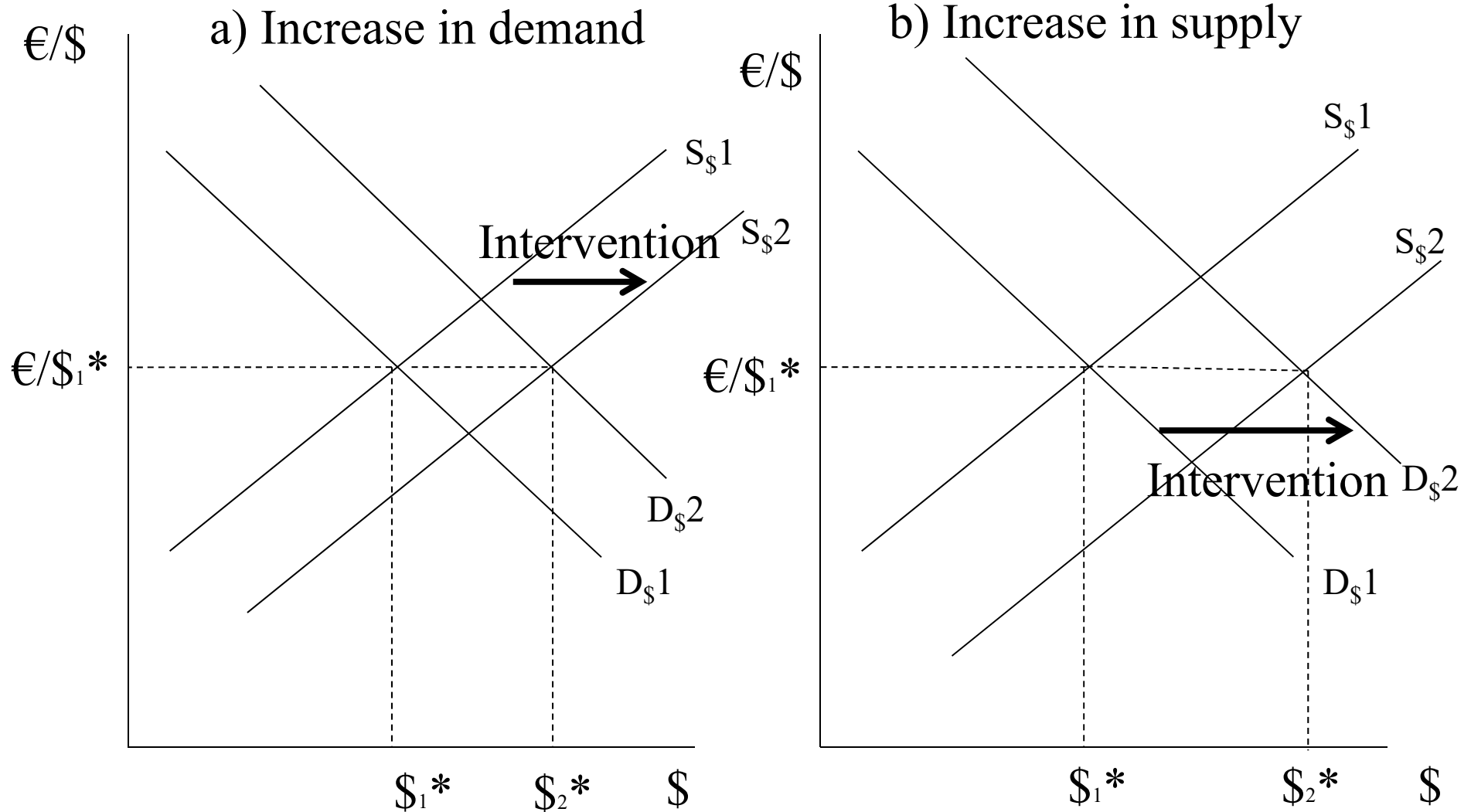
EXCHANGE RATES REGIMES

Floating exchange rate regime
(The exchange rate is strictly set by the market)



Fixed exchange rate regime

(The exchange rate is not set by the market, but strongly influenced by foreign-exchange market intervention. The central bank commits to maintaining the value of its currency in terms of other currencies. The central bank undertakes to keep the exchange rate at a publicly announced parity)



ARBITRAGE

- The process by which an individual purchases a product in a low-priced market for simultaneous resale in a high-priced market for the purpose of making a benefit
- In a nutshell, arbitrage consists of buying “cheap” in one segment of a market and selling “dear” in another. Arbitrage is risk-free and it requires: a) Perfect competition; b) No barriers to trade; c) No transport costs.

