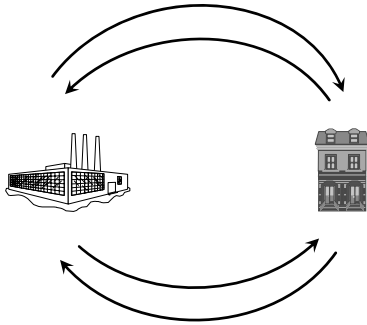


**International Financial Markets**  
**3. Macro Economic Policy and International Financial Markets**



**3. Macro Economic Policy and International Financial Markets**

- 3. Macro Economic Policy and International Financial Markets
  - 3.1. How Central Banks Work
  - 3.2. Central Banks and International Financial Markets
    - 3.2.1. The interest rate parity channel
    - 3.2.2. The purchasing power parity channel

Literature:<sup>1)</sup>

- Chapter 3, Fell, Lindsay (2000): Financial Products and Markets, Continuum, London.
- Chapter 25, 26 Kohn, Meir (1994): Financial Institutions and Markets, McGraw-Hill, New York.
- Chapter 18, Mankiw, N.G. (2001): Principles of Economics, Harcourt Coll. Publ., Orlando.

<sup>1)</sup> The recommended literature typically includes more content than necessary for an understanding of this chapter. Relevant for the examination is the content of this chapter as presented in the lectures.

**3.1. How Central Banks Work**

► How people get central bank money

- There are four principle ways, how central banks get their money among the people:
  1. Buying securities on capital markets
  2. Lending money to commercial banks
  3. Buying foreign currencies on foreign exchange markets
  4. Buying gold
- The first three types of transactions
  - ◆ decrease domestic interest rates and exchange rates in the short run
  - ◆ and increase domestic prices of goods in the medium run.
- Both effects have a significant consequences for the interaction of the local economy with international financial markets.

**3.1. How Central Banks Work**

	Eurosystem's net assets in gold and foreign currency	Main refinancing operations	Longer-term refinancing operations	Other factors (net)	Central government deposits with the Eurosystem	Base money	Credit institutions' current accounts	Banknotes in circulation
	1	2	3	10	9	12	11	8
2006	327.0	313.1	120.0	66.4	54.9	771.8	173.2	598.6
2007	327.5	173.0	278.6	26.6	61.9	841.9	196.8	644.6
2008 15 Jan.	343.8	255.7	268.8	116.4	46.4	870.2	200.9	668.2
12 Feb.	353.6	173.8	268.5	110.7	51.7	854.5	202.4	651.7
11 Mar.	343.3	181.3	268.5	125.0	59.7	858.7	205.3	653.2
15 Apr.	349.4	181.5	278.6	124.8	66.4	870.3	207.5	662.1
13 May	364.5	174.4	285.0	112.2	68.8	876.6	208.6	667.6
10 June	375.0	172.8	287.9	111.5	67.3	879.7	208.1	671.4
8 July	376.4	185.4	275.4	118.3	64.9	890.3	212.7	677.2
12 Aug.	374.5	166.3	299.3	123.0	61.3	901.2	214.8	686.1

Monetary Instruments of the ECB = Provision of Money to the Economy

Absorption of Money by Governments (Deposit Accounts) and commercial banks (Minimum Reserve Requirements)

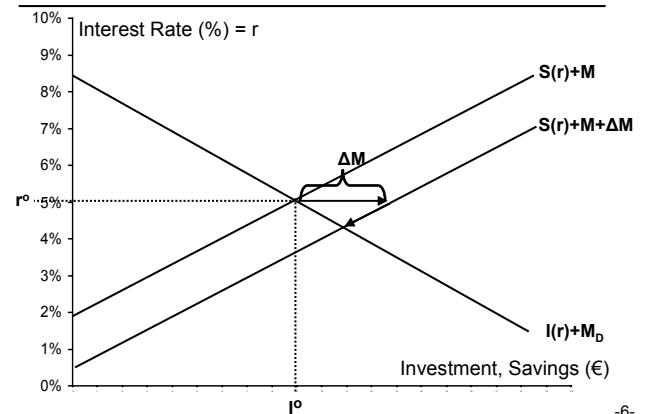
Source: ECB Monthly Bulletin, Table 1.4. Minimum reserve and liquidity statistics

