Macroeconomics

BASICS

middle run
short run — long run

IMPORTANT WORDS

aggregate output = GDP
The unemployment rate
The inflation rate
Okuns Law & Phillips Curve

The measure of aggregate output is called gross domestic product (GDP).

GDP is the value of final goods and services produced in the economy during a given period.
GDP is the sum of value added in the economy during a given period.
GDP is the value of incomes in the economy during a given period.

Intermediate good → Zwischen Produkt
Final good → Finales Produkt
We only count the final goods
Production side → Income side
always equal: PS = IS

NOMINAL & REAL GDP

Nominal GDP is the sum of the quantities of final goods produced, times their current price (Q · P = N)

Real GDP is the sum of the quantities of final goods times constant prices. (→ Basisjahr)

Y = Real GDP t = Zeitpunkt

€Y = Nominal GDP

Can increase for two reasons:
- production of goods increases
- price of goods increases

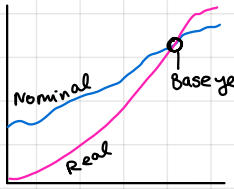
Nominal GDP is also called GDP at current prices / euros.
Real GDP is also called GDP in terms of goods / in constant euros / adjustet for inflation / in (base year) prices.

Real GDP in chained prices reflects relative prices that change over time.

Example:

t	Stk.	P	N-GDP	R-GDP (→2009)
2008	10	20	200	240 (10 · 24)
2009	12	24	288	288 (12 · 24)
2010	13	26	338	312 (13 · 24)

Base year ↓ (2009)
chained prices ↓ (24)



Hedonic pricing
→ Bewertungsmethode in case of changing quality. Example:
Quality increase of 18%
Price decrease of 7% } 25%
Quality-adjusted price has fallen by about 25%


UNEMPLOYMENT RATE

Labour Force = employment + unemployment

L = N + U

- Unemployment is the number of people who do not have a job, but are looking for one
  - ↳ Not in the labour force: Mothers at home, kids, retired people, injuried, etc

The unemployment rate is the ratio of the number of people who are unemployed to the number of people in the labour force. u = U/L

unemployment rate = unemployment / labour force

Discouraged workers are those, who give up looking for a job and so no longer counted as unemployed.

The participation rate is the ratio of the labour force to the total population of working age.

Background + Importance
→ Effect on welfare of the unemployed
→ Signal economy is not using human resources efficiently
→ Low unemployment rate can lead to labour shortages

INFLATION RATE

Inflation is a sustained rise in the general level of prices.

The inflation rate is the rate at which the price level increases.

Deflation is a sustained decline in the price level.

Background + Importance
→ Affects income distribution when not all prices and wages rise proportionally
→ Leads to distortions (Verzerrung) due to uncertainty, some prices that are fixed by law or regulation, and its interaction with taxation.
→ Best rate of inflation: 1-4%

GDP DEFLATOR

The GDP deflator in year t (P_t) is the ratio of nominal GDP to real GDP in year t.

$$P_t = \frac{\text{Nominal GDP}_t}{\text{Real GDP}_t} = \frac{€Y_t}{Y_t}$$

GDP Deflator

→ Is called an index number

Nominal GDP is equal to the GDP deflator times real GDP.

$$€Y_t = P_t \cdot Y_t$$

The rate of change = rate of inflation

$$\pi_t = \frac{(P_t - P_{t-1})}{P_{t-1}}$$

rate of change; GDP Deflator; previous year

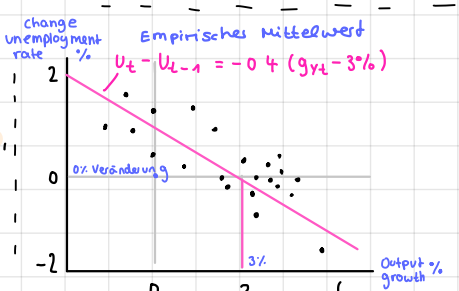
Example:
Real GDP Y_{2020} = 1000
Nominal GDP $€Y_{2020}$ = 1100
GDP Deflator P_{2019} = 1