Financial centre arbitrage: there exist different exchange rates in different financial centres. It ensures that finally the rate quoted in the two centres coincides

Madrid: $1.2\$ = 1\text{€}$

New York: $1.3\$ = 1\text{€}$

Triangular arbitrage: there exist inconsistencies among exchange rates in the same financial centre. It produces cross rate equality

$1.2\$ = 1\text{€}$

$1\text{€} = 240 \text{ Y}$

$1\$ = 100 \text{ Y}$

EXCHANGE RATES: TYPOLOGY

Nominal versus real exchange rates

- **Nominal (S)**: The exchange rate that prevails at a given date. The amount of one currency that will be obtained for one unit of another. It is merely the price of one currency in terms of another.

- **Real (Sr)**: The nominal exchange rate adjusted for relative prices between the countries under consideration. They are usually presented in “index form”.

- $S_r = SP^*/P \cdot 100$ (direct quotation)

- $S_r = SP/P^* \cdot 100$ (indirect quotation)

Year	Nominal exchange rate	Nominal exchange rate index	EMU price index	US price index	Real exchange rate index
0	1.25\$/€	100	100	100	100
1	1.25\$/€	100	125	100	125
2	1.5625\$/€	125	125	125	125
3	1\$/€	80	140	112	100
4	0.9\$/€	72	130	90	104
5	1.08\$/€	86.4	156	99	136.1

Bilateral versus multilateral exchange rates

- **Bilateral:** Between two currencies.
- **Multilateral (Effective or Trade-weighted):** The price of a currency against a basket of foreign currencies. This is important when we are interested in assessing the strength (or weakness) of our currency when we trade with different countries, each with its own currency (exchange rate).

Nominal Effective Exchange Rate

$$ES = \sum_{i=1}^n \frac{S_{i,t}}{S_{i,0}} \cdot w_i 100 \qquad w_i = \frac{X_i + M_i}{\sum_{i=1}^n (X_i + M_i)}$$

Real Effective Exchange Rate

$$ESr = \left(\sum_{i=1}^n \frac{S_{i,t}}{S_{i,0}} \cdot w_i \right) \cdot \left(\frac{\sum P_i^* w_i}{P} \right) 100 \qquad \text{(direct quotation)}$$

$$ESr = \left(\sum_{i=1}^n \frac{S_{i,t}}{S_{i,0}} \cdot w_i \right) \cdot \left(\frac{P}{\sum P_i^* w_i} \right) 100 \qquad \text{(indirect quotation)}$$

Computing Effective Exchange Rates

	S		S indices		S ratios		X+M	w	Price indices	
	t=0	t=1	t=0	t=1	t=0	t=1			t=0	t=1
USA	\$1=€1	\$0.66=€1	100	66.66	1	0.66	75	0.50	100	110
Japan	¥100=€1	¥83.33=€1	100	83.33	1	0.83	25	0.17	100	125
UK	£0.5=€1	£0.33=€1	100	66.66	1	0.66	50	0.33	100	120
EMU									100	110
ES0	$((1*0.5)+(1*0.17)+(1*0.33))*100$						100			
ES1	$((0.66*0.5)+(0.83*0.17)+(0.66*0.33))*100$						69.5			
ESr0							100			
ESr1	$69.5 * [110 / ((110*0.5) + (125*0.17) + (120*0.33))]$						66.0			

For the sake of interpretation...

Year	Nominal effective exchange rate index (IQ)	Real effective exchange rate index (IQ)
2000	100	100
2016a	80	90
2016b	80	105
2016c	120	110
2016d	120	130

Spot versus forward exchange rates

- **Spot (S):** The quotation between two currencies for immediate delivery (The current exchange rate).
- **Forward (F):** The exchange rate agreed today to exchange currencies at some specified time in the future. The transactions contracted today are not completed (the effective delivery of the foreign currency does not take place) until a later date.

