Task

a) Explain what is meant by the term potential output and explain what challenges the German economy faces with regard to this parameter in view of its demographic development.

b) From the given values in the table, determine mathematically exact the nominal economic growth of Germany of the year 2022. In addition, according to press reports of Jan. 25, 2023, the German government now assumes no recession this year, but rather real growth of 0.2% and an overall economic price increase of 5%. From this, determine the forecast nominal GDP for 2023 and its growth rate.

c) In the long term, a reduction in potential growth to 1% p.a. is assumed due to the difficult political and economic environment. If this is used as a basis for the real growth of the economy up to 2030 and it is assumed that nominal GDP in Germany will be 6 trillion euros in 2030, the expected average annual price development up to 2030 can be derived from this. Determine this annual average price development in percent mathematically exactly.

	GDP (nominal)	GDP-Index (nominal)	Growth rate GDP (nominal)	GDP-Index (real)	Growth rate GDP (real)	GDP-Deflator	Growth rate GDP-Deflator
2022	3,9	100,00		100,00	1,90%	100,00	6,00%
2023							
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.
2030							

Task:

a) Define the economic variable consumer price index with its quantitative components, and explain what general problem in price measurement arises from the increasingly rapid technological progress in digital products.

b) Determine the inflation rate of the year 2022 from the given values for the three goods categories *energy, industrial goods* and *other goods*.

c) Due to the price cap for energy, a constant price development for energy is assumed for the year 2023. Overall, inflation is forecast to be 10% in 2023. For the category of *other goods*, however, the price increase is expected to be only 9%. How much would the prices of industrial goods have to increase in 2023? In addition, mathematically exactly determine the annual average value of the price increase in percent for the category of *other goods* for the period from 2021 to 2023 based on the given values.

	Energy		Industrial goods		Other goods		Basket	CPI	Inflation
	Price [Euro]	weight	Price [Euro]	weight	Price [Euro]	weight			
2021	2	0,15	3	0,2	4			100	
2022	2,1	0,15	3,1	0,2	4,1				
2023		0,15		0,2					

Task:

The economic relationships in the goods and money market are given by the following functions:

$C(y)=40+0,7 \cdot y$ $\qquad$ $I(i)=10-20i$ $\quad$ $G=10$ $\quad$ $L(y,i)=2y-100i$ $\qquad$ $M=400$ $p=4$

y:= Income; i:= interest rate; m:= real money ; G:= government expenditure; C(y):= consumption; I(i):= Investment; L(y,i):= money demand; M:= nominal money; p:= price level

a) Determine the functional relationship of the average consumption rate as a function of income y, and from this explain the economic significance of autonomous consumption $c_0=40$.

b) Determine graphically and mathematically the simultaneous equilibrium in the money and goods markets within the IS/LM model and explain qualitatively what is meant by the crowding-out effect.

c) Assume that the long-run equilibrium income y_{long} (AS-long-run) is lower than the equilibrium income as (b). Argue economically via the AD curve (qualitatively or mathematically) why the long-run price level p_{long} must then be greater than the given price level p=4.

Task:

a) Explain what is generally understood by the yield curve.

b) In a country, short-term interest rates are 0.5% and long-term interest rates are 2.5%. Determine the short-term expected interest rates according to the expected value theory.

c) Explain what is meant by liquidity premium theory and, using the given data from (b), determine approximately how high the liquidity premium would have to be in order that, together with expected value theory, this structure of the yield curve could be interpreted as a recession signal.

Task:

a) Differentiate between the concepts of real and nominal economic growth and explain the conceptual difference between the calculation of real economic growth and real interest rates.

b) In 2021, nominal GDP in Germany was 3.6 trillion euros. In 2022, GDP was 3.87 trillion euros and the macroeconomic price level increased by 5.5% compared to the previous year. Furthermore, assume a real stagnation of the overall economic performance in 2023. From this, calculate mathematically exactly the nominal and real economic growth of the year 2022, as well as assuming that nominal GDP in 2023 is 4.0 trillion. euros, calculate the (expected) overall price increase rate for 2023.