**3.1. How Central Banks Work**

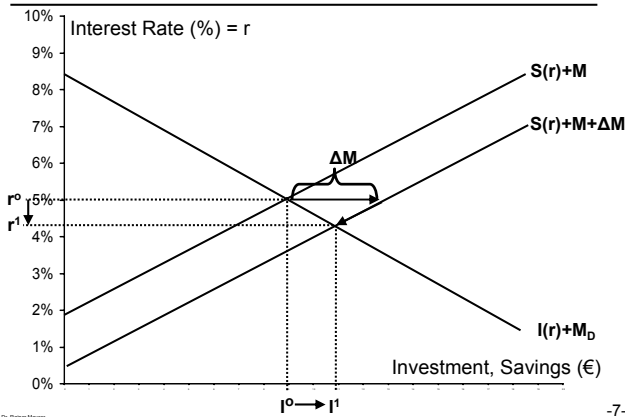
1. Buying securities on capital markets

- This type of transaction is also called "open market operation".
- Some central banks, like the Federal Reserve of America (Fed) mainly use open market operations, i.e. they buy government bonds, to inject their money into the economy. Others, like the ECB are not allowed to buy government bonds (Article 101 §1 of the EC-Treaty). The ECB does primarily inject its money via credits to commercial banks.
- Buying bonds means increasing credit supply.
- Everything else unchanged, an increase in credit supply decreases interest rates.

**3.1. How Central Banks Work**



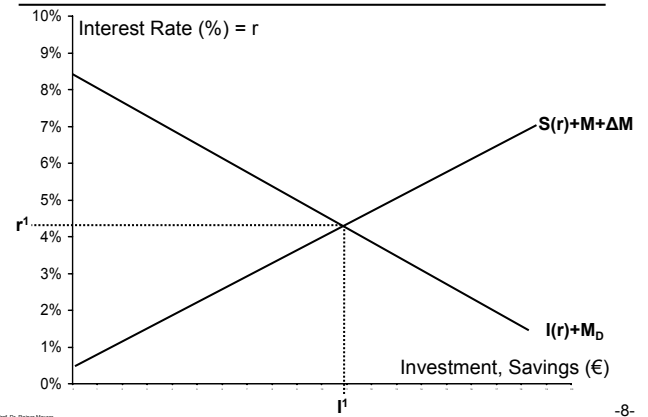
### 3.1. How Central Banks Work



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### 3.1. How Central Banks Work



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### 3.1. How Central Banks Work

#### 2. Lending money to commercial banks

- This type of transaction is also called “main refinancing operation”.
- A “main refinancing operation” of the European Central Bank is typically a money auction.
- The “auction price” is the interest rate banks are offering for a certain amount of central bank money.

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### 3.1. How Central Banks Work

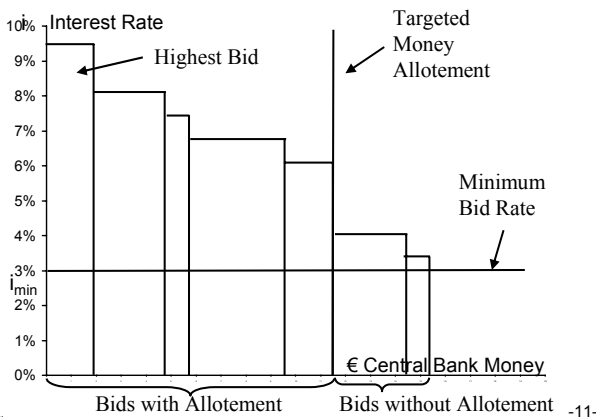
#### ► Lending money to commercial banks

- The special type of money auction the European Central Bank (ECB) prefers is called “american interest tender”:
  - ◆ The ECB announces a minimum bid interest rate.
  - ◆ Banks name an interest rate equal or higher than the minimum bid rate and the quantity of money they demand for this interest rate.
  - ◆ The ECB ranks these offers according to the magnitude of interest rates.
  - ◆ The ECB allocates central bank money starting with the bank with the highest interest rate bid to banks with lower bids as long as all the money the ECB wants to auction is allocated.
  - ◆ Each bank who gets an allocation of central bank money, has to pay the interest rate of its individual bid.