THE FORWARD EXCHANGE RATE

The forward exchange rate is determined in the forward exchange market. This is the market where buyers and sellers agree today to exchange currencies at some specified date in the future.

The economic agents involved in foreign transactions may keep an **open** or a **closed** position.

An economic agent keeps a **closed** position when the value of his assets and liabilities in foreign currency is the same (**$A=L$**). An economic agent keeps an **open** position when he keeps a net asset or liability position in the foreign currency (**$A \neq L$**). An open position may be **long** (net asset position, **$A > L$**) or **short** (net liability position, **$A < L$**).

Keeping an open position in foreign currency implies an exchange-rate risk.

The **forward exchange market** involves three types of **economic agents**: Hedgers, arbitrageurs and speculators.

- **Hedgers** are involved in **Hedging**: The act of reducing or eliminating a net asset or net liability position in the foreign currency = The act of reducing or eliminating an ER risk.

- **Speculators** are involved in **Speculation**: The act of holding a good, service or security in the hope of profiting from a future rise in its price. Speculation in the forward exchange market is the act of deliberately taking a net asset (long) or a net liability (short) position in the foreign currency = The act of deliberately accepting ER risk in the hope of making a profit.

- **Arbitrageurs** are involved in **Arbitrage**: The act of forward buying and selling foreign currency for making a profit without incurring in any exchange-rate risk.

Hedgers

They try to eliminate the ER risk. Let me put an example:

Imagine you have to pay 100.000\$ for goods produced in USA in six months' time. Additionally, you will receive 50.000\$ at this time. So, you keep an open position of 50.000\$

Speculators

They don't try to eliminate the ER risk. They love risk:

- The risk of keeping a **long position** in foreign currency (liabilities < assets) is that of appreciation of domestic currency.
- The risk of keeping a **short position** in foreign currency (liabilities > assets) is that of depreciation of domestic currency.

So, speculators:

- Look for a **long position** when the expected S in 6 months is higher than F . Because of this, the speculator buys foreign currency (dollars) forward.
- Look for a **short position** when the expected S in 6 months is lower than F . Because of this, the speculator sells foreign currency (dollars) forward.

The difference between forward exchange rate and spot exchange rate is called the forward discount/premium.

When the exchange rate is stated by using the direct quotation, the foreign currency is said to be at premium/discount whenever the forward rate is higher/less than the spot rate. It is normally presented as a percentage of the spot exchange rate

Forward premium = $[(F-S)/S]*100 >0$

Forward discount = $[(F-S)/S]*100 <0$

When everything is expressed in annual terms, it is called "P".

$$P = [(F-S)/S]*100*(360/t)$$

Arbitrageurs

Agents that aim to make a riskless profit out of discrepancies between interest rate differentials and what is known the forward discount or forward premium.

Covered interest parity condition (CIP): it relates S , F , r and r^* .

$$P = \frac{F - S}{S} = r - r^*$$

Note: P expressed in percentage and annual terms

The covered interest parity condition

(Note: We use the direct quotation)

Problem: Where to invest a specific amount of money? In the domestic or in the foreign asset?

Both assets are exactly the same, except for the currency of denomination and the interest rate attached to them, r and r^* .

- First option: To invest in the domestic asset

1€ after a year becomes $(1+r)$ €

- Second option: To invest in the foreign asset

1.- 1€ is equal to $1/S$ \$

2.- $1/S$ \$ after a year become $(1/S)(1+r^*)$ \$

3.- $(1/S)(1+r^*)$ \$ are equal to $[(1/S)(1+r^*)F]$ €

Therefore, comparing $(1+r)$ to $[(1/S)(1+r^*)F]$ we decide whether to invest in the domestic or in the foreign asset

When $(1+r) = [(1/S)(1+r^*)F]$ the so called **covered interest parity condition** is fulfilled.