	BIP (nominal)	BIP-Index (nominal)	Wachstumsrate BIP (nominal)	BIP-Index (real)	Wachstumsrate BIP (real)	BIP-Deflator	Wachstumsrate BIP-Deflator
2021		100,00		100,00		100,00	
2022							
2023							

Task:

Assume the following functional relationships within the IS/LM model:

C(y)=80+0,8·y   I(i)=10-20i   G=20   L(y,i)=2y-100i   M=100 p=2

y:= Income; i:= interest rate; m:= real money ; G:= government expenditure; C(y):= consumption; I(i):= Investment; L(y,i):= money demand; M:= nominal money; p:= price level

a) Explain briefly the dependencies in the given money demand function, taking into account the motives of money holders.
b) Determine the equations of the IS and LM curves as well as the simultaneous equilibrium on the money and goods market within the IS/LM-model. Also, plot the equilibrium in a suitable diagram.
c) Assume a 20% increase in the price level in the course of the current price increases, and explain graphically within the IS/LM-model what effects this has on the equilibrium income and the equilibrium interest rate. Also explain how fiscal policy could be used to keep the equilibrium income at the same level as in task (b) despite the price increase.
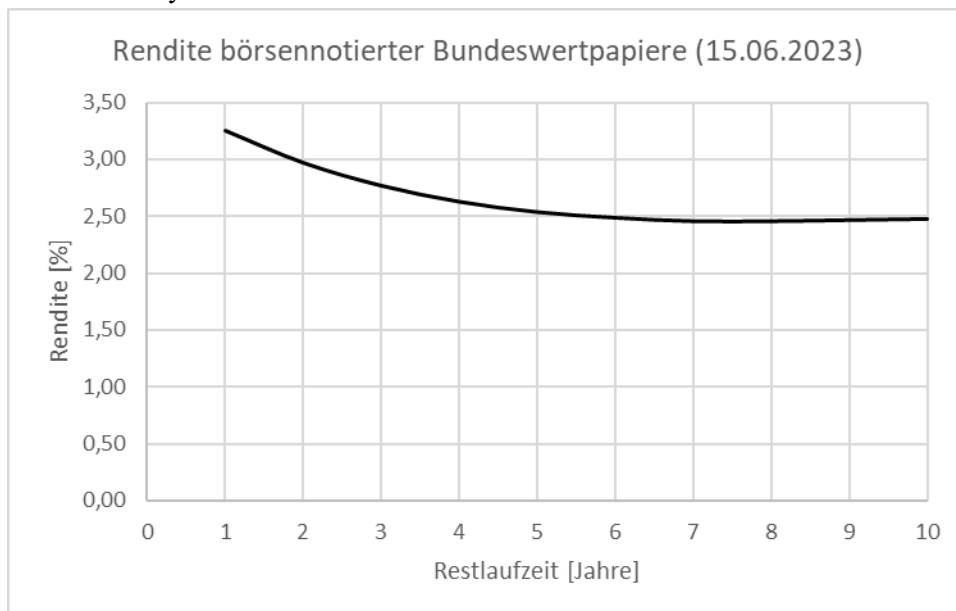
Task:

a) In July 2021, the ECB changed its inflation target based on the annual rate of change of the harmonized consumer price index in the medium term from "*close to but below 2%*" to "*symmetric around 2%*". Against the background of inflation developments over the past 10 years, explain why this change has been made, also addressing the high rates of price increases in the recent past.
b) Consider the weighted division of the CPI into the components *housing, water, electricity, gas and other fuels (WWSGB)* and *Rest* with the following given values of the years 2021 and 2022. Furthermore, use the current inflation forecast of the HRI (Handelsblatt Research Institute) of 3% for the overall index and the index value 120, for the subindex of the component *WWSGB* from in 2023. From these values, determine mathematically exact the inflation rate for 2022, the rate of change of the *Rest* component for 2023, and the (expected) average inflation rate p.a. of the *HWEGF* subcomponent.

	WWSGB		Rest		VPI	Inflation
	Index	Gewicht	Index	Gewicht		
2021	100,00	0,25	100,00	0,75		
2022	118,00	0,25	103,20	0,75		
2023		0,25		0,75		

c) After the ad hoc publication of the 2022 inflation rate for Germany in January 2023, this value has been corrected downward by one percentage point only one month later in February 2023 due to the reweighting of the CPI subcategories. Assume that the value you calculated in (b) corresponds to the currently reported inflation rate for the German economy in 2022. Given this assumption, determine the original weighting of the *HWEGF* category before the February 2023 CPI correction.

Task:

a) Explain the four different types of unemployment, especially with regard to their time horizon, giving one example each.
b) Explain the basic differences between Keynesian and neoclassical theory, especially with regard to the respective assumptions.
c) On Thursday, June 15, 2023, the ECB raised the key interest rates by another 25 basis points. Explain why, in view of the yield curve given in the diagram, this new increase is viewed controversially.

Rendite börsennotierter Bundeswertpapiere (15.06.2023)

Task:

a) Explain what is generally understood by the quantity theory of money, derive a money demand function from it and show the difference to a Keynesian money demand function.

b) The 12 months between September 2022 and September 2023 were characterized by the sharpest rise in key interest rates since World War II. Both the period length of the interest rate rise and the absolute change in interest rates were not larger during the two oil crises. As a result, we are currently facing the following yield curve (see diagram) in Germany. In this context, explain what is generally understood by the yield curve and why a rising yield curve is referred to as a normal yield curve.