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### American Interest Rate Tender



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### 3.1. How Central Banks Work

#### ► Lending money to commercial banks

- How to make sure that banks bid for central bank money?
  - ◆ The minimum bid rate must be lower than the market interest rate for credits with the same maturity without credit supply by the central bank.
- What do commercial banks do with central bank money?
  - ◆ Deposit money: If commercial banks take 1€ cash from the central bank and offer it to private households and firms as a credit on a deposit account, they find that only a fraction “ $c$ ” (e.g.  $c = 20\%$ ) of this money is withdrawn in form of cash.
  - ◆ Why? The reason is that we live in a world, were a lot of transactions can be paid without cash:
    - In many shops we can pay with credit cards or “e-money”.
    - Many bills (salaries, rents etc.) are paid with cashless bank transfers or checks.

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### 3.1. How Central Banks Work

- ◆ Hence deposit money, which is the base for all these cashless transfers, can be used instead of cash.
- ◆ Since deposit money too flows in a circle (e.g. from firms to workers in form of wages and than back form workers to firms when workers pay for their purchases of goods and services with EC-cards) it is used again and again as a means of payment without being withdrawn in cash (even though this is always possible).
- ◆ As a consequence, the following equation holds:

Money Withdrawn from Banks = Banks' Stocks of Cash

⇔ Deposit Money Credits \* c = Banks' Stocks of Cash

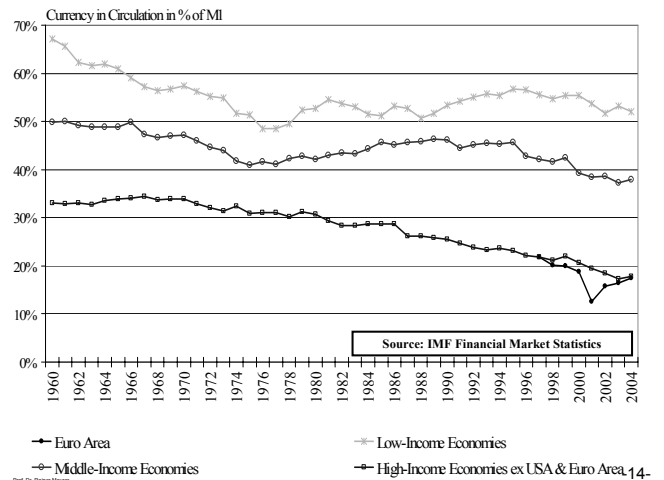
⇔  $M * c = B$

⇔  $M = B / c$

⇒  $M > B$  if  $c < 100\%$

⇒ Deposit Money Credits > Central Bank Money if  $c < 100\%$

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### 3.1. How Central Banks Work

- As these empirical observations show, the cash ratio is not stable in reality.
  - Therefore commercial banks typically hold always a certain amount of additional cash as “security reserve” also called “excess reserves”.
- Additionally in most countries commercial banks are required to hold cash reserves by law.
  - Therefore, assuming that the “required reserve” ratio plus the “excess reserve” ratio add up to “r” we can rewrite the above formula as:
 
$$\text{Deposit Money Credits} * (c+r) = \text{Banks' Stocks of Cash}$$

$$M * (c+r) = B$$

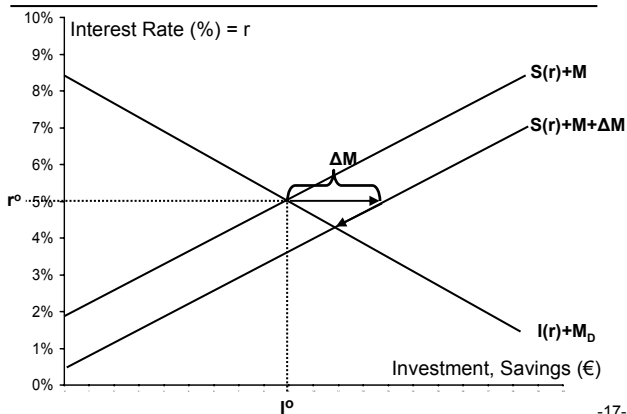
$$M = B / (c+r)$$
- Consequently, “reserves” reduce somewhat the capacity to create “deposit money”.
- “ $1 / (c+r)$ ” is called the “money multiplier”.