This expression can be transformed into: $\frac{F}{S} = \frac{(1+r)}{(1+r^*)}$

We have seen that: $P = \frac{F-S}{S} \Rightarrow \frac{F}{S} = P + 1$

And, assuming $(P * r^*)$ is very small , it can be transformed into:

$$P = \frac{F - S}{S} = r - r^*$$

Note: if we were using the **indirect quotation**, the expression would become:

$$P = \frac{F - S}{S} = r^* - r$$

Interpretation:

If $r > r^*$, then $P > 0$ and $F > S$. Premium for the foreign currency

If $r < r^*$, then $P < 0$ and $F < S$. Discount for the foreign currency

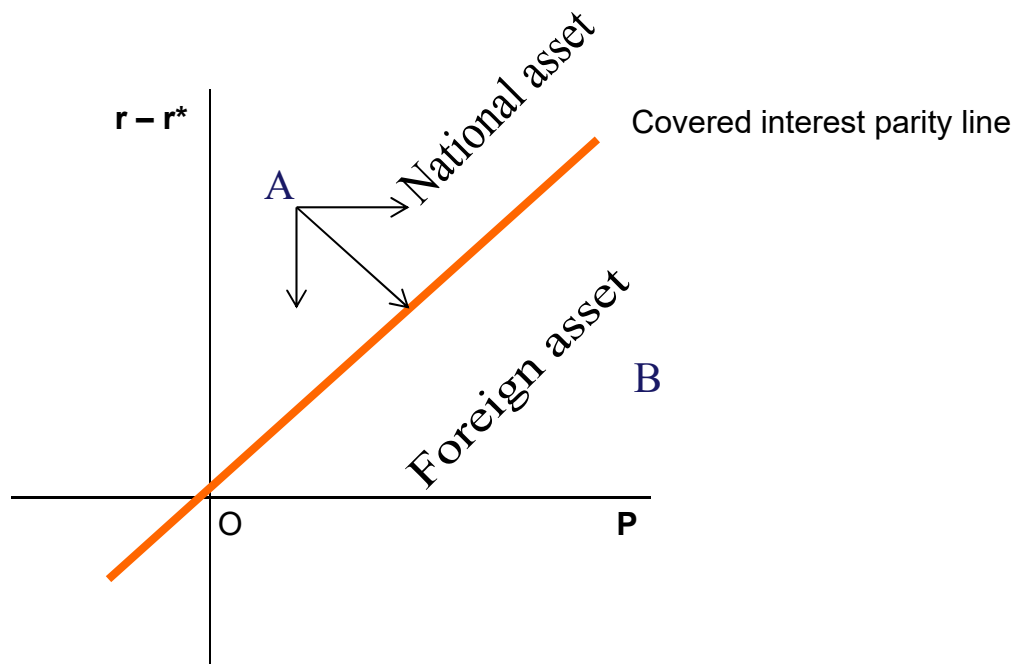
If $r = r^*$, then $P = 0$ and $F = S$.

From other perspective:

