

**MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE**

**SIMON KUZNETS KHARKIV NATIONAL UNIVERSITY OF ECONOMICS**

## **MACRO- AND MICROECONOMICS**

**Guidelines**

**to practical tasks**

**for Bachelor's (first) degree students**

**of speciality 073 "Management"**

**of the educational program "Business Administration"**

**Kharkiv**

**S. Kuznets KhNUE**

**2023**

UDC 330.101.54(072.034)

M16

**Compiled by** T. Cherkashyna

Затверджено на засіданні кафедри державного управління, публічного адміністрування та економічної політики.

Протокол № 2 від 02.09.2022 р.

*Самостійне електронне текстове мережеве видання*

**Macro-** and Microeconomics [Electronic resource] : guidelines M16 to practical tasks for Bachelor's (first) degree students of speciality 073 "Management" of the educational program "Business Administration" / compiled by T. Cherkashyna. – Kharkiv : S. Kuznets KhNUE, 2023. – 61 p. (English)

The guidelines for doing practical tasks on the academic discipline are given to provide the students with skills related to the use of concepts and categories of micro- and macroeconomics, thorough mastering of the essence of economic phenomena and processes, providing basic fundamental theoretical preparation that is necessary for further study of other economic disciplines, deep understanding of laws and key economic trends in the development of global society.

For Bachelor's (first) degree students of all specialities, all forms of study.

**UDC 330.101.54(072.034)**

© Simon Kuznets Kharkiv National  
University of Economics, 2023

## Introduction

The academic discipline "Macro- and Microeconomics" refers to the cycle of natural sciences and general economic subjects. It is an integral part of a complex of economic subjects that includes political economy, modern economic theory, history of economics and economic thought, government regulation, world economy, international economy, social economy, global economy, environmental economy. The issues considered in this academic discipline are essential for future economists in terms of revealing the mechanism of economic systems functioning based on a combination of micro- and macroeconomic theories, concepts, models which are substantiated by world and national economic science and approved by economic practice.

According to the syllabus of the academic discipline, it consists of lectures, practical studies and independent work. The purpose of practical studies is to deepen, systematize, specify and consolidate students' knowledge received at the lectures, to form their ability to systematically apply theoretical knowledge using analysis of specific macro- and microeconomic problems, to make scientific generalizations regarding the assessment of the manifestation of individual phenomena that are characteristic of transformation processes in national economy.

The purpose of the guidelines to practical tasks is to help students in doing computing and graph tasks, consolidating theoretical material and acquiring practical skills in solving macro- and microeconomic problems. The advantage of these guidelines is the systematization of practical tasks depending on the level of their complexity that allows the teacher to choose methods of student's knowledge assessment according to the level of their preparation and in this way to adjust the course of the practical session. In order to do the proposed tasks, students must attend the lectures, use the methodical support for this academic discipline as well as apply the recommended methodical literature and relevant information resources.

Examples of tasks which are given in the guidelines contain all the needed formulas and explanations as to the use of them. The list of typical written tasks for students' self-study is also given.

# Content module 1.

## The main problems of microeconomics

### Theme 1. Utility of economic goods. Economic choice. Analysis of consumer behavior

**Task 1.** Farmer Petrenko runs agricultural business and grows only two goods: maize and onions. The information about Petrenko's production alternatives is given in Table 1.1.

Table 1.1

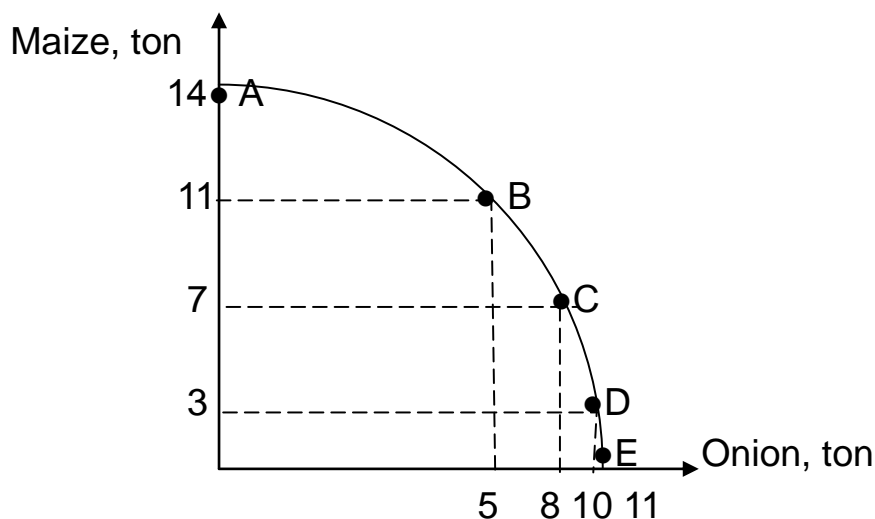
#### Production possibilities of the agricultural enterprise

Good	Production alternatives				
	A	B	C	D	E
Maize, ton	14	11	7	3	0
Onions, ton	0	5	8	10	11

Do the following: 1) show these data graphically; 2) calculate the opportunity cost of the onion for each production combination (A – E) using the data contained in Table 1.1.

#### *Guidelines for doing task 1*

1. Build a production possibilities curve:



**Fig. 1.1. The production possibilities curve**

2. To calculate the opportunity cost of the onion, use the formula:

$$\text{Opportunity costs of good X (A)} = \frac{Y(A) - Y(B)}{X(B) - X(A)}, \quad (1.1)$$

where X(A) is the volume of good X for combination A;

X(B) is the volume of good X for combination B;

Y(A) is the volume of good Y for combination A;

Y(B) is the volume of good X for combination B.

Entering the input data in formula (1.1), we obtain:

$$\text{Opportunity costs of the onion (AB)} = \frac{14 - 11}{5 - 0} = 0.6.$$

$$\text{Opportunity costs of the onion (BC)} = \frac{11 - 7}{8 - 5} = 1.3.$$

$$\text{Opportunity costs of the onion (CD)} = \frac{7 - 3}{10 - 8} = 2.$$

$$\text{Opportunity costs of the onion (DE)} = \frac{3 - 0}{11 - 10} = 3.$$

**Task 2.** Study the data given in Table 1.2.

Table 1.2

### The dynamics of total utility of mutton

Mutton consumed, kg	Total utility, utils
1	12
2	20
3	28
4	32
5	34

Do the following: 1) calculate the marginal utility of mutton at each level of consumption; 2) build total utility and marginal utility curves.

### Guidelines for doing task 2

1. To calculate the marginal utility of mutton, use the formula:

$$MU = \frac{\Delta TU}{\Delta Q}, \quad (1.2)$$

where MU is marginal utility;

$\Delta TU$  is the increase in total utility;

$\Delta Q$  is the increase in the quantity of goods.

Entering the input data in formula (1.2), we obtain:

$$MU_2 = (20 \text{ utils} - 12 \text{ utils}) / (2 - 1) = 8 \text{ utils.}$$

$$MU_3 = 28 \text{ utils} - 20 \text{ utils} = 8 \text{ utils.}$$

$$MU_4 = 32 \text{ utils} - 28 \text{ utils} = 4 \text{ utils.}$$

$$MU_5 = 34 \text{ utils} - 32 \text{ utils} = 2 \text{ utils.}$$

2. Build total utility and marginal utility curves:

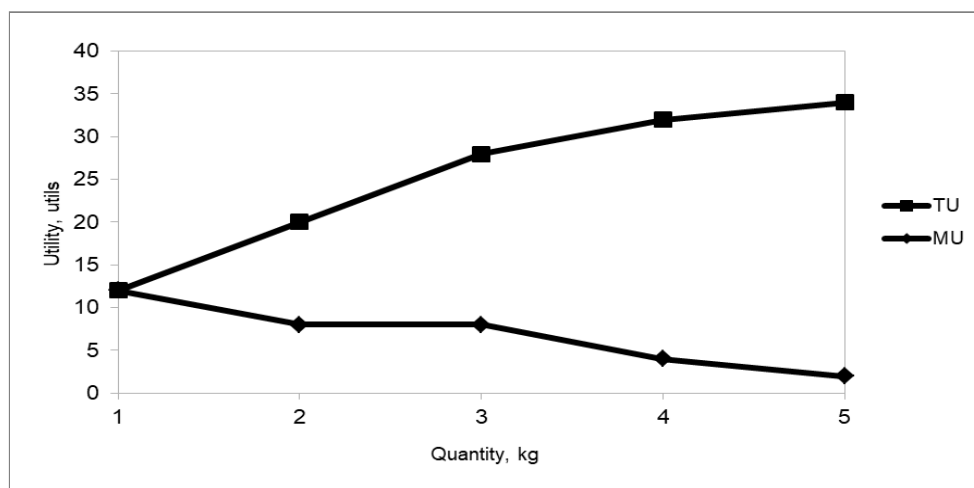


Fig. 1.2. Total utility and marginal utility curves

**Task 3.** Study the data given in Table 1.3.

Table 1.3

### Relationship between marginal utility and price of goods

Good	Marginal utility, utils	Price, euros
X	$\alpha$	14
Y	48	6
Z	32	$\beta$

Calculate the meanings of parameters  $\alpha$  and  $\beta$  if the consumer is in equilibrium.

*Guidelines for doing task 3*

To solve this task, use utility maximizing rule (Gossen's second law):

$$\frac{MU_X}{P_X} = \frac{MU_Y}{P_Y} = \frac{MU_Z}{P_Z}, \quad (1.3)$$

where  $MU_X$  is the marginal utility of good X;

$P_X$  is the price of good X;

$MU_Y$  is the marginal utility of good Y;

$P_Y$  is the price of good Y;

$MU_Z$  is the marginal utility of good Z;

$P_Z$  is the price of good Z.

Entering the input data in formula (1.3), we obtain:

$$\frac{MU_X}{14} = \frac{48}{6}.$$

Hence  $MU_X = 112$  utils.

Accordingly express the price of good Y based on the following equation:

$$\frac{MU_Y}{P_Y} = \frac{MU_Z}{P_Z}.$$

Entering the input data in the formula, we obtain:

$$\frac{48}{6} = \frac{32}{P_Z}.$$

Thus, the price of good Z is 4.5 euro.

**Task 4.** Andrew consumes only two goods: cheese and biscuits. The price of cheese is 6 euro, the price of biscuits is 3 euro, the marginal utility of cheese is 120 utils. Calculate: a) the marginal utility of biscuits; b) the marginal utility of money for each good.

*Guidelines for doing task 4*

a) Calculate the marginal utility of biscuits:

$$\frac{MU_C}{P_C} = \frac{MU_B}{P_B}. \quad (1.4)$$

Entering the input data in formula (1.4), we obtain:

$$MU_B = 60 \text{ utils.}$$

b) Calculate the marginal utility of money for each good:

$$\lambda = \frac{MU}{P}. \quad (1.5)$$

Entering the input data in the formula, we obtain:

$$\lambda_C = \lambda_B = 20.$$

Thus, the marginal utility of biscuits is 60 utils, the marginal utility of money for both goods is 20.

**Task 5.** Study the data given in Table 1.4.

Table 1.4

**Relationship between total utility and quantity of milk and meat**

Quantity of good, kg	Total utility of milk, utils	Total utility of meat, utils
1	60	360
2	111	630
3	156	810
4	196	945
5	232	1 050
6	265	1 140

Assuming that the price of milk is \$1.5 and the price of meat is \$7.5, determine the combination of milk and meat when the total utility is maximum and the consumer equilibrates.



### Guidelines for doing task 5

As we know, the consumer equilibrates if the following equation is valid:

$$\frac{MU_{MK}}{P_{MK}} = \frac{MU_{MT}}{P_{MT}}. \quad (1.6)$$

So in order to determine the combination of goods we need to fill in Table 1.5.