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### 3.1. How Central Banks Work

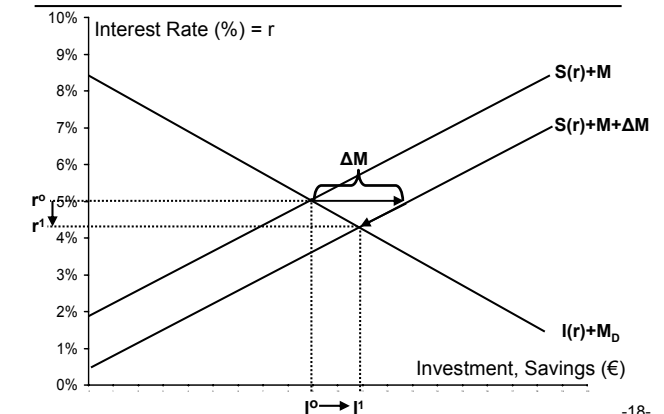
- “M” is also called “M1”, or “Narrow Money” or simply “Money”.
- “M” equals the sum of deposit money plus cash supplied by the central bank “B” minus reserves of commercial banks “r\*M”.
- Consequently, how does central bank “lending money to banks” affect the credit market?
  - In the same way as open market transactions affect the credit market:
    - ◆ It increases credit supply so that interest rates decrease.
    - ◆ This is shown by the following graphs:

### 3.1. How Central Banks Work



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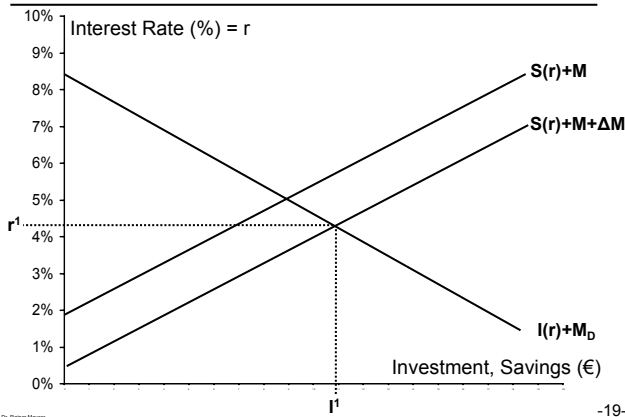
### 3.1. How Central Banks Work



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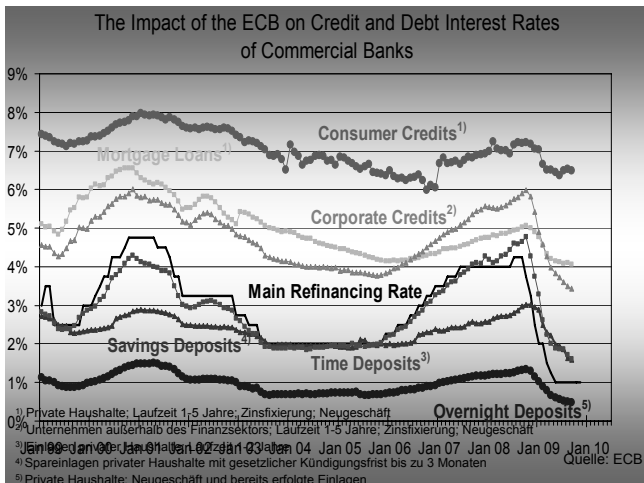
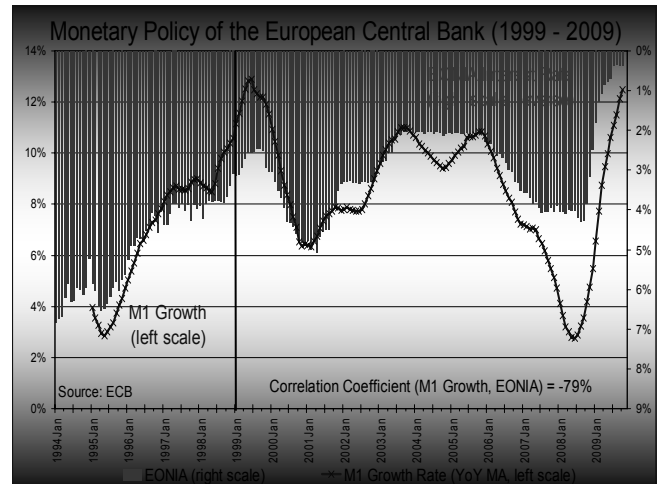
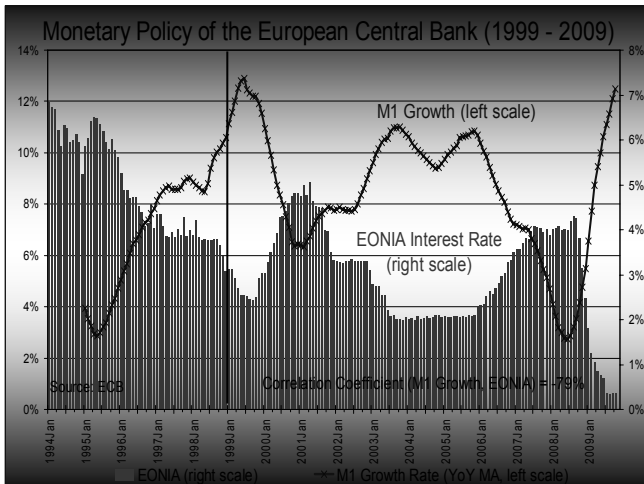
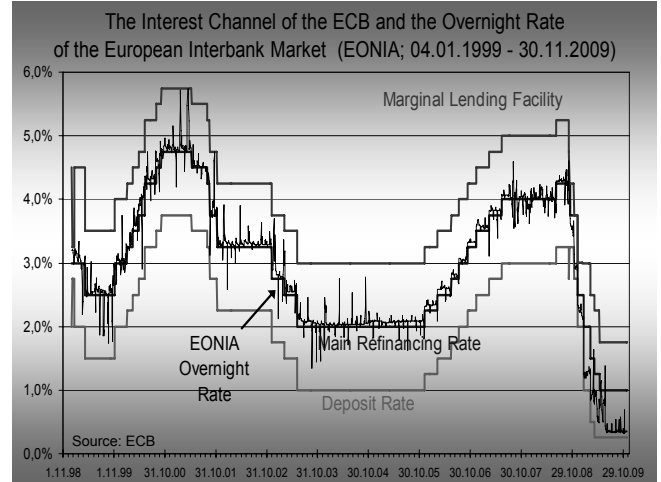
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### 3.1. How Central Banks Work