If $(r - r^*) > P$, then agents invest in the national asset

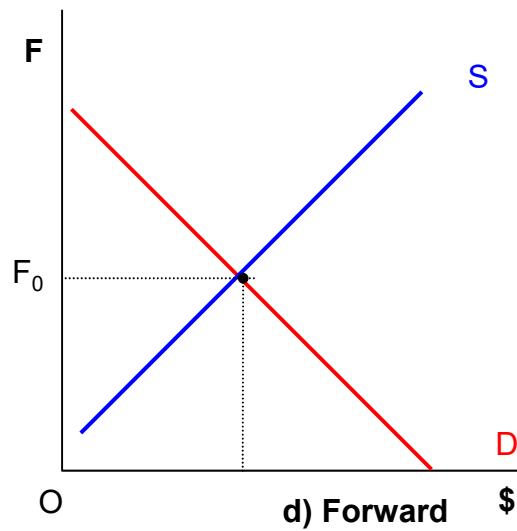
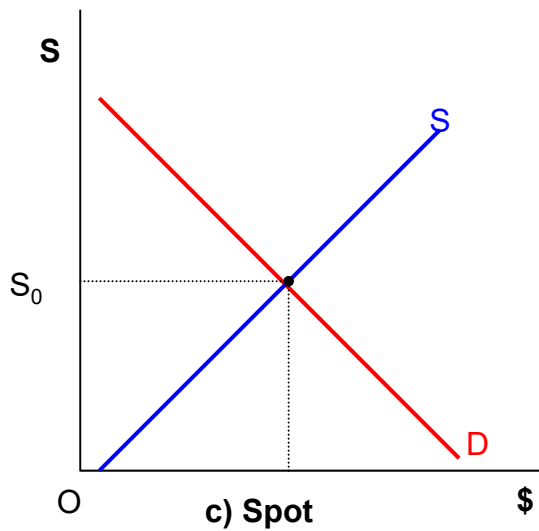
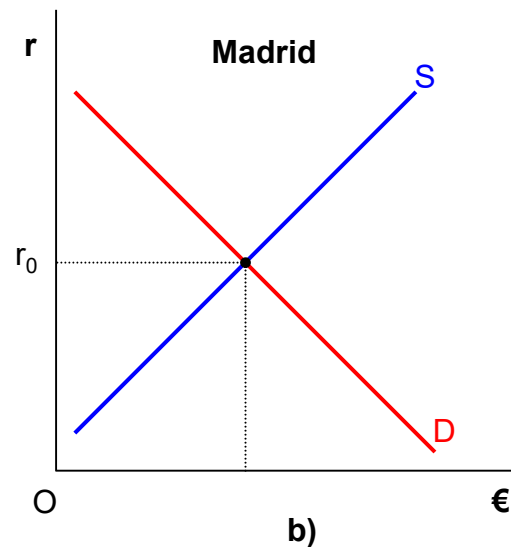
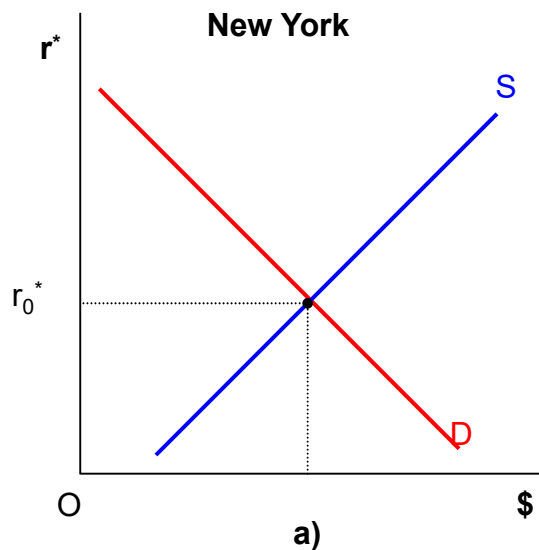
If $(r - r^*) < P$, then agents invest in the foreign asset