Table 1.5

### Relationship between utility and quantity of milk and meat

Quantity	Milk			Meat		
	TU <sub>MK</sub>	MU <sub>MK</sub>	MU <sub>MK</sub> / P <sub>MK</sub>	TU <sub>MT</sub>	MU <sub>MT</sub>	MU <sub>MT</sub> / P <sub>MT</sub>
1	60	60	–	360	360	–
2	111	51	34	630	270	36
3	156	45	30	810	180	24
4	196	40	26.7	945	135	18
5	232	36	24	1 050	105	14
6	265	33	22	1 140	90	12

Thus, in the conditions of equilibrium a rational consumer should purchase 5 of milk and 3 kg of meat.

**Task 6.** Marginal utility of grapes is described as  $MU_G = 30 - 2 \cdot X$ , and marginal utility of apples is described as  $MU_Y = 19 - 3 \cdot Y$ . The price of grapes is \$2, the price of apples is \$1, the consumer income is \$13. What amount of each goods will the consumer purchase to maximize total utility?

### Guidelines for doing task 6

In order to solve this task, it is necessary to form a system of equations in which the first equation is the utility maximizing rule and another equation is a budget constraint:

$$\left\{ \begin{array}{l} \frac{MU_G}{P_G} = \frac{MU_A}{P_A}; \\ P_G \cdot QG + P_A \cdot QA = I; \end{array} \right.$$

$$\left\{ \begin{array}{l} \frac{30 - 3X}{2} = \frac{19 - 3Y}{1}; \\ 2 \cdot X + Y = 13. \end{array} \right.$$

Hence  $Y = 13 - 2 \cdot X$ .

Entering the input data in the utility maximizing rule, we obtain:

$$\begin{aligned} 20 - 2 \cdot X &= 2 \cdot (19 - 3 \cdot Y); \\ 30 - 2 \cdot X &= 38 - 6 \cdot Y; \\ 30 - 2 \cdot X &= 38 - 6 \cdot (13 - 2 \cdot X); \\ 30 - 2 \cdot X &= 38 - 78 + 30; \\ -2 \cdot X - 12 \cdot X &= 38 - 78 + 30; \\ -14 \cdot X &= -70; \\ X &= 5. \end{aligned}$$

Hence  $Y = 13 - 2 \cdot X = 13 - 2 \cdot 5 = 3$ .

Thus, a rational consumer will purchase 5 kg of grapes and 3 kg of apples.

**Task 7.** The budget line equation is described as follows:  $I = 2 \cdot X + 4 \cdot Y$ , where  $X$  and  $Y$  are the quantities of cucumbers and tomatoes. Consumer's income is \$40. Marginal utility of cucumbers is described as  $MU_C = 4 \cdot X + 6$ , while marginal utility of tomatoes is described as  $MU_T = 32 - 2 \cdot Y$ . What amount of each goods will the consumer purchase to maximize the total utility?

**Task 8.** In Table 1.6, production possibilities for consumer goods (tables) and capital goods (buses) are presented.

Table 1.6

### Production possibilities for consumer goods

Type of product	Production alternatives				
	A	B	C	D	E
Buses	0	2	4	6	8
Tables	30	27	21	12	0

Do the following: 1) show these data graphically; 2) plot a PPC assuming that improvement occurs in the technology of producing tables but not in the technology of producing buses; 3) plot a PPC assuming that a technological

advance occurs in producing buses but not in producing tables; 4) plot a PPC that demonstrates technological improvement in the production of both goods.

**Task 9.** Fill the gaps in Table 1.7.

Table 1.7

**Relationship between utility and quantity of consumer goods**

Quantity consumed, kg	Potatoes		Fish		Chicken	
	TU <sub>P</sub>	MU <sub>P</sub>	TU <sub>F</sub>	MU <sub>F</sub>	TU <sub>C</sub>	MU <sub>C</sub>
1	60			90	128	
2		48	170			104
3		33		50		80
4		15	245			56
5	165			20	408	

**Task 10.** Study the data given in Table 1.8.

Table 1.8

**Consumption of bananas and oranges**

Combination	Bananas, kg	Oranges, kg
A	2	5
B	3	4
C	4	3
D	7	2

Do the following: 1) build an indifference curve; 2) build a budget line if the price of bananas is \$5, the price of oranges is \$10 and consumer's income is \$50; 3) define graphically the point of consumer optimum.

**Task 11.** Table 1.9 contains the data on consumption of mutton and fish.

Table 1.9

**Consumption of mutton and fish products**

Combination	Mutton, kg	Fish products, kg
A	6	15
B	7	10
C	10	6
D	14	4

Do the following: 1) build an indifference curve; 2) build a budget line if the price of mutton is 10 euro, the price of fish products is 7 euro and consumer's income is 140 euro; 3) define graphically the point of consumer optimum.

**Task 12.** Suppose that a consumer buys two goods in the following combinations (Table 1.10).

Table 1.10

### Consumption of ketchup and mayonnaise

Combination	Ketchup, items	Mayonnaise, items
A	2	8
B	4	5
C	5	3
D	7	1

Calculate the marginal rate of substitution of oranges for ketchup at each combination.

**Task 13.** Emma's income is 20 euro and she spends it on two goods: fish and vegetables. The price of fish is 4 euro and the price on vegetables is 5 euro. Consumer choice that maximizes Emma's utility includes 2.5 kg of fish and 2 kg of vegetables (2.5F; 2V). When Emma's income increases by 20 euro, then the optimal point shifts to the combination including 4 kg of fish and 5 kg of vegetables (4F; 5V). When Emma's income increases some more by 10 euros, then the optimal point shifts to the combination including 5.5 kg of fish and 5.6 kg of vegetables (5.5F; 5.6V). Build the income expansion line.

## Theme 2. The law of supply and demand in a market economy

**Task 1.** The demand for pears is represented by the equation  $Q_D = 48 + 12 \cdot P$  and the supply is given by the equation  $Q_S = 62 + 5 \cdot P$ . Determine the equilibrium price and the equilibrium quantity.

*Guidelines for doing task 1*

Calculate the equilibrium price:

$$48 + 12 \cdot P = 62 + 5 \cdot P;$$

$$12 \cdot P - 5 \cdot P = 62 - 48;$$

$$7 \cdot P = 14;$$

$$P = 2 \text{ euro.}$$

Now calculate the equilibrium quantity by entering the equilibrium price ( $P = 2$  euro) in each equation:

$$Q_D = 48 + 12 \cdot P = 48 + 12 \cdot 2 = 72 \text{ kg.}$$

$$Q_S = 62 + 5 \cdot P = 62 + 5 \cdot 2 = 72 \text{ kg.}$$

**Task 2.** Suppose that demand for apples is represented by the equation  $Q_D = 46 - 8 \cdot P$ , while the supply is given by the equation  $Q_S = -32 + 18 \cdot P$ . Determine: 1) the equilibrium price and the equilibrium quantity; 2) surplus or shortage if the price is fixed at 4 euros; 3) surplus or shortage if the price is fixed at 2 euros.

*Guidelines for doing task 2*

1. Calculate the equilibrium price:

$$46 - 8 \cdot P = -32 + 18 \cdot P;$$

$$-8 \cdot P - 18 \cdot P = -32 - 46;$$

$$-26 \cdot P = -78;$$

$$P = 3 \text{ euro.}$$

Now calculate the equilibrium quantity by entering the equilibrium price ( $P = 3$  euro) in each equation:

$$Q_D = 46 - 8 \cdot P = 46 - 8 \cdot 3 = 22 \text{ ton.}$$

$$Q_S = -32 + 18 \cdot 3 = 22 \text{ ton.}$$

Thus, the equilibrium price is 3 euro and the equilibrium quantity is 22 ton.

2. Calculate surplus or shortage if the price is fixed at 4 euro. In order to do this, enter the new price ( $P = 4$  euro) in each equation:

$$Q_D = 46 - 8P = 46 - 8 \cdot 4 = 14 \text{ ton.}$$

$$Q_S = -32 + 18P = -32 + 18 \cdot 4 = 40 \text{ ton.}$$

Thus, surplus that equals 26 ton will be observed.

3. Calculate surplus or shortage if the price is fixed at 2 euro:

$$Q_D = 46 - 8 \cdot P = 46 - 8 \cdot 2 = 30 \text{ ton.}$$

$$Q_S = -32 + 18 \cdot P = -32 + 18 \cdot 2 = 4 \text{ ton.}$$

Thus, shortage will be observed that also equals 26 tons.

**Task 3.** Fill in Table 2.1.

### Relationship between price and quantity of consumer goods

Indicator	Coats		Motorbikes		Journals	
Price	3 200	2 000	75 000	50 000	50	30
Quantity	10	12	100	200	3 000	4 000
Total revenue						
Price elasticity of demand						
Type of elasticity						

#### Guidelines for doing task 3

1. Calculate total revenue for each good:

$$TR = P \cdot Q, \quad (2.1)$$

where TR is total revenue;

Q is the quantity of goods;

P is the price of goods.

Entering the input data in the formula, we obtain:

Total revenue of coats (10 items) = 3 200 UAH per item · 10 items = 32 000 UAH.

Total revenue of coats (12 items) = 2 000 UAH per item · 12 items = 24 000 UAH.

Total revenue of motorbikes (100 items) = 75 000 UAH per item · 100 items = 7 500 000 UAH.

Total revenue of motorbikes (200 items) = 50 000 UAH per item · 200 items = 1 000 000 UAH.

Total revenue of journals (3000 items) = 50 UAH per item · 3 000 items = 150 000 UAH.

Total revenue of journals (4000 items) = 40 UAH per item · 4 000 items = 160 000 UAH.

2. Calculate price elasticity of demand:

$$E_P^D = \frac{\Delta Q}{\Delta P} = \frac{Q_2 - Q_1}{Q_2 + Q_1} \div \frac{P_2 - P_1}{P_2 + P_1}, \quad (2.2)$$

where  $E_P^D$  is price elasticity of demand;

$Q_1$  is the initial quantity of goods;

$Q_2$  is the final quantity of goods;  
 $P_1$  is the initial price of goods;  
 $P_2$  is the final price of goods.

$$E_P^D = \frac{\Delta Q}{\Delta P} = \frac{2\,000 - 3\,200}{3\,200} \div \frac{12 - 10}{10} = 1.88.$$

$$E_P^D = \frac{\Delta Q}{\Delta P} = \frac{2\,000 - 3\,200}{3\,200 + 2\,000} \div \frac{12 - 10}{10 + 12} = 2.55.$$

$$E_P^D = \frac{\Delta Q}{\Delta P} = \frac{50\,000 - 75\,000}{50\,000 + 75\,000} \div \frac{200 - 100}{200 + 100} = 0.61.$$

$$E_P^D = \frac{\Delta Q}{\Delta P} = \frac{30 - 50}{30 + 50} \div \frac{4\,000 - 3\,000}{4\,000 + 3\,000} = 1.76.$$

**Task 4.** Calculate: 1) income elasticity of demand for tangerines if income decreases from 500 000 euro to 450 000 euro and demand declines from 20 ton to 18 ton; 2) cross elasticity (or cross price elasticity) of demand for tangerine if the price of oranges increases from 27.5 UAH to 32 UAH and demand for tangerine increases from 100 ton to 124 ton.

*Guidelines for doing task 3*

1. Calculate income elasticity of demand for tangerines:

$$E_I^D = \frac{\Delta Q}{\Delta I} = \frac{Q_2 - Q_1}{Q_1} \div \frac{I_2 - I_1}{I_1}, \quad (2.3)$$

where  $E_I^D$  is the income elasticity of demand;

$I_1$  is the initial income;

$I_2$  is the final income.