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### 3.1. How Central Banks Work

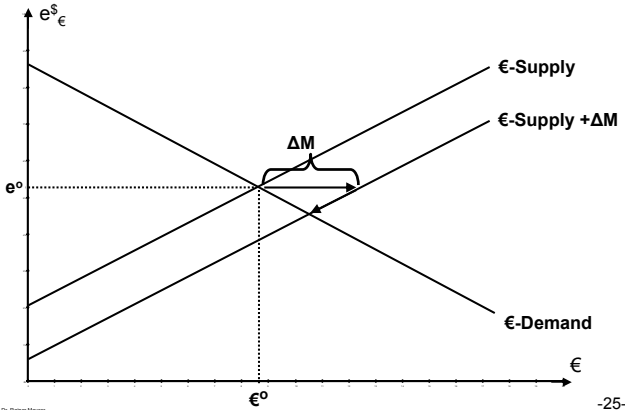
#### 3. Buying foreign currencies on foreign exchange markets

- This type of transaction is also called "foreign exchange market operation".
- Central banks buy foreign currency and pay with domestic currency.
- Consequently, buying foreign currency increases the quantity of central bank money.

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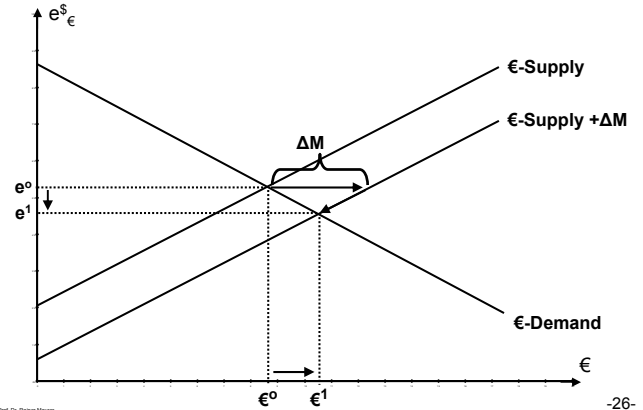
### The Foreign Exchange Market