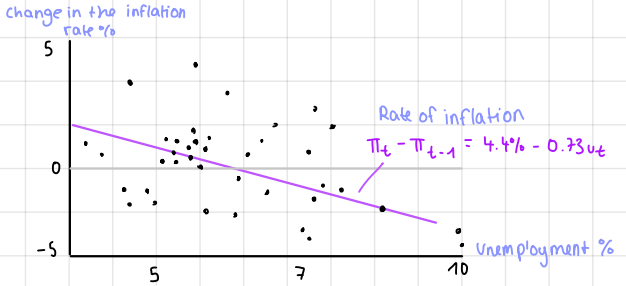
$P_{2020} = \frac{1100}{1000} = 1{,}1$ → GDP Deflator

$\pi_{2020} = \frac{(1{,}1 - 1)}{1} = 0{,}1 = 10\%$ rate of inflation

Rate of growth of nominal GDP is equal to the rate of inflation plus the rate of growth of real GDP.

rate of inflation = rate of growth of real GDP + rate of growth of nominal GDP





OKUNS LAW Output growth that is higher than usual is associated with a reduction in the unemployment rate. Output growth that is lower than usual is associated with an increase in the unemployment rate.

PHILLIPS CURVE A low unemployment rate leads to an increase in the inflation rate. A high unemployment rate leads to a decrease in the inflation rate.

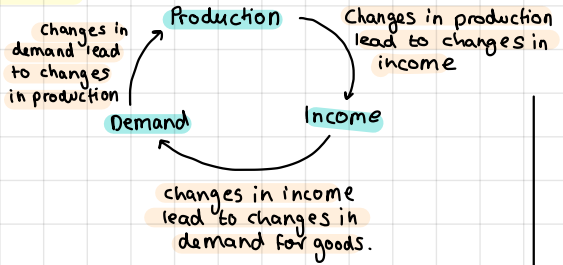
Short run = movement in output driven by movement in demand
medium run = level of output determined by supply factors
long run = economy depends on ability to innovate.

Macroeconomics

THE GOODS MARKET

THE SHORT RUN

Year-to-year movements focus is on production, income and demand:



Composition of GDP example:

		Billions of euros	Per cent of GDP
	GDP (Y)	13,958	100
1	Consumption (C)	7,696	55
2	Investment (I)	2,707	19
3	Government spending (G)	2,920	21
4	Net exports	338	2.8
	Exports (X)	6,019	43
	Imports (IM)	−5,631	−40
5	Inventory investment	12	0.1

THE COMPOSITION OF GDP

Consumption (C): goods and services purchased by consumers (total demand).

Investment (I) or fixed investment: The sum of nonresidential investment and residential investment.

Government spending (G): Purchases of goods and services by the federal, state and local governments; excluding government transfers.

Exports (X): Purchases of domestic goods and services by foreigners.

Imports (IM): Purchases of foreign goods and services by domestic consumers, domestic firms and the domestic government.

Net exports or trade balance
$= X - IM$
$X > IM$ = trade surplus
$IM > X$ = trade deficit

Inventory investment:
Difference between production and sales.
→ Produced but not sold → Investment

DEMAND FOR GOODS

Consumption (C) is a function of disposable income (Y_D).

Y_D = Income after Government transfers and paying taxes. $Y_D \equiv Y - T$

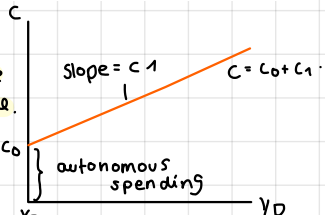
Consumption function: $C = C \cdot (Y_D)$ → behavioural equation

$C = (C_0 + C_1) \cdot Y_D$

C_0: what people consume if Y_D equals zero. → Autonomous Consumption

C_1: Propensity (Neigung) to consume

Consumption increases with disposable income but less than one for one. A lower value of C_0 will shift the entire line down.