Entering the input data in formula (2.3), we obtain:

$$E_I^D = \frac{18\text{ton} - 20\text{ton}}{20\text{ton}} \div \frac{400\,000\text{ euro} - 500\,000\text{ euro}}{500\,000\text{ euro}} = 0.5.$$

2. Calculate cross elasticity (or cross price elasticity) of demand for tangerines:

$$E_{XY} = \frac{\Delta Q_X}{\Delta P_Y} = \frac{Q_{2(X)} - Q_{1(X)}}{Q_{1(X)}} \div \frac{P_{2(Y)} - P_{1(Y)}}{P_{1(Y)}}, \quad (2.4)$$

where  $E_{XY}$  is cross elasticity of demand.

Entering the input data in formula (2.4), we obtain:

$$E_{xy} = \frac{124 \text{ ton} - 100 \text{ ton}}{100 \text{ ton}} \div \frac{32 \text{ UAH} - 27.5 \text{ UAH}}{27.5 \text{ UAH}} = 1.5.$$

**Task 5.** Assume that demand for salt is represented by the equation  $Q_D = 100 - 4P$  and supply is given by the equation  $Q_S = 60 + 4P$ . Determine the equilibrium price and the equilibrium quantity.

**Task 6.** Demand for strawberry is represented by the equation  $Q_D = 30 - P$  and supply is given by the equation  $Q_S = 15 + 2P$ . Determine: a) the equilibrium price and the equilibrium quantity; b) surplus or shortage if the price is fixed at 6.5 euro; c) surplus or shortage if the price is fixed at 4.5 euro.

**Task 7.** Calculate price elasticity of demand if the price of sport magazines rises by 5 % and the demand for sport magazines falls by 7.5 %.

**Task 8.** Calculate the value of price elasticity of demand if the price of buckwheat rises from 1.5 to 2 euro and the demand for buckwheat falls from 1 000 to 875 units.

**Task 9.** Study the data contained in Table 2.2.

Table 2.2

### Relationship between price and quantity demanded of consumer good

Price, dollar	2.10	1.80	1.50	1.20	0.90	0.60	0.30
Quantity demanded, units	10	20	30	40	50	60	70

Do the following: 1) calculate the value of price elasticity of demand at each price; 2) determine at which price demand is relatively elastic and at which price it is relatively inelastic; 3) determine at what price demand is unitary elastic; 4) calculate total revenue and build a total revenue curve.

**Task 10.** Study the data given in Table 2.3.

Table 2.3

### Relationship between consumer's income and the number of passengers transported by the urban fixed-route taxi

Consumer's income, UAH	The number of passengers transported by the urban fixed-route taxi	Income elasticity of demand
1	2	3
8 000	10 000	
12 000	12 000	



Table 2.3 (the end)

1	2	3
16 000	15 000	
20 000	18 000	
24 000	20 000	

Do the following: 1) build an income curve; 2) determine the relationship between the income and the number of passengers transported by the urban fixed-route taxi as positive or negative; 3) calculate income elasticity of demand; 4) determine what type of services (inferior, superior or normal) passenger transportation belongs to.

### **Theme 3. The theory of marginal products and microeconomic model of an enterprise. Costs of production and profit**

**Task 1.** Fill in Table 3.1 and build an average product curve and a marginal product curve.

Table 3.1

#### **Relationship between the number of workers and the quantity of good produced**

Number of workers (L)	Quantity of good (Q)	Average product of labor (APL)	Marginal product of labor (MPL)
1	10		
2	17		
3	22		
4	25		
5	26		
6	25		
7	23		

#### *Guidelines for doing task 1*

1. In order to calculate an average product, use the formula:

$$APL = \frac{Q}{L}, \quad (3.1)$$

where APL is the average product of labor;  
 Q is the quantity of goods;  
 L is the number of workers (quantity of labor).

In order to calculate a marginal product, use the formula:

$$MPL = \frac{\Delta Q}{\Delta L}, \quad (3.2)$$

where MPL is the marginal product of labor;  
 $\Delta Q$  is the change in the quantity of goods;  
 $\Delta L$  is the change in labor.

We obtain the following results:

L	Q	APL	MPL
1	10	10	10
2	17	8.5	7
3	22	7.3	5
4	25	6.25	3
5	26	5.2	1
6	25	4.17	-1
7	23	3.3	-2

2. Build the average product and marginal product curves (Fig. 3.1).

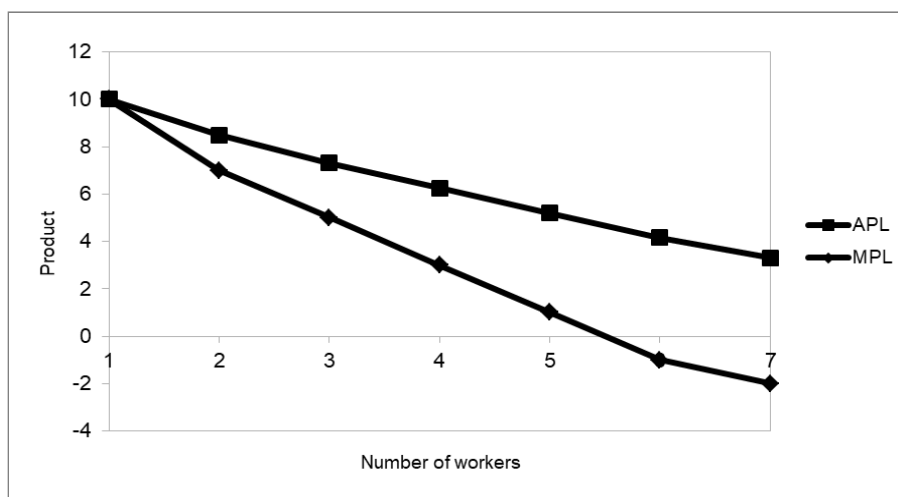


Fig. 3.1. The average product and marginal product curves

**Task 2.** Study the data given in Table 3.2.

### Combination of production factors

Combination	Capital	Labor
A	5	1
B	3	2
C	2	3
D	1	5

Do the following: 1) build an isoquant if 75 units of good are produced and show how isoquants will change if 65, 90, 105 units of good are produced; 2) calculate the marginal rate of technological substitution for each combination of production factors.

#### Guidelines for doing task 2

1. Build the isoquants (Fig. 3.2).

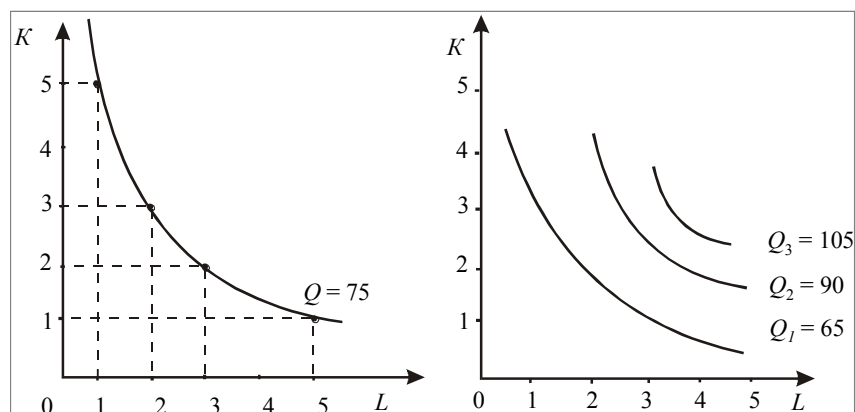


Fig. 3.2. The isoquants

2. In order to calculate the marginal rate of technological substitution, use the formula:

$$\text{MRTS}_{K,L} = \frac{\Delta L}{\Delta K}. \quad (3.3)$$

Entering the input data in formula (3.3), we obtain:

$$\text{MRTS}_{K,L} = \frac{2-1}{3-5} = -0.5.$$

$$MRTS_{K,L} = \frac{3-2}{2-3} = -1.$$

$$MRTS_{K,L} = \frac{5-3}{1-2} = -2.$$

**Task 3.** Calculate fixed costs, average fixed costs, average variable costs, average total costs and marginal costs using the data in Table 3.3.

Table 3.3

**Relationship between fixed, variable and total cost**

Q	TC	VC	FC
100	1 050	800	250
150	1 450	1 200	
250	1 750	1 500	

Build average cost curves.

*Guidelines for doing task 3*

1. Calculate total costs using the following formula:

$$TC = FC + VC, \tag{3.4}$$

where TC is total costs;  
 FC is fixed costs;  
 VC is variable costs.

Calculate average total costs using the following formula:

$$ATC = \frac{TC}{Q}, \tag{3.5}$$

where ATC is average total costs.

Calculate average variable costs using the following formula:

$$AVC = \frac{VC}{Q}, \tag{3.6}$$

where AVC is average variable costs.

Calculate average fixed costs using the following formula:

$$AFC = \frac{FC}{Q}, \quad (3.7)$$

where AFC is average fixed costs.

Calculate marginal costs using formula (3.8):

$$MC = \frac{\Delta TC}{\Delta Q}. \quad (3.8)$$

where MC is marginal costs;

$\Delta TC$  is the increase in total cost;

$\Delta Q$  is the increase in quantity.

Enter the obtained results in the table:

Q	TC	FC	VC	AFC	AVC	ATC	MC
100	1 050	250	800	2.5	8	10.5	–
150	1 450	250	1 200	1.67	8	9.67	8
250	1 750	250	1 500	1	6.2	7	3

2. Build average cost curves (Fig. 3.3).

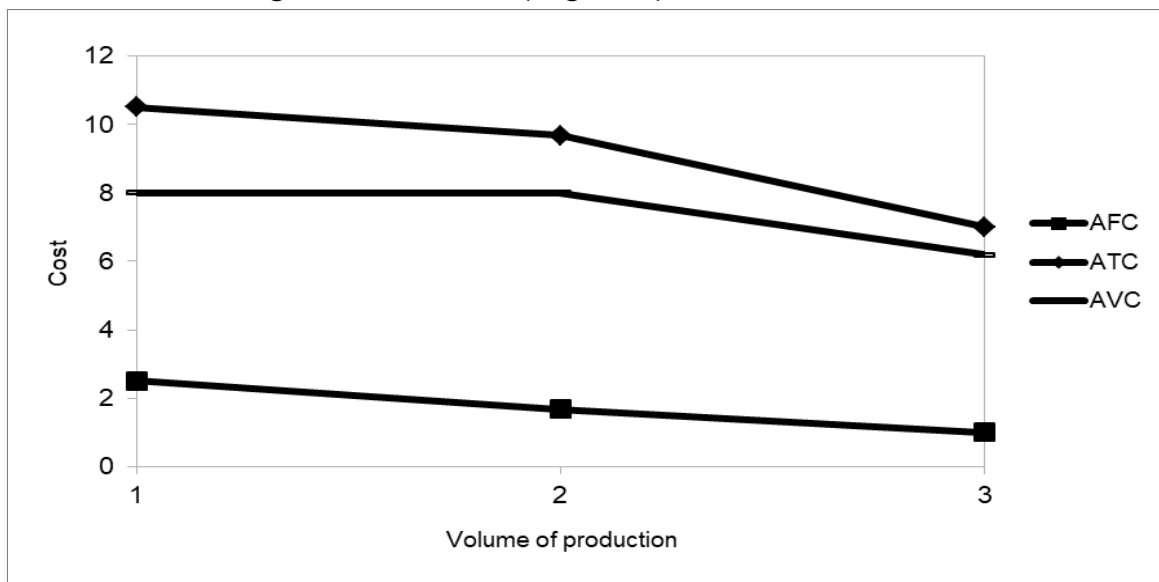


Fig. 3.3. Average cost curves

**Task 4.** Operation of a firm is characterized by the following indicators: average variable costs are 3 euro per item, average fixed costs are 4.5 euro per item, implicit costs are 7 500 euro. Calculate economic profit if the firm produces 5 000 items and the price of its good is 15 euro.