If $(r - r^*) = P$, no reasons for one or the other



Point A: Relationship between S, F, r and r*

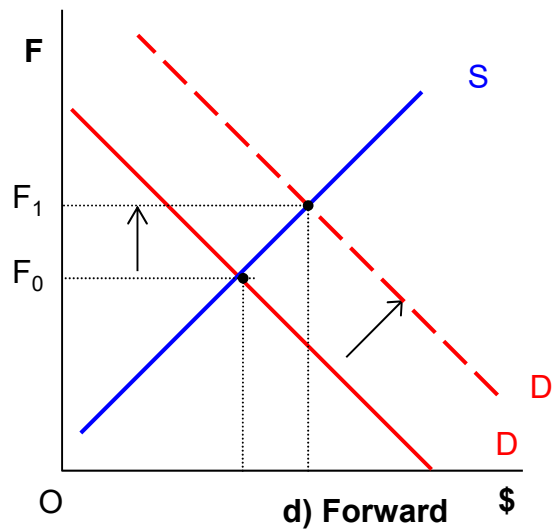
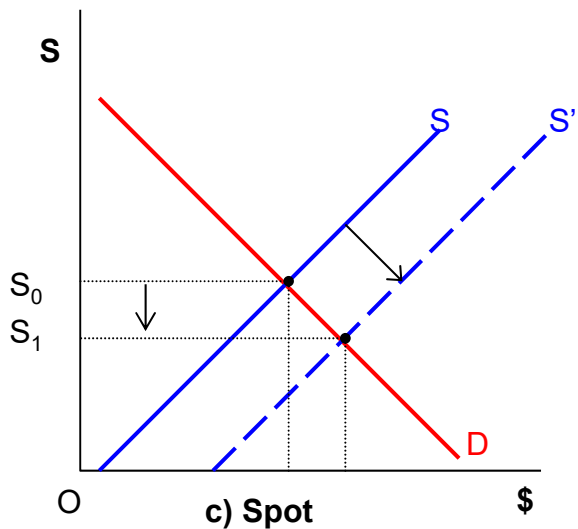
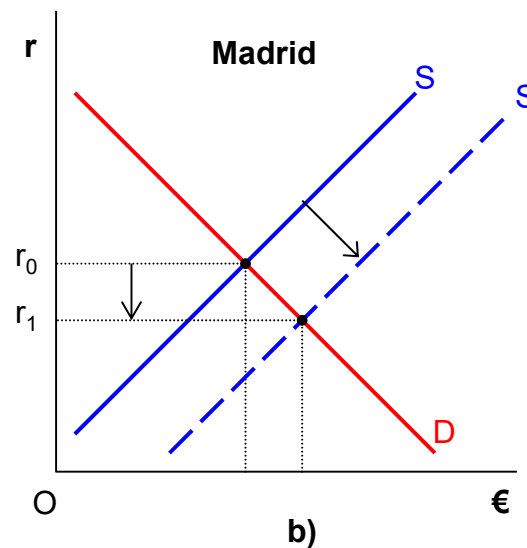
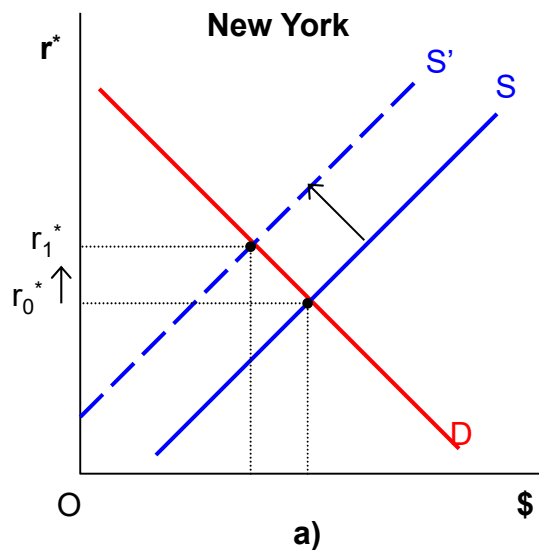
Money/Loanable funds markets



Foreign exchange markets

Point A: Relationship between S, F, r and r^*

Money/Loanable funds markets



Foreign exchange markets

Computation of the forward exchange rate

Remember this expression:

$$(1+r) = [(1/S)(1+r^*)F]$$

It can be transformed into:

$$F = [(r-r^*)S/(1+r^*)] + S$$

And this is the expression for the forward exchange rate

Computation of the forward exchange rate

Example:

	€/ \$ exchange rate	r	r*
Spot rate	0.8		
1 month	0.8007	2	1
3 month	0.8020	2	1
6 month	0.8032	2	1.2
12 month	0.8087	2.3	1.2

The spot €/ \$ exchange rate is 0.8 euros per dollar.

The one-month forward exchange rate is calculated as:

$$\frac{[(0.02 - 0.01)/12]}{[1 + (0.01/12)]} \times 0.8 + 0.8 = 0.8007\text{€}/\$$$

The three-month forward exchange rate is calculated as:

$$\frac{[(0.02 - 0.01)/4]}{[1 + (0.01/4)]} \times 0.8 + 0.8 = 0.8020\text{€}/\$$$

The six-month forward exchange rate is calculated as:

$$\frac{[(0.02 - 0.012)/2]}{[1 + (0.012/2)]} \times 0.8 + 0.8 = 0.8032\text{€}/\$$$

The one-year forward exchange rate is calculated as:

$$\frac{[(0.023 - 0.012)]}{[1 + (0.012)]} \times 0.8 + 0.8 = 0.8087\text{€}/\$$$

The balance of payments

Aim: To understand how the international activity of a country is recorded in the balance of payments and how this information can be interpreted

The balance of payments

The balance of payments (BP) is the statistical record of all economic transactions between the residents of a country and the rest of the world for a given time period.