$C = C_0 + C_1 (Y - T)$ (Y_D)

Higher income → Higher Consumption

Open economy: Total demand $Z \equiv C + I + G + X - IM$

Closed economy: $Z \equiv C + I + G$

Endogenous variables: Depending on other variables.

Exogenous variables: Not explained and taken as given to solve a model.

$I = \bar{I}$ (variable / taken as given)

T (taxes) and G (government spendings) describe the fiscal policy and are independent → exogenous

DETERMINATION OF EQUILIBRIUM OUTPUT

Assume $X = IM = 0$ (closed economy), so $Z \equiv C + I + G$

Replacing C and I from previous equations: $Z \equiv C_0 + C_1 (Y - T) + \bar{I} + G$

Equilibrium in the goods market requires $Y = Z$. This is an equilibrium condition.

Replacing $Y = Z$ with equation: $Y = C_0 + C_1 (Y - T) + \bar{I} + G$

Production = income = demand. In equilibrium it is equal.

Rewrite equation: $Y = C_0 + C_1 \cdot Y - C_1 \cdot T + \bar{I} + G$

characterises equilibrium output in algebra:

Reorganise the equation: $(1 - C_1) \cdot Y = C_0 + \bar{I} + G - C_1 T$

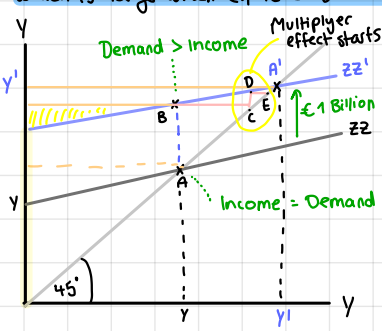
Devide both sides by $(1 - C_1)$: $Y = \frac{1}{1 - C_1} [C_0 + \bar{I} + G - C_1 \cdot T]$

More income → more consumption → higher equilibrium

Autonomous spending (doesn't depend on income)

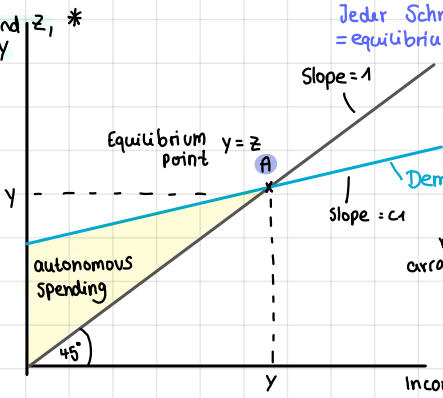
Total Demand, Z; Production, Y

This term is the multiplier, which is large when C_1 is closer to 1.



Equilibrium output is determined by the condition that production is equal to demand.

An increase in autonomous spending has a more than one-for-one effect on equilibrium output.



IS-RELATION

Private saving
public saving

Private saving (S): $S \equiv Y_D - C$; $S \equiv Y - T - C$

Public saving $\equiv T - G$: Budget surplus > 0 < Budget deficit

Herleitung:

In equilibrium: $Y = C + I + G$ (Z) $|-T/-C$

$Y - T - C = I + G - T$

$S = I + G - T$ (umgeschrieben)

$I = S + (T - G)$

This is the IS relation = Investment equals Saving

Production = Demand
Investment = Saving

Consumption behaviour:

$S \equiv Y - T - C$

$= Y - T - C_0 - C_1 \cdot (Y - T)$ (rearranging)

$S = -C_0 + (1 - C_1) \cdot (Y - T)$

propensity to save between 0 and 1.