*Guidelines for doing task 4*

1. Calculate total revenue using the formula:

$$TR = P \cdot Q, \quad (3.9)$$

where TR is total revenue.

Total revenue = 15 euro per item · 5000 items = 75 000 euro.

2. Calculate total (explicit) costs:

$$TC = (AFC + AVC) \cdot Q, \quad (3.10)$$

where AFC is average fixed costs;

AVC is average variable costs.

Entering the input data in formula (3.10), we obtain:

$TC = (4.5 \text{ euro per item} + 3 \text{ euro per item}) \cdot 5\,000 \text{ items} = 37\,500 \text{ euro}.$

3. Calculate economic profit as the difference between explicit and implicit costs:

Economic profit = 75 000 euro – (37 500 euro + 7500 euro) = 30 000 euro.

Thus, economic profit makes 30 000 euro.

**Task 5.** Functioning of the baker's shop Milena is characterized by the following indicators: fixed costs are 150 000 euro, variable costs make 250 000 euro, total revenue amounts to 800 000 euro. Calculate the accounting profit of the bakery.

*Guidelines for doing task 5*

1. Calculate total costs as the sum of fixed and variable costs:

$$TC = FC + VC,$$

where TC is total costs;

FC is fixed costs;

VC is variable costs.

Entering the input data in this formula, we obtain:

$TC = 150\,000 \text{ euro} + 250\,000 \text{ euro} = 400\,000 \text{ euro}.$

2. Calculate the accounting profit as the difference between total revenue and total costs:

Accounting profit = 800 000 euro – 400 000 euro = 400 000 euro.

**Task 6.** The firm "Marichka" uses only two production factors: capital (K) and labor (L). Operation of this firm is characterized by the following indicators:  $MPK = 8$ ;  $MPL = 20$ ;  $PK = 4$ ;  $PL = 10$ . Taking into account the cost-minimization rule, determine if this combination of production factors is optimal or not.

**Task 7.** The entrepreneur Lazaruk runs a small pottery firm. He hires one helper at 12 000 euro per year, pays annual rent of 5 000 euro for his shop, and spends 20 000 euro per year on materials. He has 40 000 euro of his own funds invested in the equipment (pottery wheels, kilns, and so forth) that could earn him 4000 euro per year if alternatively invested. He has been offered 15 000 euro per year to work as a potter for a competitor. He estimates his entrepreneurial talents are worth 3000 euro per year. Total annual revenue from the pottery sales is 72 000 euro. Calculate the accounting profit and the economic profit for Lazaruk's pottery firm.

**Task 8.** Calculate variable costs if average total costs are 250 000 crones, average fixed costs are 100 000 crones, the output is 800 units.

**Task 9.** Calculate fixed costs, average fixed costs, average variable costs, average total costs and marginal costs using the data given in Table 3.4.

Table 3.4

### Relationship between fixed, variable and total cost

Q	TC	VC	FC
100	1 000	700	300
120	1 500	1 200	
200	2 000	1 700	

**Task 10.** Table 3.5 contains some data.

Table 3.5

### Relationship between total, average and marginal cost

Q	VC	FC	TC	AFC	AVC	ATC	MC
	2	3	4	5	6	7	8
0	0	120					
1	60						
2	80						
3	95						
4	105						

Table 3.5 (the end)

1	2	3	4	5	6	7	8
5	125						
6	150						
7	180						
8	200						
9	200						
10	240						

Do the following: 1) fill in Table 3.5; 2) plot graphs of the average and marginal cost.

### Theme 4. The theory of market structures

**Task 1.** A perfect competitive firm uses only one production factor that is labor. Information about the number of workers and the volume of production of the firm is also known (Table 4.1).

Table 4.1

#### Relationship between the number of workers and the volume of production

Number of workers, people	Volume of production, units
1	20
2	50
3	70
4	85
5	95

Do the following: 1) using the TR – TC approach, calculate the optimal volume of production if the price of labor is 30 euro and price of good is 2 euro; 2) calculate the optimal size of the resource.

#### *Guidelines for doing task 1*

a) calculate the optimal volume of production, using the formulas:

$$Pr = TC - TR, \quad (4.1)$$

where Pr is profit,



$$TC = Q_L \cdot P_L, \quad (4.2)$$

$$TR = P \cdot Q. \quad (4.3)$$

Table 4.2

**Relationship between total cost, total revenue and profit**

L	Q	TC	TR	Pr
1	20	30	40	10
2	50	60	100	40
3	70	90	140	50
<u>4</u>	<u>85</u>	<u>120</u>	<u>170</u>	<u>50</u>
5	95	150	190	40

b) In order to calculate the optimal size of the resource, use the following rule:

$$r_L = MPL \cdot P, \quad (4.4)$$

where  $r_L$  is the optimal size of the resource.

Table 4.3

**Relationship between the optimal size of the resource and the volume of production**

L	Q	MPL	$r_L$ (P = 2 euro per unit)
1	20	20	40
2	50	30	60
3	70	20	40
<u>4</u>	<u>85</u>	<u>15</u>	<u>30</u>
5	95	10	20

**Task 2.** The quantitative relationship between the total costs of the monopoly and the output are given in Table 4.4.

Table 4.4

**Relationship between the total costs of the monopoly and the output**

Output, thousand units	Total costs, thousand euro
0	24
1	28
2	36
3	48
4	64
5	84
6	108

The quantitative relationship between the demand on the monopoly good and the price of it is given in Table 4.5.

Table 4.5

**Relationship between the demand on the monopoly good and the price of it**

Price, euro	Demand, thousand units
14	6
16	5
18	4
20	3
22	2
24	1
26	0

Based on this information, calculate the price, the profit and the optimal volume of production of this monopoly good.

*Guidelines for doing task 2*

In order to solve this task, fill in Table 4.6.

Table 4.6

**Costs and profit of the monopoly**

Q	P	TC	ATC	MC	TR	Pr	MR
1	2	3	4	5	6	7	8
0	26	24	–	–	0	-24	–
1	24	28	28	4	24	-4	24

Table 4.6 (the end)

1	2	3	4	5	6	7	8
2	22	36	18	8	44	8	20
<u>3</u>	<u>20</u>	<u>48</u>	<u>16</u>	<u>8</u>	<u>60</u>	<u>12</u>	<u>16</u>
4	18	64	16	16	72	8	12
5	16	84	16.8	20	80	-4	8
6	14	108	18	24	84	-24	4

Thus, the price is 20 euro, the profit is 12 000 euro and the optimal volume of production of this monopoly is 3 000 units.

**Task 3.** Assume that monopoly X is characterized by the following equations:  $MR = 2\,000 - 40 \cdot Q$ ,  $TR = 2\,000 \cdot Q - 20 \cdot Q^2$ ,  $MC = 200 + 20 \cdot Q$ . Do the following: 1) calculate the price and the optimal volume of production of this monopoly; 2) determine how the price and the optimal volume of production will change if this enterprise is a perfectly competitive firm.

*Guidelines for doing task 3*

1. Calculate the optimal volume of production of the monopoly based on profit-maximization rule in the conditions of pure monopoly:

$$MR = MC;$$

$$2\,000 - 40 \cdot Q = 200 + 20 \cdot Q;$$

$$1\,800 = 60 \cdot Q;$$

$$Q = 30 \text{ units.}$$

2. Calculate the monopoly price:

$$TR = P \cdot Q.$$

$$\text{Hence } P = \frac{TR}{Q}.$$

$$P = \frac{20 \cdot Q - Q^2}{Q} = 2\,000 - 20 \cdot Q = 2\,000 - 20 \cdot 30 = 1\,400.$$

3. Determine how the price and the optimal volume of production will change if this enterprise is a perfectly competitive firm:

$$MC = ATC = P;$$

$$200 + 20 \cdot Q = 2\,000 - 20 \cdot Q;$$

$$1\,800 = 40 \cdot Q;$$

$$Q = 45 \text{ units.}$$

**Task 4.** Information about the demand for good X of two groups of consumers is given in Table 4.7.

Table 4.7

**Demand for good X of two groups of consumers**

P	Q <sub>1</sub>	Q <sub>2</sub>
1	10	8
2	9	7
3	8	6
4	7	5
5	6	4

Calculate the price of the good for each group of consumers if the monopoly uses price discrimination at the third level, marginal costs are constant and equal 6 euro.

*Guidelines for doing task 4*

The maximization profit rule in the conditions of price discrimination at the third level is as follows:

$$MR_1(Q_1) = MR_2(Q_2) = MC(Q).$$

P	Q <sub>1</sub>	Q <sub>2</sub>	TR <sub>1</sub>	TR <sub>2</sub>	MR <sub>1</sub>	MR <sub>2</sub>
1	10	8	10	8	10	8
<u>2</u>	<u>9</u>	7	18	14	8	<u>6</u>
<u>3</u>	<u>8</u>	6	24	18	<u>6</u>	4
4	7	5	28	20	4	2
5	6	4	30	20	-2	0

Thus, in the first segment 8 units will be sold (the price is 3 euro per unit) and in the second segment 9 units will be sold (the price is 2 euro per unit).

**Task 5.** Consider the oligopoly market. The price of a good is 50 euro and the marginal costs equal 45 euro. The market power of the biggest firm is 40 % and market power of other firms is the following: 30 %, 10 %, 15 %, 5 % accordingly. Calculate: 1) the Lerner index; 2) the Herfindahl index; 3) the Herfindahl index if three firms with higher market power merge in a cartel; 4) determine the type of the analyzed market.

*Guidelines for doing task 5*

1. Calculate the Lerner index using the formula:

$$L = \frac{P - MC}{P}, \quad (4.5)$$

where L is the Lerner index;

P is the price of the good;

MC is the marginal costs.

$$L = \frac{50 \text{ euro} - 45 \text{ euro}}{50 \text{ euro}} = 0.1 \text{ euro}.$$

2. Calculate the Herfindahl index:

$$HI = S_1^2 + S_2^2 + \dots + S_N^2, \quad (4.6)$$

where  $S_1$  is the percentage market share of firm 1;

$S_2$  is the percentage market share of firm 2,

and so on for each firm in the industry.

$$HI = 40^2 + 30^2 + 10^2 + 15^2 + 5^2 = 2\,850.$$

3. Calculate the Herfindahl index if three firms with lower market power merge in a cartel:

$$HI = 40^2 + 30^2 + 30^2 = 3\,400.$$

4. The characteristics of the market depending on the level of concentration and monopolization is as follows:

The meaning of the Herfindahl index	The type of market	The level of concentration	The intensity of competition
From 0 to 1 000	Non-monopolized	Low	High
From 1 000 to 1 800	Transitional from competitive to monopolized	Moderate	Moderate
From 1 800 to 10 000	Noncompetitive	High	Low

Thus, the analyzed industry is a market with moderate concentration.

**Task 6.** In the long run, the operation of the firm Mriya on the market of monopolistic competition is described by the following equations:  $MC = 3 \cdot Q$ ,  $MR = 20 - 2 \cdot Q$ . Calculate the excess of production capacities if minimal long-run average costs are 11.

### Guidelines for doing task 6

1. Calculate the optimal volume of production in the conditions of monopolistic competition:

$$\begin{aligned}MR &= MC; \\20 - 2 \cdot Q &= 3 \cdot Q - 10; \\5 \cdot Q &= 30; \\Q &= 6 \text{ units.}\end{aligned}$$

2. Calculate the optimal volume of production in the conditions of perfect competition:

$$\begin{aligned}P = MC &= ATC_{\min}; \\3 \cdot Q - 10 &= 11; \\Q &= 7 \text{ units.}\end{aligned}$$

Therefore, the excess of production capacities is 1 unit ( $\Delta Q = 7 \text{ units} - 6 \text{ units} = 1 \text{ unit}$ ).