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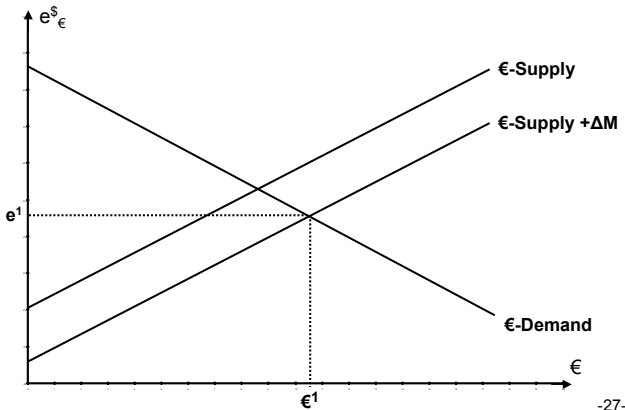
### The Foreign Exchange Market



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### The Foreign Exchange Market



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### 3.1. How Central Banks Work

- So far the analysis has shown the „first order effects” of central bank policy:
  - Open market operations (buying bonds) and main refinancing operations (auctioning central bank money to banks) both increase the supply of credits and consequently decrease the interest rate.
  - Exchange market operations (buying foreign currencies) increase the supply of domestic currency on the exchange market and consequently decrease the exchange rate (=depreciation of domestic currency).
- However, a decrease in the domestic interest rate or an depreciation of the domestic currency affect the prices of other markets too.
- These “second order effects” are analyzed in the following.

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### 3.1. How Central Banks Work



*"And please let Alan Greenspan accept the things he cannot change, give him the courage to change the things he can and the wisdom to know the difference."*

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### 3.2. Central Banks and International Financial Markets

#### 3. Macro Economic Policy and International Financial Markets

##### 3.1. How Central Banks Work

##### 3.2. Central Banks and International Financial Markets

##### 3.2.1. The interest rate parity channel

##### 3.2.2. The purchasing power parity channel

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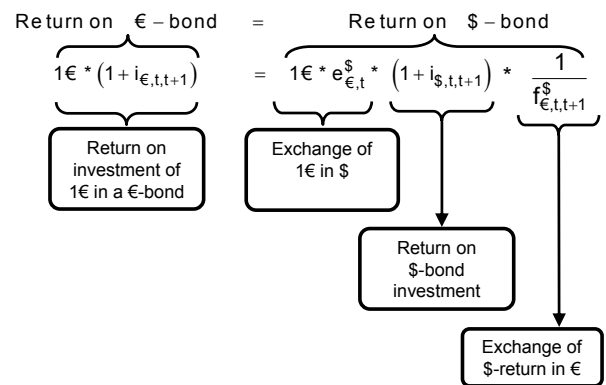
### 3.2.1. The interest rate parity channel

- We know from our discussion of foreign exchange markets that there is an arbitrage relation between the domestic and foreign capital market:
  - If the interest rate in the domestic credit market is lower than in a foreign credit market,
    - ◆ domestic savers will offer their savings to the foreign credit market and
    - ◆ foreign investors will demand credits from the domestic credit market.
  - Both actions
    - ◆ will increase the demand for foreign currency and hence will give rise to devaluation pressure against the domestic currency
    - ◆ increase the credit supply (decrease the credit demand) on the foreign credit market and hence give rise to an interest rate decrease in the foreign credit market.

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### 3.2.1. The interest rate parity channel

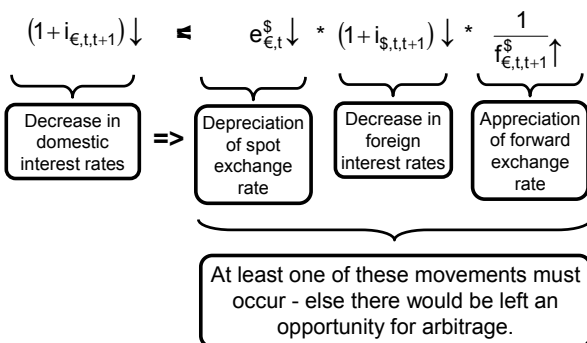


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### 3.2.1. The interest rate parity channel

Increase in domestic money supply :  $\Delta M_{\text{€}} > 0 \Rightarrow i_{\text{€},t,t+1} \downarrow \Rightarrow$



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### 3.2.1. The interest rate parity channel

- We have discovered the following causal chain:
  - Increase in Domestic Money Supply
    - => Decrease in Domestic Interest Rate
      - => Increase in Demand for Foreign Spot Currency
        - => Depreciation of Domestic Currency
      - => Increase in Credit Supply to Foreign Credit Market
        - => Decrease in Foreign Interest Rate
      - => Increase in Demand for Domestic Forward Currency
        - => Appreciation of Domestic Forward Currency
  - This causal chain evolves only, if no other effects occur (= c.p.)
  - The strength of each effect depends on the empirical size of the market parameters (= slopes of demand and supply curves).