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FINANCIAL MARKETS

BASICS

Money attribute

- Medium of exchange
- Store of value
- Unit of a count

money = + transactions
- no interest

→ currency (cash)
→ deposit (bank account)

bonds = + positive interest rate i
- no transactions

Bond = Anleihe

Investor —loan €→ borrower (Government)
.... after time .....
Investor ←€ + interest rate—

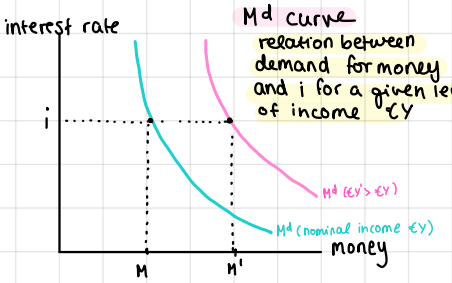
DEFINITIONS

money = pay for transactions
income = what you earn (flow)
saving = value of accumulation over time
financial wealth = value of financial assets minus financial liabilities → stock variable
investment = purchase of a new capital good
financial investment = purchase of shares or other financial assets

DEMAND FOR MONEY

Demand for money: $M^d = €Y \cdot L(i)$ (Nominal income (+), decreasing function of interest rate i (−))

Increase in interest rate decreases demand for money, because more people put their wealth into bonds.



Given bond payment per years: 100 €
Price of bond today: $€P_B$
Interest rate on bond: $i = \frac{€100 - €P_B}{€P_B}$

The higher the bond price, the lower the interest rate.
The higher the interest rate, the lower the price today.

DETERMINING THE INTEREST RATE

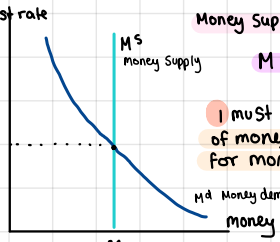
Ausgangspunkt: Central bank supplys an amount of money equal to M:

Money supply (amount): $M^s = \bar{M}$

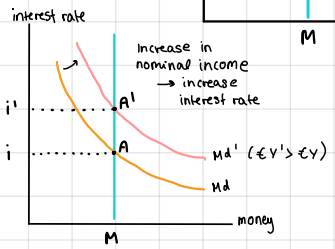
Equilibrium in financial markets requires that: $M^s = M^d = M$

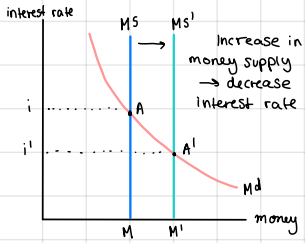
Money Supply = Money demand
$M = €Y \cdot L(i)$

Supply of money → independant to i
Demand of money → depends on i



i must be, that supply of money and i of demand for money equals each other.





Central banks change supply of money by buying or selling bonds in the bond market → open market operations

Central bank expands the supply of money by buying bonds → Expansionary open market operation

Central bank contracts the supply of money by selling bonds → Contractionary open market operation

Assets	Liabilities
Bonds	Money

→ Expansionary open market operation ↓

Assets	Liabilities
Change bonds holdings + €1 Mio	Change money stock + €1 Mio

PART TWO

Financial intermediaries: Finanzielle Vermittler
→ Receive funds from people and firms and use these to buy financial assets or to make loans to other people and firms

Example: Bank (money = liabilities), keep some funds as reserves (Resesven)

The liabilities of the central bank are the money it has issued, called central bank money. →

Assets	Liabilities
Bonds	Central bank money = Reserves + Currency

} Central Bank

Reserves Loans Bonds	Deposit Accounts

} Banks

No currency → demand money = demand chequeable deposits

$M^d = €Y \cdot L(i)$

Demand reserves bank depends on amount of chequeable deposits

$H^d = \theta \cdot M^d = \theta \cdot €Y \cdot L(i)$

θ = reserve ratio
H^d = demand high-power money

H denotes the supply of central bank money, then equilibrium condition:

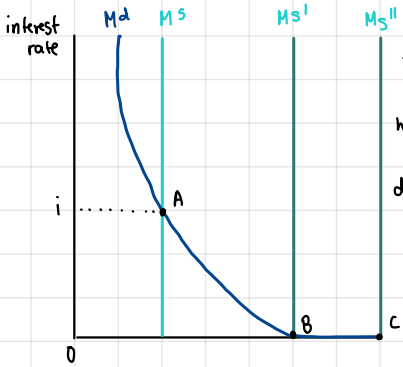
$H = H^d$
$H = \theta\ €Y \cdot L(i)$

Increase in H → decrease i
Decrease in H → increase i

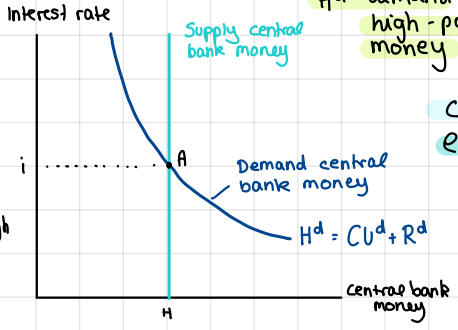
LIQUIDITY TRAP

Zero lower bound: The interest rate cannot go below zero.

Economy is in a liquidity trap when the interest rate is down to zero, monetary policy cannot decrease it further.



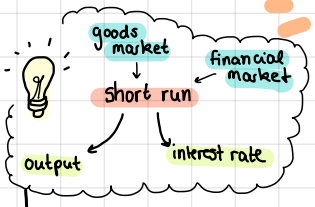
i = 0
→ people have enough money
→ holding money & bonds (gleichgültig)
→ demand money horizontal
→ i doesn't change



Supply central bank money = demand central bank money

Macroeconomics

THE IS-LM MODEL



↳ Framework: IS-LM model by Hicks & Hansen

THE GOODS MARKET + IS RELATION

① Investment (I) depends on production (Y) and the interest rate (i)

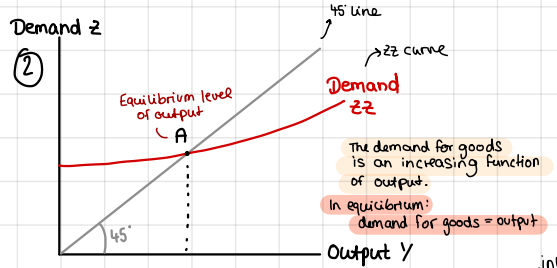
$I = I \cdot (Y, i)$ so equilibrium in goods market:

$Y = C \cdot (Y-T) + I \cdot (Y, i) + G$ (output; + , −)

C: consumption (disposable income); I: investment (production + interest rate); G: Governmental spendings

Investment equals savings ← IS relation

② Demand Z



The demand for goods is an increasing function of output.

In equilibrium: demand for goods = output

→ ZZ is upward sloping because:

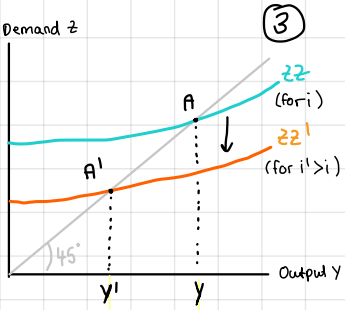
interest rate —increase→ output —increase→ demand

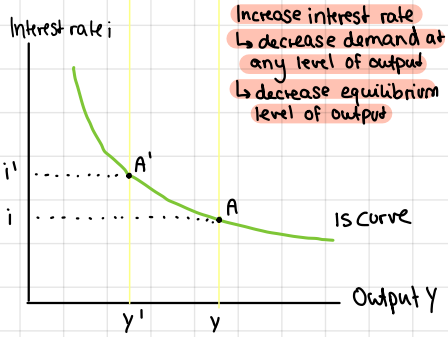
because of its effects on consumption and investment

→ ZZ = curve, ZZ ≠ line
↳ not linear

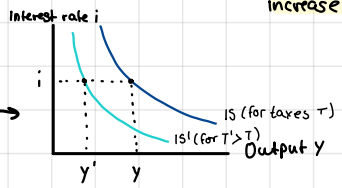
→ ZZ = flatter than 45° line
↳ increase in output → less than one-for-one increase in demand

③ Demand Z





Increase interest rate
↳ decrease demand at any level of output
↳ decrease equilibrium level of output



An increase in taxes shifts the curve left.