**Task 7.** A perfect competitive firm aims to maximize its profit. Calculate the volume of production in the short run if the price of good is 25 euro and the marginal costs function is described by the equation:  $MC = 0.2 \cdot Q + 15$ .

**Task 8.** The total costs function of a perfect competitive firm is described by the equation:  $TC = 6 \cdot Q + 2 \cdot Q^2$ . Calculate the profit (or loss) of this firm if the firm produces 5 units and the price of each unit is 36 franc.

**Task 9.** Assume that the price of the good is \$7.5 and marginal costs are \$3.5. Determine if the perfect competitive firm should continue to produce this good or not.

**Task 10.** Average total costs of a perfect competitive firm are described by the equation:  $ATC = 20 + 2 \cdot Q$ . Determine how the optimal volume of production changes if the price of the good decreases from 80 UAH to 60 UAH.

**Task 11.** Total costs of the monopoly X are described as by following equation:  $TC = 10 \cdot Q$ . Calculate the monopoly price if price elasticity of demand is 3 zlotiy.

## Content module 2

### The main problems of macroeconomics

#### Theme 5. Macroeconomic indicators in national accounts

**Task 1.** Study the data given in Table 5.1.

Table 5.1

#### The dynamics of nominal GDP and deflator in the country X

Year	Nominal GDP, bln franc	Deflator, %	Real GDP, bln franc
2019	175.2	102.6	
2020	184.9	104.5	
2021	188.01	108.1	
2022	191.06	110.12	

Calculate real GDP for each year.

#### *Guidelines for doing task 1*

In order to solve this task, use the following formula:

$$GDP_R = \frac{GDP_N}{D} \cdot 100, \quad (5.1)$$

where  $GDP_R$  is real GDP;

$GDP_N$  is nominal GDP;

D is the deflator.

Entering the input data in formula (5.1), we obtain:

$$GDP_R(2019) = \frac{175.2 \text{ bln franc}}{102.6} \cdot 100 = 170.76 \text{ bln franc.}$$

$$GDP_R(2020) = \frac{184.9 \text{ bln franc}}{104.5} \cdot 100 = 176.94 \text{ bln franc.}$$

$$GDP_R(2021) = \frac{188.01 \text{ bln franc}}{108.1} \cdot 100 = 173.92 \text{ bln franc.}$$

$$GDP_R(2022) = \frac{191.06 \text{ bln franc}}{110.12} \cdot 100 = 173.5 \text{ bln franc.}$$

**Task 2.** Use the following data to calculate GDP of the country Alfa that consists of the following elements (bln euro):  $C = 100 + 0.5 \cdot (Y - T)$ ,  $T = 40$ ,  $I = 150$ ,  $G = 45$ ,  $NE = 10$ .

*Guidelines for doing task 1*

In order to calculate the size of GDP, use the expenditure method of calculation of GDP that is mathematically described as:

$$Y = C + I + G + NE, \quad (5.2)$$

where  $Y$  is GDP;

$C$  is consumption;

$I$  is gross investment;

$G$  is government purchases of goods and services;

$NE$  is net exports (the difference between the export and import of the country).

Entering the data in this formula (5.2), we obtain:

$$Y = 100 + 0.5 \cdot (Y - 40) + 150 + 45 + 10;$$

$$Y = 100 + 0,5 \cdot Y - 20 + 150 + 45 + 10;$$

$$0.5 \cdot Y = 285;$$

$$Y = 570 \text{ bln euro.}$$

**Task 3.** Nominal GDP of the country Beta is 185 bln dollars, consumption is 70 % of GDP, gross investment is 20 % of GDP, net exports make 2 % of GDP. Calculate the size of government purchases of goods and services of this country.

*Guidelines for doing task 3*

In order to calculate the size of government purchases of goods and services, use the expenditure method of calculation of GDP:

$$Y = C + G + I + NE.$$

Hence,  $G = Y - C - I - NE$ .

Because the initial data is presented in relative units, we can write the following:

$$G = 100 \% - 70 \% - 20 \% - 2 \% = 8 \%.$$

The size of government purchases of goods and services in absolute units equals:

$$G = 8.5 \% \cdot Y = 0.08 \cdot 185 \text{ bln dollars} = 14.8 \text{ bln dollars.}$$



**Task 4.** Assume that country X produces and consumes only two goods: good A and good B. Using the data in Table 5.2, calculate the Laspeyres index, the Paasche index and the Fisher index.

Table 5.2

**Relationship between price and quantity of good**

Good	2021		2022	
	Price of good	Quantity of good	Price of good	Quantity of good
A	18	5	21	6
B	41	14	36	11

*Guidelines for doing task 3*

1. Calculate the Laspeyres index using the formula:

$$P_L = \frac{\sum P_i^1 \cdot Q_i^0}{\sum P_i^0 \cdot Q_i^0} \quad (5.3)$$

where  $P_L$  is the Laspeyres index;

$P_i^1$  and  $P_i^0$  is the price level of the  $i$ -th good in the base (0) and current (1) years respectively;

$Q_i^0$  is the amount of the  $i$ -th good in the base period.

$$P_L = (21 \cdot 5 + 36 \cdot 13) / (18 \cdot 5 + 41 \cdot 13) = 573 / 623 = 0.92.$$

2. Calculate the Paasche index using the formula:

$$P_P = \frac{\sum P_i^1 \cdot Q_i^1}{\sum P_i^0 \cdot Q_i^1} \quad (5.4)$$

where  $P_P$  is the Paasche index;

$Q_i^1$  is the amount of the  $i$ -th good consumed in the current period.

$$P_P = (21 \cdot 6 + 36 \cdot 11) / (18 \cdot 6 + 41 \cdot 11) = 522 / 559 = 0.93.$$

3. Calculate the Fisher index using the formula:

$$P_F = \sqrt{P_L \cdot P_P}, \quad (5.5)$$

$$P_F = \sqrt{0,92 \cdot 0.93} = 0.925.$$

As we see, all indexes indicate a decrease in the average price level in the country X.

**Task 5.** Real GDP of the country A was 2 200 bln peso in 2021. Calculate nominal GDP in 2022 if real GDP increases by 5 % and price level increases by 15 %.

*Guidelines for doing task 5*

1. Calculate real GDP in 2022:

$$GDP_{2022} = 2\,200 \text{ bln peso} \cdot 1.05 = 2\,310 \text{ bln peso.}$$

2. Calculate nominal GDP in 2022 using the formula:

$$GDP_N = \frac{GDP_R \cdot D}{100}.$$

Entering the data in the formula above, we will obtain:

$$GDP_n = \frac{2\,310 \text{ bln peso} \cdot 115}{100} = 2\,656.65 \text{ bln peso.}$$

**Task 6.** Study the data given in Table 5.3.

Table 5.3

**The dynamics of nominal GDP and deflator in the country Delta**

Year	Nominal GDP, bln krone	GDP deflator, %	Real GDP, bln krone
2019	240.24	108.25	
2020	265.12	115.06	
2021	295.06	104.02	
2022	310.48	99.05	

Calculate real GDP for each year.

**Task 7.** Calculate the size of gross investment of the country Beta if its economy is characterized by the following data: GDP is 250 bln dollars, consumption is 175 bln dollars, government purchases of goods and services is 25 bln euro, net export is 8 bln dollars.

**Task 8.** The economy of the country Delta is characterized by the following data (bln franc):  $C = 55 + 0.3 \cdot (Y - T + TR)$ ,  $I = 10 + 0.3 \cdot Y$ ,  $G = 64$ ,  $NE = 12 - 0.04 \cdot Y$ ,  $T = 35$ ,  $TR = 10$ . Calculate GDP of this country using the expenditure method.

**Task 9.** Wages and salaries amount to 350 bln UAH, rent is 35 bln UAH, net interest income is 10 bln UAH, proprietors income is 45 bln UAH, corporate

profit is 75 bln UAH, consumption of fixed capital (depreciation) is 18 bln UAH, taxes on production and imports, transfers make 22 bln UAH, statistical discrepancy is 25 bln UAH, personal taxes amount to 12 bln UAH, net foreign factor income is 20 bln UAH. Calculate gross national product (GNP), net national product (NNP), net domestic product (NDP), national income (NI), personal income (PI).

**Task 10.** Real GDP of the country X was 450 bln euro in 2022. Calculate nominal GDP in 2023 if real GDP decreased by 3.5 % but price level increased by 7.04 %.

**Task 11.** Suppose country X produces only two goods: A and B. Calculate the Laspeyres price index, the Paasche price index and the Fisher ideal index taking into account that 2021 is the base period (Table 5.4).

Table 5.4

**Relationship between price and quantity of good in the country X**

Good	Years			
	2021		2022	
	Price of good A	Quantity of good A	Price of good B	Quantity of good B
A	18	5	23	7
B	44	15	39	10

**Theme 6. Household's consumption and private investment.  
Macroeconomic equilibrium**

**Task 1.** Study the consumption schedule given in Table 6.1.

Table 6.1

**The dynamics of disposable income of the country Alfa**

$Y_d$	C	S
600		
800		
1 000		
1 200		
1 400		

Do the following: 1) calculate consumption and saving if the consumption function is described as  $C = 250 + 0.5 \cdot Y_d$ ; 2) plot a consumption curve; 3) plot a saving curve.

*Guidelines for doing task 1*

1. Calculate consumption and saving.

a) calculate the size of consumption entering the values of disposable income in the consumption function:

$$C_1 = 250 + 0.5 \cdot 600 = 550;$$

$$C_2 = 250 + 0.5 \cdot 800 = 650;$$

$$C_3 = 250 + 0.5 \cdot 1\,000 = 750;$$

$$C_4 = 250 + 0.5 \cdot 1\,200 = 850;$$

$$C_5 = 250 + 0.5 \cdot 1\,400 = 950.$$

b) calculate the size of saving using the formula:

$$S = Y_d - C, \tag{6.1}$$

where S is saving;

$Y_d$  is disposable income;

C is consumption.