The BP reveals:

- How many goods and services the country has been exporting and importing.
- Whether the country has been borrowing from (lending to) the rest of the world.
- Whether the stock of international reserves of the monetary authorities has been increasing or decreasing.

Thus, the figures in the BP can:

- Affect the exchange rate
- Lead to changes in economic policies (changes in r , G , the level of protection, ...)

The compilation of the balance of payments follows the principle of “**double-entry book-keeping**”. Each transaction is recorded both as a Credit and as a Debit.

- **Debit** items in the BP reflect transactions that give rise to a payment from the home country to the ROW. They imply an outflow of foreign currency.
- **Credit** items in the BP reflect transactions that give rise to a payment to the home country from the ROW. They imply an inflow of foreign currency.

In an accounting sense the balance of payments is always in equilibrium. However, this does not necessarily happen in economic terms:

- **Equilibrium**: Credits = Debits
- **Surplus**: Credits > Debits
- **Deficit**: Credits < Debits

Categories of BP transactions

I.- Goods and services

II.- Unilateral transfers (gifts)

III.- Long-term capital (private and public)

IV.- Short-term private capital

V.- Short-term public capital

Specific types of transactions for each of our five categories

Debits (-) (Outflows of money)

- Imports of goods
- Imports of services

- Unilateral transfers made

- Increase in LT foreign assets owned by home country
- Decrease in LT home assets owned by foreign countries

- Increase in ST foreign assets owned by home private citizens
- Decrease in ST home assets owned by foreign private citizens

- Increase in ST foreign assets owned by home government
- Decrease in ST home assets owned by foreign governments

Category I

Category II

Category III

Category IV

Category V

Credits (+) (Inflows of money)

- Exports of goods
- Exports of services

- Unilateral transfers received

- Decrease in LT foreign assets owned by home country
- Increase in LT home assets owned by foreign countries

- Decrease in ST foreign assets owned by home private citizens
- Increase in ST home assets owned by foreign private citizens

- Decrease in ST foreign assets owned by home government
- Increase in ST home assets owned by foreign governments

The BP is traditionally made up of two sub accounts:

- The **Current Account (CA = Categories I and II)**, which refers to income flows. It essentially reflects sources and uses of national income.
- The **Capital Account (K = Categories III, IV and V)**, which records flows of financial capital (changes in assets and liabilities).
 - Capital inflows come from:
 - Borrowing money from foreigners
 - Selling foreign financial assets to foreigners
 - Investing in the country by foreigners
 - Capital outflows come from:
 - Lending money to foreigners
 - Buying home financial assets to foreigners
 - Investing in the foreign country by nationals.

Balance of payments of Europe

Current Account		
(1) Exports of goods	+ 150	
(2) Imports of goods	- 200	
(3) Trade Balance	- 50	sum rows (1) + (2)
(4) Exports of services	+ 120	
(5) Imports of services	- 160	
(6) Interest, profits and dividends received	+ 20	
(7) Interest, profits and dividends paid	- 10	
(8) Unilateral receipts	+ 30	
(9) Unilateral payments	- 20	
(10) Current account balance	- 70	sum (3) to (9) inclusive
Capital Account		
(11) Investment Abroad	- 30	
(12) Short term lending	- 60	
(13) Medium and long term lending	- 80	
(14) Repayment of borrowing to ROW	- 70	
(15) Inward Foreign investment	+ 170	
(16) Short term borrowing	+ 40	
(17) Medium and long term borrowing	+ 30	
(18) Repayments on loans received from ROW	+ 50	
(19) Capital account balance	+ 50	sum (11) to (18) inclusive
(20) Statistical error	+ 5	zero minus [(10) + (19) + (24)]
(21) Official settlements balance	-15	sum (10) + (19) + (20)
(22) Change in reserves rise (-), fall (+)	+ 10	
(23) IMF borrowing from (+) repayments to (-)	+ 5	
(24) Official financing balance	+ 15	(22) + (23)

Notes: ROW stands for rest of the world. The official financing balance is equal in magnitude but opposite in sign to the official settlements balance.

(24) This is in order for the BP to be in equilibrium; thus, changes in international reserves are presented with the sign changed: a + means a fall in reserves; a - means an increase in reserves.