Yield (p.a.) German government bonds
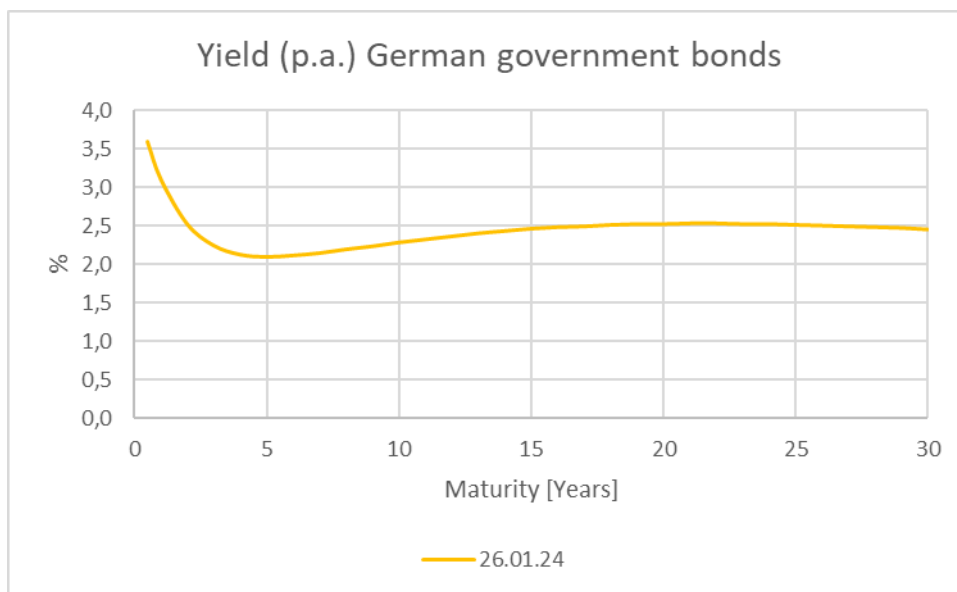
Compared to the diagram, by simplicity we assume a short-term interest rate i_1=3% (p.a.) for an investment of one year and a long-term interest rate i_2=2,0 % (p.a.) for an investment of two years. Calculate the expected short-term interest rate in one year according to the market expectation theory and explain what this means for the business cycle from a macroeconomic perspective.

Task:

a) Explain the difference between total production, gross national product and gross domestic product. Furthermore, explain under which circumstances the measurement of a country's overall economic performance based on gross domestic product can be problematic.

b) On January 15, the German Federal Statistical Office confirmed the real shrinkage of the German economy in 2023 that many had expected. The following additional numbers were also given in the flash report. Use them to complete the table below.

c) Due to the drop in education levels confirmed by the latest PISA study, potential growth is expected to fall to 0.5% p.a. until 2030. If this is taken as the average future real GDP growth rate (p.a.), how much would the average annual rate of price increases over the next seven years be, assuming a nominal GDP of 5,0 trillion euros in 2030?

	GDP (nominal) Tri. Euro	GDP-Index (nominal)	Growth rate GDP (nominal)	GDP-Index (real)	Growth rate GDP (real)	GDP-Deflator	Growth rate GDP-Deflator
2021	3,62	100,00	--	100,00	--	100,00	--
2022	3,88				1,80%		
2023			6,30%		-0,30%		

Task 3 (25 Points):

Assume the following functional relationships within the IS/LM model:

C(y)=120+0,8·y   I(i)=50-30i   G=80   L(y,i)=y-100i   M=300 p=1

y:= Income; i:= interest rate; m:= real money ; G:= government expenditure; C(y):= consumption; I(i):= Investment; L(y,i):= money demand; M:= nominal money; p:= price level

a) Briefly explain the negative interest rate dependency of investment via Keynes` marginal efficiency of capital.

b) Determine the equations of the IS and LM curves as well as the simultaneous equilibrium on the money and goods market within the IS/LM-model. Also, plot the equilibrium in a suitable diagram.

c) Assume a reduction in government spending of $\Delta G=20$ based on the latest ruling by the federal constitutional court. By how much would the ECB have to expand the money supply at the same time so that overall economic income would not change? Sketch these effects on the IS and LM curves in your graph from (b).

Task:

a) In 2022, the inflation rate of 6,9% was significantly higher than the rate of change in the GDP deflator of 5,3%. Against this background, explain why, from this macroeconomic perspective, the recent tough wage negotiations, e.g. at the railroads and in the public sector, are not surprising.

b) According to the latest report from the Federal Statistical Office, inflation will amount to 5,9% in 2023. One of the main price drivers was household energy (HE), which accounts for around 4% of the total basket of goods and has risen in price by 14% in 2023. Calculate the price increase of the remaining index (N-HE) in percent.