We obtain:

$$S_1 = 600 - 550 = 50;$$

$$S_2 = 800 - 650 = 150;$$

$$S_3 = 1\,000 - 750 = 250;$$

$$S_4 = 1\,200 - 850 = 350;$$

$$S_5 = 1\,400 - 950 = 450.$$

Now we can fill in the table:

$Y_d$	C	S
600	550	50
800	650	150
1 000	750	250
1 200	850	350
1 400	950	450

2. Plot a consumption curve (Fig. 6.1).

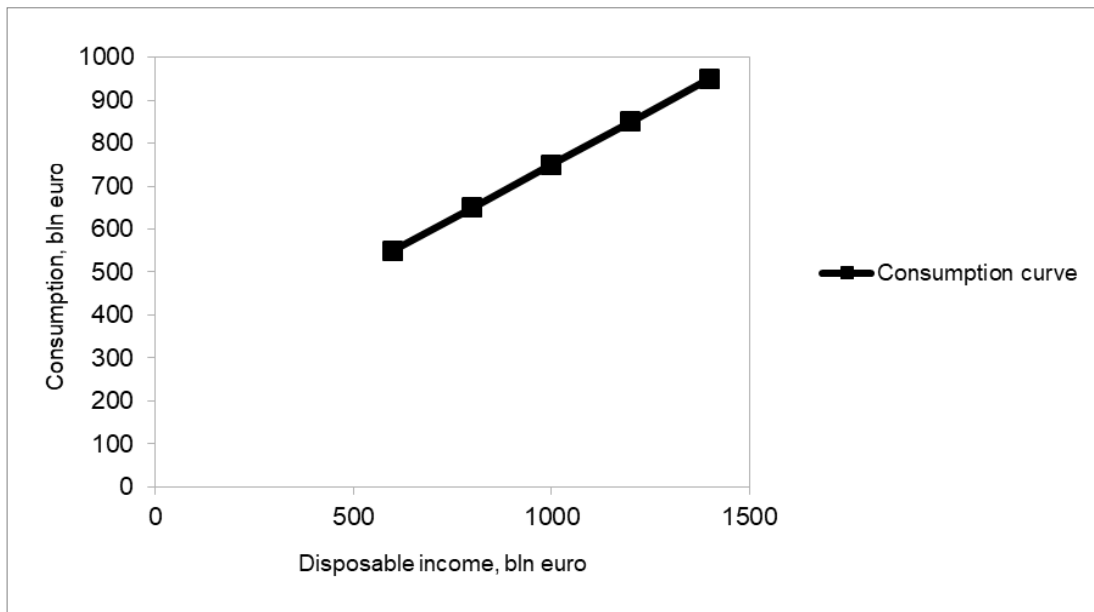


Fig. 6.1. The consumption curve

3. Plot a saving curve (Fig. 6.2).

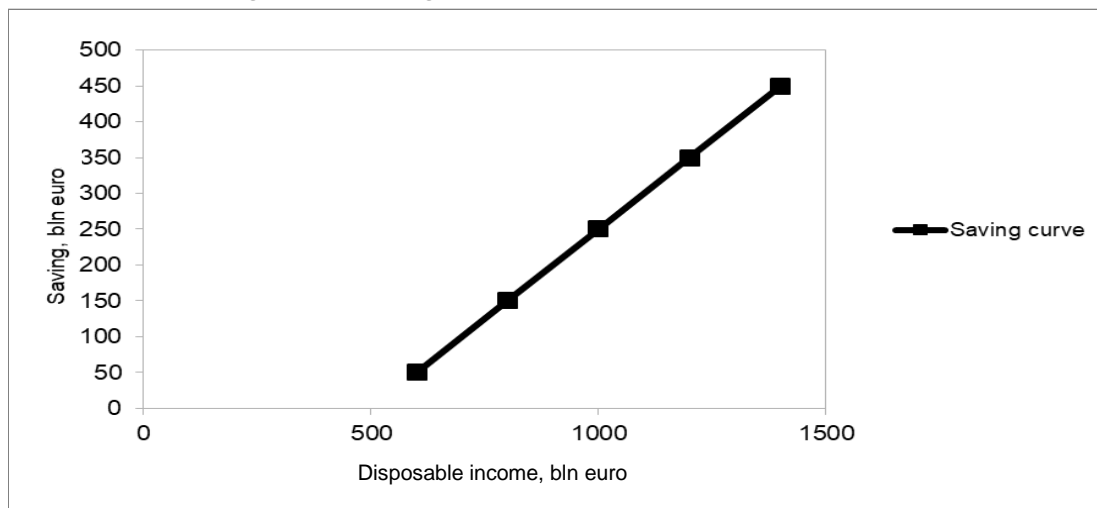


Fig. 6.2. The saving curve

**Task 2.** Fill in Table 6.2.

Table 6.2

**The dynamics of disposable income and consumption in the country Beta**

$Y_d$ , bln euro	C, bln euro	S, bln euro	APC	APS	MPC	MPS
1	2	3	4	5	6	7
550	530					

Table 6.2 (the end)

1	2	3	4	5	6	7
600	560					
650	590					
700	620					
750	650					
800	680					

*Guidelines for doing task 2*

1. Calculate the size of saving using the formula:

$$Y_d = C + S. \quad (6.2)$$

Hence  $S = Y_d - C$ .

$$S_1 = 550 - 530 = 20.$$

$$S_2 = 600 - 560 = 40.$$

$$S_3 = 650 - 590 = 60.$$

$$S_4 = 700 - 620 = 80.$$

$$S_5 = 750 - 650 = 100.$$

$$S_6 = 800 - 680 = 120.$$

2. Calculate the average propensity to consume using the formula:

$$APC = \frac{C}{Y_d}, \quad (6.3)$$

where APC is the average propensity to save.

We obtain:

$$APC_1 = \frac{530}{550} = 0.96.$$

$$APC_2 = \frac{560}{600} = 0.93.$$

$$APC_3 = \frac{590}{650} = 0.91.$$

$$APC_4 = \frac{620}{700} = 0.89.$$

$$APC_5 = \frac{650}{750} = 0.87.$$

$$APC_6 = \frac{680}{800} = 0.85.$$

3. Calculate the average propensity to save using the following formula:

$$APS = 1 - APC, \quad (6.4)$$

where APS is the average propensity to save.

We obtain:

$$APS_1 = 1 - APC = 1 - 0.96 = 0.04.$$

$$APS_2 = 1 - APC = 1 - 0.93 = 0.07.$$

$$APS_3 = 1 - APC = 1 - 0.91 = 0.09.$$

$$APS_4 = 1 - APC = 1 - 0.89 = 0.11.$$

$$APS_5 = 1 - APC = 1 - 0.87 = 0.13.$$

$$APS_6 = 1 - APC = 1 - 0.85 = 0.15.$$

4. Calculate the marginal propensity to consume using the formula:

$$MPC = c' = \frac{\Delta C}{\Delta Y_d}, \quad (6.5)$$

where MPC is marginal propensity to consume;

$\Delta C$  is a change in consumption;

$\Delta Y_d$  is a change in disposable income.

We obtain:

$$MPC = \frac{30 \text{ bln euro}}{50 \text{ bln euro}} = 0.6.$$

5. Calculate the marginal propensity to save using the formula:

$$MPS = 1 - 0.6 = 0.4.$$

Thus, Table 6.2 when completed looks as follows:

Y <sub>d</sub> , bln euro	C, bln euro	S, bln euro	APC	APS	MPC	MPS
550	530	20	0.96	0.04	0.6	0.4
600	560	40	0.93	0.07		
650	590	60	0.91	0.09		
700	620	80	0.89	0.11		
750	650	100	0.87	0.13		
800	680	120	0.85	0.15		

**Task 3.** In 2021 aggregate supply in the country A equaled 700 bln dollars and the AD curve was described as  $AD = 1500 - 20 \cdot P$ . In 2022 aggregate supply increased by 25 % and the AD curve was described as  $AD = 2375 - 30 \cdot P$ . Calculate how the equilibrium price level changed during 2021 – 2022.

*Guidelines for doing task 3*

1. Calculate the equilibrium price level in the country in 2021:

$$\begin{aligned} AD &= AS; \\ 1500 - 20 \cdot P &= 700; \\ P &= 40 \text{ dollars.} \end{aligned}$$

2. Calculate the equilibrium price level in the country in 2022:

$$\begin{aligned} 2375 - 30 \cdot P &= 700 \cdot 1.25; \\ P &= 50 \text{ dollars.} \end{aligned}$$

Thus, the equilibrium price level in the country A increased by 10 US dollars (or by 20 %).

**Task 4.** The country Gama is characterized by the following data: potential GDP is 800 bln dollars, sensibility of the quantity of production to a decline in the actual price level from the expected price level is 0.75, the actual price level is 105 %, the expected price level is 102.4 %. Calculate the total output of this country.

*Guidelines for doing task 4*

In order to solve this task, use the aggregate supply function in the short run (SRAS function) that is described as:

$$Y_{AS} = Y_P + \alpha \cdot (P - P_E), \quad (6.6)$$

where  $Y_{AS}$  is the total output in the short run;

$Y_P$  is the potential GDP;

$\alpha$  is the sensibility of the quantity of production to a decline in the actual price level from the expected price level;

$P$  is the actual price level;

$P_E$  is the expected price level (or price level at full employment that equilibrates the labor market and eliminates cyclical unemployment).

Entering the data in the SRAS function (6.6), we obtain:

$$Y_{AS} = 800 \text{ bln dollars} + 0.75 \cdot (105 \% - 102.4 \%) = 801.95 \text{ bln dollars.}$$

**Task 5.** The economy of the country X is characterized by the following data, bln euro:  $C = 120 + 0.7 \cdot Y$ ,  $I = 200$ . Calculate: 1) the equilibrium GDP;



2) the equilibrium GDP if investments increase by 250 bln euro; 3) the multiplier of investment.

*Guidelines for doing task 5*

1. As we know, there are only two macroeconomic agents in a closed private economy: households and enterprises. So GDP will be described as:

$$Y = C + I. \quad (6.7)$$

Entering the initial data in the formula, we will obtain:

$$Y = 120 \text{ bln euro} + 0.7 \cdot Y + 200 \text{ bln euro};$$

$$Y - 0.7 \cdot Y = 320 \text{ bln euro};$$

$$0.3 \cdot Y = 320 \text{ bln euro};$$

$$Y = 1\,066.67 \text{ bln euro}.$$

Thus, the initial equilibrium GDP is 1066.67 bln euro.

2. If investments increase by 250 bln euro, they will be 450 bln euro (or  $I = 250 \text{ bln euro} + 200 \text{ bln euro} = 450 \text{ bln euro}$ ):

$$Y = C + I;$$

$$Y = 120 + 0.7 \cdot Y + 450;$$

$$0.3 \cdot Y = 570;$$

$$Y = 1\,900 \text{ bln euro}.$$

3. In order to calculate the value of the investment multiplier, use the formula:

$$m_I = \frac{\Delta Y}{\Delta I}, \quad (6.8)$$

where  $m_I$  is the investment multiplier;

$\Delta Y$  is the change in GDP;

$\Delta I$  is the change in investment.

Entering the data in formula (6.8), we will obtain:

$$m_I = \frac{833.33 \text{ bln euro}}{250 \text{ bln euro}} = 3.33.$$

**Task 6.** Julia is planning to run a business in Morocco. Now she has five possibilities to make money investing in one of the following projects (Table 6.3).

### Investment possibilities of running business in Morocco

Indicators	Project 1	Project 2	Project 3	Project 4	Project 5
Investment, mln dirham	100	100	100	100	100
Net profit, mln dirham	10	15	20	30	12

Advise Julia how to choose the right project to invest money.

#### *Guidelines for doing task 6*

To choose the right project to invest money, calculate the net profit rate of each project using the formula:

$$\text{NPI} = \frac{\text{NP}}{I} \cdot 100, \quad (6.9)$$

where NPI is the net profit rate;

NP is the net profit.

Entering the data in formula (6.9), we obtain:

$$\text{NPI (1)} = \frac{10 \text{ mln dirham}}{100 \text{ mln dirham}} \cdot 100 = 10.$$

$$\text{NPI (2)} = \frac{15 \text{ mln dirham}}{100 \text{ mln dirham}} \cdot 100 = 15.$$

$$\text{NPI (3)} = \frac{20 \text{ mln dirham}}{100 \text{ mln dirham}} \cdot 100 = 20.$$

$$\text{NPI (4)} = \frac{30 \text{ mln dirham}}{100 \text{ mln dirham}} \cdot 100 = 30.$$

$$\text{NPI (5)} = \frac{12 \text{ mln dirham}}{100 \text{ mln dirham}} \cdot 100 = 12.$$

So it is recommended that project 4 be chosen because the net profit rate is the highest (NPI (4) = 30 %).

**Task 7.** Actual GDP of the economy is 800 bln euro, potential GDP is 700 bln euro, marginal propensity to consume is 0.75. Determine the size and type of gap in this economy.

*Guidelines for doing task 7*

1. Calculate the meaning of the multiplier of government spending:

$$m_E = \frac{1}{MPS} = \frac{1}{1-MPC}, \quad (6.10)$$

where  $m_E$  is the multiplier of government spending.