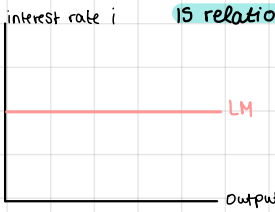
FINANCIAL MARKETS and the LM RELATION

$M = \epsilon Y \cdot L(i)$ ← devide by the price level

$\frac{M}{P} = Y \cdot L(i)$ → LM Relation

In equilibrium, real money supply equals the real money demand, which depends on real income Y and the interest rate i.

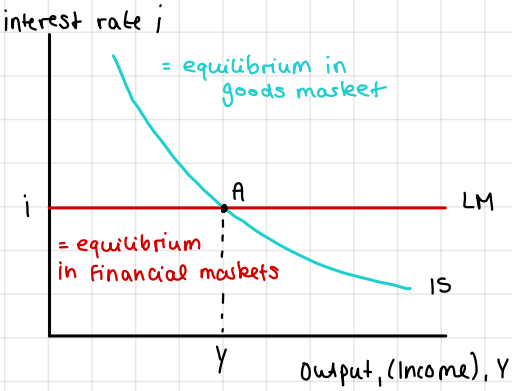
The central bank chooses the interest rate (and adjusts the money suppply so as to achieve it.



IS relation: $Y = C(Y-T) + I(Y, i) + G$

LM relation: $i = \bar{i}$

The IS and LM relation together determine output.



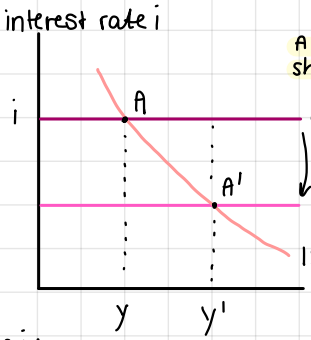
PUTTING IS and the LM RELATIONS TOGETHER

- Equilibrium in the goods market implies that an increase in the interest rate leads to a decrease in output.
- This is represented by the IS-curve.
- Equilibrium in financial markets is represented by the horizontal LM curve.
- Only in point A, which is in both curves, are both goods and financial markets in equilibrium.

Monetary Policy:

Increase in M
↔ monetary expansion

Decrease in M
↔ monetary contraction
↔ monetary tightening

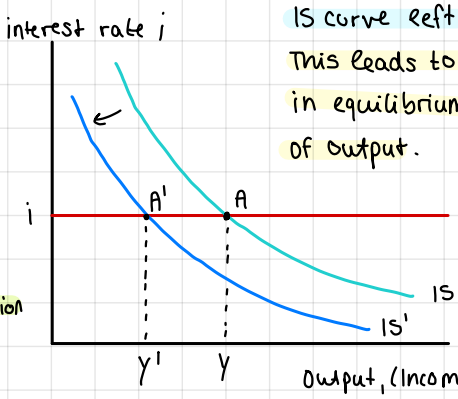


A monetary expansion shifts the LM curve down and leads to higher output (lower interest rate → investment increases).

Fiscal policy:

Decrease in G-T
→ fiscal contraction ↔ fiscal consolidation

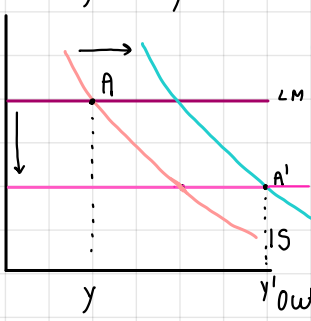
Increase in G-T
→ fiscal expansion



An increase in taxes shifts the IS curve left. This leads to decrease in equilibrium level of output.

POLICY MIX

- Monetary-fiscal policy mix is the combination of monetary and fiscal policies.
- Suppose, that the economy is in a recession and output is too low.
- Both fiscal and monetary policies can be used to increase output.



The fiscal expansion shifts the IS curve to the right.

A monetary expansion shifts LM curve down.

Both lead to higher output.