	HE		N-HE		CPI	Inflation
	Index	Weight	Index	Weight		
2022	100,00	0,04	100,00			
2023		0,04				5,90%

c) Based on a CPI(2022)=100 for the year 2022, the consumer price index in Germany in 1999 at the start of the euro was CPI(1999)=67. Against this background, comment on the statement: "Since the inflation rates in the last 3 years (3.1%; 6.9%; 5.9%) have deviated very significantly upwards from 2%, the ECB has massively missed the target of price level stability, at least for Germany in general".

Task:
a) Define the term gross domestic product and explain three points of criticism in connection with the interpretation of this term as a measure of welfare.

b) In 2023, nominal GDP in Germany was 4.1 trillion euros. In addition, nominal GDP growth rate was 6.3% while the GDP-Deflator change rate was 6.6%. In 2024, the same absolute change in nominal GDP is assumed from 2023 to 2024 as from 2022 to 2023. At the same time, the GDP-Deflator change rate in 2024 is expected to be the half of 2023. Determine the exact annual average real GDP growth rate between 2022 and 2024 from the data.

c) In the current debate, we report the enormous catch-up process of the Chinese economy over the last 25 years. According to current data from the International Monetary Fund, the nominal GDP of the USA is USD 27.4 trillion and that of China is USD 17.7 trillion. It is also assumed that China will grow at a nominal rate of 6% p.a. and the USA at 4% p.a. over the next years. According to these data, when would China have caught up with the USA in terms of nominal GDP? Does this mean, that after this further catch-up process the standard of living in China will be the same compared to USA?

	GDP (nominal)	GDP-Index (nominal)	Growth rate GDP (nominal)	GDP-Index (real)	Growth rate GDP (real)	GDP-Deflator	Growth rate GDP-Deflator
2022		100,00		100,00		100,00	
2023							
2024							

Task 2 (25 Points):

a) Explain what is meant by seasonal and frictional unemployment, with particular reference to their effect on potential output.

b) **Energy prices** with a weighting in the CPI of 15% changed by +20% from 2022 to 2023, while the aggregate of **other goods** has only risen by 4%. Calculate the inflation rate as a percentage for 2023. For 2024, it is assumed that the inflation rate will halve while energy prices will fall to the starting level of 2022. By how much would the component of other goods then have to rise from 2023 to 2024?

c) Based on the latest wage negotiations, a wage growth of 5% and an interest rate change of 1 %-point with an overall economic price increase rate of 3% can be assumed. Explain the effects of these changes on profits of the entrepreneur sector in the context of neoclassical theory (analytically or argumentatively). You can use the following profit function for a calculation:

$$\pi(K, L) = pK^\alpha L^{1-\alpha} - iK - wL$$

K: Capital; L: Labor; p: Price level; i: interest rate; w: wage; $0 < \alpha < 1$

:

	Energy		Non-Energy		Basket	CPI	Inflation
	Price [Euro]	Weight	Price [Euro]	Weight			
2022	1		1			100	
2023							
2024							

Task:

The economic relationships in the goods and money market are given by the following functions:

C(y)=5+0,8·y   I(i)=1-2i   G=10   L(y,i)=2y-12i   M=30   p=1

y:= Income; i:= interest rate; m:= real money ; G:= government expenditure; C(y):= consumption; I(i):= Investment; L(y,i):= money demand; M:= nominal money; p:= price level

a) Determine the government spending multiplier in the Keynesian goods market model from the data and outline the underlying process.
b) Determine graphically and mathematically the simultaneous equilibrium in the money and goods markets within the IS/LM model.
c) Explain why an increase in government spending on income y is lower in the IS/LM model than in the Keynesian goods market model. Also explain by how much overall economic

output would increase under the assumptions of the basic neoclassical model if government spending were doubled.

Task:

a) Explain the difference between the Keynesian demand function for money derived from the three motives for holding money and the neoclassical demand for money derived from the quantity theory of money.

b) According to the yield curve (measured by the interest of government bonds), short-term interest rates are currently at 3.5% p.a. (1-year) and long-term interest rates are 3% p.a. (2-year). Determine the expected short-term interest rate according to the expected value theory and the liquidity theory, assuming that the liquidity premium is 0.5 percentage points. What economic signal can be derived from this?

c) In general, the interest rate of the ECB's main refinancing operations is referred to as the key interest rate for the eurozone. Since the outbreak of the global financial and economic crisis in the winter of 2008/09, what is the practical value of this statement?