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### 3.2.1. The interest rate parity channel

- Interdependency of Foreign and Domestic Capital Markets:
  - Our analysis shows:
    - ◆ The monetary policy of the European Central Bank (ECB) affects the capital markets in all countries whose capital markets are open for savers of the European Currency Union (ECU) – and vice versa.
    - ◆ Internationally open capital markets imply interdependency of national monetary politics.

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## 3.2. Central Banks and International Financial Markets

### 3.2.2. The purchasing power parity channel

- 3. Macro Economic Policy and International Financial Markets
  - 3.1. How Central Banks Work
  - 3.2. Central Banks and International Financial Markets
    - 3.2.1. The interest rate parity channel
    - 3.2.2. The purchasing power parity channel



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### 3.2.2. The purchasing power parity channel

- Effects of monetary policy, which run over the interest parity channel affect financial markets in the short-term.
- There is however a medium- / long-term effect of monetary policy on the exchange rate, which we have not analyzed so far:
  - The Purchasing Power Channel

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### 3.2.2. The purchasing power parity channel

- The Purchasing Power Channel :
    - Increase in Domestic Money Supply:  $\Delta M_e > 0$ 
      - => Decrease in Domestic Interest Rate:  $i \downarrow$ 
        - => Increase in Domestic Investment:  $I(i \downarrow) \uparrow$
        - => Increase in Domestic Consumption:  $C(i \downarrow) \uparrow$
      - => Devaluation of Domestic Currency:  $P_e * e^s_e \downarrow < P_s$ 
        - => Increase in Domestic Exports:  $EX(e^s_e \downarrow) \uparrow$
        - => Decrease in Domestic Imports:  $IM(e^s_e \downarrow) \downarrow$
- // => Increase in Demand for Domestic Goods:  $Y_D \uparrow = C \uparrow + I \uparrow + EX \uparrow - IM \downarrow$   
=> Domestic Excess Demand:  $Y_D > Y_S$   
=> Increase in the Domestic Price Level:  $P_e \uparrow$

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### 3.2.2. The purchasing power parity channel

- The Purchasing Power Channel:
  - Increase in Domestic Money Supply
    - ...=> Increase in The Domestic Price Level:  $P_e \uparrow$
    - => Tendency towards a Reestablishment of Purchasing Power Parity:  $P_e \uparrow * e^s_e \downarrow = P_s$
- The Purchasing Power Channel shows:
  - There is a “built-in tendency” towards a long-run return of the exchange rate to Purchasing Power Parity.
  - If domestic monetary policy leads to a short-term depreciation of the domestic currency,  $e^s_e \downarrow$ , so that the Purchasing Power Parity is disturbed,  $P_e * e^s_e \downarrow < P_s$ , the resulting increase in demand for goods causes a long-run increase in the domestic price level, so that Purchasing Power Parity is reestablished at a lower exchange rate:  $P_e \uparrow * e^s_e \downarrow = P_s$

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### Chapter 3: Questions for Review

You should be able to answer the following questions at the end of this chapter. If you have difficulties in answering a question, discuss this question with me during or at the end of the next lecture or attend my colloquium.

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### Chapter 3: Questions for Review

1. How get central banks their money among the people?
2. What is the “first order effect” of an “open market operation”?
3. What is the “first order effect” of an “main refinancing operation”?
4. What effect has the “cash ratio” on credit supply?
5. Explain the “money multiplier”.
6. What is the “first order effect” of an “foreign exchange market operation”?
7. What is an American interest tender?
8. Why can banks create “deposit money” out of central bank money?

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### Chapter 3: Questions for Review

7. How does an increase in the domestic supply of central bank money affect the foreign exchange spot rate, the foreign exchange forward rate and foreign capital markets, when everything else stays unchanged (complete causal chain)?
8. Given an increase in the €-central bank money supply, what can the American Central Bank (FED) do (a) to prevent a decrease in American interest rates (b) to prevent the \$ to appreciate against the Euro.
9. What is the long run effect of an increase in a central bank money supply on the foreign exchange spot rate and the domestic price level (complete causal chain)?

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### Chapter 3: Questions for Review

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10. Explain the “interest rate parity channel” chain of monetary policy.
11. Explain the “purchasing power parity channel” chain of monetary policy.