Entering the input data in formula (6.10), we obtain:

$$m_E = \frac{1}{1-0.75} = 4.$$

2. In the analyzed economy actual GDP is less than potential GDP so inflation gap is observed there. Calculate the size of inflation GDP using the formula:

$$U_A = \frac{\Delta Y}{\Delta E} = \frac{Y_A - Y_P}{\Delta E}, \quad (6.11)$$

where  $Y_A$  is the actual GDP;

$Y_P$  is potential GDP.

$$\text{Hence } \Delta E = \frac{Y_A - Y_P}{m_E}.$$

Entering the input data in formula (6.11), we obtain:

$$\Delta E = \frac{800 \text{ bln euro} - 700 \text{ bln euro}}{4} = 25 \text{ bln euro}.$$

**Task 8.** Assume that investment in the country A is 50 bln euro, saving is described in the form of equation  $S = 0.2 \cdot Y - 100$ . Calculate the size of the recession gap if potential GDP is 1 000 bln euro.

*Guidelines for doing task 8*

1. Calculate the meaning of the multiplier of government spending using formula (6.10):

$$m_E = \frac{1}{0,2} = 5.$$

2. Calculate the size of actual GDP:

$$S = I;$$

$$0.2 \cdot Y - 100 = 50 \text{ bln euro};$$

$$Y = 750 \text{ bln euro}.$$

3. In the country B actual GDP is higher than potential GDP so a recession gap is observed there. Calculate the size of the recession gap using the formula:

$$\Delta E = \frac{Y_P - Y_A}{m_E}. \quad (6.12)$$

Entering the input data in formula (6.12), we obtain:

$$\Delta E = \frac{1000 \text{ bln euro} - 750 \text{ bln euro}}{5} = 50 \text{ bln euro}.$$

**Task 9.** Potential GDP is 2 500 bln euro, actual GDP is 2 300 bln euro, marginal propensity to save is 0.3. Calculate the size of the recession gap if the government is planning to increase average price levels by 10 %.

*Guidelines for doing task 9*

1. Calculate the meaning of the multiplier of government spending using the formula (6.10):

$$m_E = \frac{1}{0.3} = 3.33.$$

2. Calculate the size of the recession gap using the formula:

$$\Delta E = \frac{Y_p \cdot P - Y_a \cdot P}{m_e}. \quad (6.13)$$

Entering the input data in formula (6.13), we obtain:

$$\Delta E = \frac{2\,500 \text{ bln euro} - 2\,300 \text{ bln euro} \cdot 1.1}{1.33} = -22.56 \text{ bln euro}.$$

**Task 10.** Calculate the equilibrium disposable income in the country Beta if its economy is characterized by the following data: autonomous investment is 320 bln euro and the saving function is described as:  $S = -150 + 0.2 \cdot Y_d$ .

**Task 11.** Calculate the size of saving in the country A if its economy is characterized by the following data: disposable income is 450 bln euro and the saving function is described as:  $S = 120 + 0.4 \cdot Y_d$ .

**Task 12.** Disposable income in the economy is 360 bln dollars. Calculate the average propensity to consume if consumption is 380 bln dollars and autonomous consumption is 59 bln dollars.

**Task 13.** During a year disposable income of a country increased by 80 bln euro and consumption increased by 45 bln euro. Calculate: 1) marginal propensity to consume; 2) marginal propensity to save.

**Task 14.** The consumption function is described as  $C = 120 + 0.8 \cdot Y_d$ . Do the following: 1) calculate the investment multiplier; 2) calculate the investment accelerator; 3) write the saving equation.

## Theme 7. Macroeconomic instability. Banking system

**Task 1.** Calculate the inflation rate for each year using the data given in Table 7.1.

Table 7.1

### Dynamic of consumer price index in the country Gama

Years	Consumer price index, %
2019	105.5
2020	108.9
2021	110.25
2022	120.1

#### *Guidelines for doing task 1*

In order to calculate the inflation rate, use the following formula:

$$\pi = \frac{P_t - P_{t-1}}{P_{t-1}} \cdot 100, \quad (7.1)$$

where  $P_t$  is the consumer price index in the current year;

$P_{t-1}$  is the consumer price index in the base year.

Entering the input data in formula (7.1), we obtain:

$$\pi_{2020} = \frac{108.9 - 105.5}{105.5} \cdot 100 = 3.22.$$

$$\pi_{2021} = \frac{110.25 - 108.9}{108.9} \cdot 100 = 1.24.$$

$$\pi_{2022} = \frac{120.1 - 110.25}{110.25} \cdot 100 = 8.93.$$

**Task 2.** The economy of the country Beta is characterized by the following indicators: the natural unemployment rate is 10.5 %, the actual unemployment rate is 12.2 %, the expected inflation rate is 5.5 %, the empiric coefficient that is defined by the angle of inclination of the Phillips curve and the sensibility of cyclical unemployment to inflation rate is 0.2. Calculate the actual inflation rate in that economy using the Phillips equation.

*Guidelines for doing task 2*

In order to do this task, use the Phillips equation that is mathematically described as:

$$\pi = \pi_e - \beta \cdot (u - u^*), \quad (7.2)$$

where  $\pi$  is the actual inflation rate;

$\pi_e$  is the expected inflation rate;

$\beta$  is the empiric coefficient that defines the angle of inclination of the Phillips curve and the sensibility of cyclical unemployment to inflation rate;

$u$  is the actual unemployment rate;

$u^*$  is the natural unemployment rate.

Entering the input data in formula (7.2), we obtain:

$$\pi = 5.5 \% - 0.2 \cdot (12.2 \% - 10.5 \%) = 5.16 \%$$

**Task 3.** Calculate the actual unemployment rate and the cyclical unemployment rate, if all residents of the country A amount to 78 million people, residents under 16 years of age are 3.4 million people, institutionalized adults make 2.9 million people, adults not looking for jobs amount to 0.75 million people, the number of unemployed is 2.6 million people, the natural unemployment rate is 2.01 %.

*Guidelines for doing task 3*

1. Calculate the number of labor force:

$$L = \text{All residents} - \text{Residents under 16 years of age} - \text{Institutionalized adults} - \text{Adults not looking for jobs}, \quad (7.3)$$

where  $L$  is labor force.

$L = 78 \text{ million people} - 3.4 \text{ million people} - 2.9 \text{ million people} - 0.75 \text{ million people} = 70.95 \text{ million people}.$

2. Calculate actual unemployment rate using the formula:

$$U_A = \frac{U}{L} \cdot 100, \quad (7.4)$$

where  $U_A$  is the unemployment rate;

$U$  is the number of unemployed;

$L$  is the labor force.

$$U_A = \frac{3.2 \text{ million people}}{70.95 \text{ million people}} \cdot 100 = 4.51.$$

3. Calculate natural unemployment rate using the formula:

$$U_N = U_A - U_C, \quad (7.5)$$

where  $U_N$  is natural unemployment rate.

$$U_N = 5.51 \% - 2.01 \% = 2.5 \%$$

**Task 4.** The economy of the country A is characterized by the following data: actual unemployment rate is 8.6 %, frictional unemployment rate is 2.2 % and structural unemployment rate is 1.5 %. Calculate: 1) the cyclical unemployment rate; 2) the GDP gap according to Okun's law.

*Guidelines for doing task 4*

1. To calculate the cyclical unemployment rate do the following:

a) calculate the natural unemployment rate using the formula:

$$U_N = U_{FR} + U_{STR}. \quad (7.6)$$

Entering the input data in formula (7.6), we obtain:

$$U_N = 2.2 \% + 1.5 \% = 3.7 \%$$

b) calculate the cyclical unemployment rate using the formula:

$$U_C = U_A - U_N, \quad (7.7)$$

where  $U_C$  is the cyclical unemployment rate.

Entering the input data in formula (7.7), we obtain:

$$U_C = 8.6 \% - 3.7 \% = 4.9 \%$$

2. Calculate the GDP gap according to Okun's law:

$$\Delta Y = -\beta \cdot (U_A - U_N), \quad (7.8)$$

where  $\Delta Y$  is the GDP gap;

$\beta$  is Okun's coefficient ( $2 < \beta < 3$ , in our case  $\beta$  is 2.5);

$U_A$  is the actual unemployment rate.

Entering the input data in formula (7.8), we obtain:

$$\Delta Y = -2.5 \cdot 4.9 \% = -12.25 \%$$

**Task 5.** Actual GDP of the country Delfa is 900 bln euro, natural unemployment rate is 2.5 %, actual unemployment rate is 12.5 %. Calculate the potential GDP of the country Delfa.

#### *Guidelines for doing task 5*

In order to calculate the potential GDP, use Okun's law that is mathematically described as:

$$\frac{Y_A - Y_P}{Y_P} = -\beta \cdot (U_A - U_N), \quad (7.9)$$

where  $Y_P$  is potential GDP;

$Y_A$  is actual GDP.

Entering the input data in formula (7.9), we obtain:

$$\frac{900 - Y_P}{Y_P} = -2.5 \cdot (12.5 - 2.5) = -10 = -0.1$$

$$900 \text{ bln euro} - Y_P = -0.1 \cdot Y_P;$$

$$900 \text{ bln euro} = -0.1 \cdot Y_P + Y_P;$$

$$Y_P = 1\,000 \text{ bln euro.}$$

**Task 6.** The actual GDP of the country Alfa in 2021 is 3 800 bln euro. The government of this country is planning to increase GDP to 4 200 bln euro in order to equilibrate the national economy in 2022. The marginal propensity to consume is 0.7. The tax rate is 0.18.

1. How should government purchases be increased to equilibrate the economy of this country?

2. How should taxes be decreased to equilibrate the economy of this country?



### Guidelines for doing task 6

1. To answer the first question:

a) calculate a change in GDP:

$$\Delta Y = 4\,200 \text{ bln euro} - 3\,800 \text{ bln euro} = 400 \text{ bln euro};$$

b) calculate the value of the multiplier of government purchases, using the formula:

$$m_G = \frac{1}{1 - \text{MPC} \cdot (1 - t)}, \quad (7.10)$$

where  $m_G$  is the multiplier of government spending.

$$m_G = \frac{1}{1 - 0.7(1 - 0.18)} = 2.35.$$

c) calculate how government purchases should be increased to equilibrate the economy of this country. Use the formula:

$$m_G = \frac{\Delta Y}{\Delta G}, \quad (7.11)$$

$$\text{Hence } \Delta G = \frac{\Delta Y}{m_G}.$$

Entering the data in formula (7.11), we will obtain:

$$\Delta G = \frac{400 \text{ bln euro}}{2.35} = 170.21 \text{ bln euro}.$$

2. To answer the second question:

a) calculate the meaning of the tax multiplier, using the following formula:

$$m_T = \frac{\text{MPC}}{1 - \text{MPC}(1 - t)}, \quad (7.12)$$

where  $m_T$  is the tax multiplier.

Entering the data in formula (7.12), we obtain:

$$m_T = \frac{0.7}{1 - 0.7(1 - 0.18)} = 1.64.$$

b) calculate how taxes should be decreased to equilibrate the economy of this country. Use the formula:

$$m_T = \frac{\Delta Y}{-\Delta T}. \quad (7.13)$$

Entering the data in formula (7.13), we obtain:

$$++ - \Delta T = \frac{400 \text{ bln euro}}{1.64} = -243.9 \text{ bln euro.}$$

**Task 7.** The economy of the country X is characterized by the following indicators (bln euro):  $C = 100 + 0.7 \cdot (Y - T)$ ;  $I = 200 + 0.1 \cdot Y$ ;  $G = 350$ ,  $NE = 20$ ;  $t = 0.25$ . Calculate: 1) the equilibrium GDP; 2) the multiplier of government purchases; 3) the tax multiplier.

*Guidelines for doing task 7*

1. Calculate the equilibrium GDP, using the equation:

$$Y = C + I + G + NE.$$

Entering the data in this equation, we obtain:

$$Y = 100 + 0.7 \cdot (Y - T) + 200 + 0.1 \cdot Y + 350 + 20;$$

$$Y = 100 + 0.7 \cdot (Y - 0.2 \cdot Y) + 200 + 0.1 \cdot Y + 350 + 20 \text{ bln euro};$$

$$0.06 \cdot Y = 670;$$

$$Y = 11\,166.67 \text{ bln euro.}$$

2. Calculate the value of the multiplier of government purchases. We know that the general form of the consumption function is described as  $C = C_0 + MPC \cdot Y_d = C_0 + MPC \cdot (Y - T + TR)$ . So in our task, marginal propensity to consume is 0.7. Entering the data in formula (7.10), we obtain:

$$m_G = \frac{1}{1 - 0.7(1 - 0.25)} = 2.12.$$

3. Calculate the value of the tax multiplier, using formula (7.12):

$$m_T = \frac{0.7}{1 - 0.7(1 - 0.25)} = 1.65.$$

**Task 8.** The economy of the country Alfa is characterized by the following data: potential GDP is 500 bln crone, actual GDP is 450 bln crone, government purchases of goods and services are 100 bln crone, tax rate is 0.25. Calculate the size of the cyclical deficit in this country.

*Guidelines for doing task 8*

1. Calculate the size of the actual deficit, using the formula:

$$BS_A = Y \cdot t - G, \tag{7.14}$$

where BS is the size of the actual deficit;

Y is the real (actual) GDP;

t is the tax rate;

G is the government purchases of goods and services.

Entering the initial data in formula (7.14), obtain:

$$BS = (450 \text{ bln crone} \cdot 0.25) - 100 \text{ bln crone} = 12.5 \text{ bln crone.}$$

2. Calculate the size of the structural deficit:

$$BS_S = (500 \text{ bln crone} \cdot 0.25) - 100 \text{ bln crone} = 25 \text{ bln crone.}$$

3. Calculate the size of the cyclical deficit:

$$BS_C = 12.5 \text{ bln crone} - 25 \text{ bln crone} = -12.5 \text{ bln crone.}$$

**Task 9.** The deposits of the commercial bank "Milenium" (Poland) amount to 70 mln zloty. The required reserve ratio is 15 %. Besides, this commercial bank holds 4.5 % excess reserves of deposits. Calculate the sum of money that the bank can lend.

#### *Guidelines for doing task 9*

1. Calculate the sum of compulsory bank reserves using the formula:

$$R_C = rr \cdot D, \quad (7.15)$$

where  $R_C$  is compulsory bank's reserves;

D is deposits.

Entering the input data in formula (7.15), we obtain:

$$R_C = 0.15 \cdot 70 \text{ mln zloty} = 10.5 \text{ mln zloty.}$$

2. Calculate the sum of excess bank reserves:

$$R_E = 0.045 \cdot 70 \text{ mln zloty} = 3.15 \text{ mln zloty.}$$

3. Calculate the sum of money that the bank can lend:

$$\text{Credits} = 70 \text{ mln zloty} - 10.5 \text{ mln zloty} - 3.15 \text{ mln zloty} = 56.35 \text{ mln zloty.}$$

**Task 10.** Assume that the National Bank of Ukraine is planning to increase money supply by 900 bln UAH. How should the money base be increased if cash-deposit ratio is 0.18 and the required reserve ratio is 15 %?

#### *Guidelines for doing task 10*

1. Calculate the meaning of the money multiplier:

$$m_m = \frac{cr + 1}{cr + rr}, \quad (7.16)$$

where  $m_m$  is the money multiplier;

cr is the cash-deposit ratio;  
 rr is the required reserve ratio.

Entering the input data in formula (7.16), we obtain:

$$m_m = \frac{0.18 + 1}{0.18 + 0.15} = 3.58.$$

2. Calculate how the money base should be increased using the formula:

$$S_m = m_m \cdot MB. \quad (7.17)$$

Hence  $\Delta S_m = m_m \cdot \Delta MB$ .

$$\Delta MB = \frac{\Delta MS}{m_m}.$$

$$\Delta MB = \frac{900 \text{ bln UAH}}{3.58} = 251.39 \text{ bln UAH}.$$

So the money base should be increased by 251.39 bln hryvnia.

**Task 11.** Calculate the inflation rate for each year using the data given in Table 7.2.

Table 7.2

### The dynamic of the consumer price index in the country X

Years	Consumer price index, %
2019	98.08
2020	102.4
2021	105.5
2022	103.2

**Task 12.** Using the Phillips equation, calculate the actual inflation rate caused by negative perturbation in aggregate supply, if the coefficient that defines the angle of inclination of the Phillips curve and the sensibility of cyclical unemployment to inflation rate is 0.25, the natural unemployment rate is 5.5 %, the actual unemployment rate is 8.5 %, the expected inflation rate is 4.5 %.

**Task 13.** The actual GDP of the country Beta is 550 bln dollars, the potential GDP is 610 bln dollars, the marginal propensity to save is 0.18, the tax rate is 0.2. How should government purchases be changed to equilibrate the economy of this country?

**Task 14.** The actual GDP of the country X is 900 bln dollars, the potential GDP is 950 bln dollars, the marginal propensity to consume is 0.8. How should government purchases be changed to equilibrate the economy of this country?

**Task 15.** The actual GDP of the country Alfa in the base period is 380 bln euro. The government of this country is planning to increase GDP to 430 bln euro in order to equilibrate the national economy. The marginal propensity to consume is 0.78. 1. How should government purchases be increased to equilibrate the economy of this country? 2. How should taxes be decreased to equilibrate the economy of this country?

**Task 16.** The economy of the country X is characterized by the following indicators (bln euro):  $C = 150 + 0.7 \cdot (Y - T)$ ;  $I = 220 + 0.2 \cdot Y$ ;  $G = 360$ ;  $NE = 10$ ;  $t = 0.25$ . Calculate: 1) the equilibrium GDP; 2) the multiplier of government purchases; 3) the tax multiplier.

**Task 17.** According to the expansion monetary policy of the Central Bank of Japan the government is planning to increase money supply by 1 200 bln yen. How should money base be increased if the cash-deposit ratio is 0.12 and the required reserve ratio is 0.18?

**Task 18.** The monetary system of the country A is characterized by the following indicators: cash is 50 bln euro, checkable (demand) deposits make 70 bln euro, time deposits are 25 bln euro, money market funds are 15 bln euro. Calculate the monetary aggregate M2.

## **Theme 8. State policy of economic regulation and foreign economic policy**

**Task 1.** The open economy of the country Gama is characterized by the following data: marginal propensity to consume is 0.7, marginal propensity to import is 0.15, tax rate is 0.22. Calculate how GDP will change if government purchases increase by 100 bln franc.

### *Guidelines for doing task 1*

1. Calculate the value of the multiplier in the open economy of the country Beta, using the formula:

$$m_E = \frac{1}{1 - (MPC - MPI) \cdot (1 - t)}, \quad (8.1)$$

where  $m_E$  is the multiplier of government spending in an open economy;  
MPC is the marginal propensity to consume;  
MPI is the marginal propensity to import;  
 $t$  is the tax rate.

Entering the initial data in formula (8.1), obtain:

$$m_E = \frac{1}{1 - (0.7 - 0.15)(1 - 0.22)} = 1.94.$$

2. Calculate how GDP will change, if government purchases increase.  
Use the formula:

$$m_E = \frac{\Delta Y}{\Delta G}. \quad (8.2)$$

Hence  $\Delta Y = m_E \cdot \Delta G$ .

Entering the data in formula (8.2) obtain:

$$m_E = 1.94 \cdot 100 \text{ bln euro} = 194 \text{ bln franc.}$$

**Task 2.** Draw up the balance of payments of the country X if its economy is characterized by the following trade operations: buying of bonds of foreign enterprises by the residents of the country is 70 bln peso, imports of goods and services to the country make 120 bln peso, exports of goods and services from the country amount to 140 bln peso, money transactions to the country are 50 bln peso, selling of bonds of national enterprises by foreigners is 80 bln peso, imports of gold to the country are 80 bln peso.

### *Guidelines for doing task 2*

It is known that the balance of payments of any country consists of debits and credits, so we have to divide the initial data into two groups (Table 8.1).

Table 8.1

### **Balance of payments of the country X**

Indicators	Debit	Credit
1	2	3
Buying of bonds of foreign enterprises by the residents of the country, bln peso	70	
Selling of bonds of national enterprises by foreigners, bln peso	120	

Table 8.1 (the end)

1	2	3
Imports of goods and services to the country, bln peso		80
Imports of gold to the country, bln peso	80	
Exports of goods and services from the country, bln peso		140
Money transactions to the country, bln peso		50
Total, bln peso	270	270

**Task 3.** Using Table 8.2, define: 1) which country has absolute advantage in the production of bananas; 2) which country has absolute advantage in the production of oranges; 3) calculate comparative opportunity costs of each country in the production of bananas and decide in what product each country should specialize.

Table 8.2

### Trade possibilities of the countries Alfa and Beta

Country	Labor hours per ton of bananas	Labor hours per ton of oranges
Alfa	4	3
Beta	1	2

#### *Guidelines for doing task 3*

1. Country Alfa has absolute advantage in the production of oranges because labor hours per ton of this good are less comparing with the production of bananas.

2. Country Beta has absolute advantage in the production of oranges because labor hours per ton of this good are less comparing with the production of bananas.

3. Calculate the comparative opportunity costs of each country in producing bananas. Use the following formula:

$$\text{Opportunity costs} = \frac{\text{Labor hours per ton of bananas}}{\text{Labor hours per ton of oranges}}. \quad (8.3)$$

Entering the data in formula (8.3), we obtain the data, presented in Table 8.3.

Table 8.3

### Opportunity costs of countries Alfa and Beta

Country	Opportunity costs of production of bananas	Opportunity costs of production of oranges
Alfa	0.75	1.33
Beta	2	0.5

Thus, country A should specialize in production of bananas and country Beta should specialize in production of oranges.

**Task 4.** Study the data given in Table 8.4.

Table 8.4

### Prices of consumer goods in the country A

Goods	Quantity	Price, US dollars	Price, UAH
A	10	2	48
B	15	1.5	35
C	25	0.5	15

#### *Guidelines for doing task 4*

1. Calculate the value of consumer basket in US dollars:

CB (dollars) = 10 · 2 US dollars + 15 · 1.5 US dollars + 25 · 0.5 US dollars = 55 US dollars.

2. Calculate the value of consumer basket in hryvnias:

CB (hryvnias) = 10 · 48 UAH + 15 · 35 UAH + 25 · 15 UAH = 1 380 UAH.

3. Calculate the exchange rate using the formula:

$$r_E = \frac{CB_F}{CB_N}, \quad (8.4)$$

where  $r_E$  is the exchange rate;

$CB_F$  is the value of consumer basket in foreign currency;

$CB_N$  is the value of consumer basket in national currency.

$r_E = 55 \text{ US dollars} / 1380 \text{ UAH} = 0.04 \text{ US dollars} / \text{UAH}$ .

**Task 5.** Consumer basket in Ukraine equals 9000 UAH and in the United States it is 1 000 US dollars. The nominal exchange rate is 0.4 dollar



/ UAH. How will the real exchange rate change if the average price level increases by 18.5 % in Ukraine but only by 2 % in the US?

*Guidelines for doing task 5*

1. Calculate the nominal exchange rate using the formula:

$$e_N = 1000 \text{ US dollars} / 9000 \text{ UAH} = 0.11 \text{ dollars} / \text{UAH}.$$

2. Calculate how real exchange rate will change:

$$e_R = \frac{e_N \cdot P_N}{P_F}, \tag{8.5}$$

where  $e_R$  is real exchange rate;

$P_N$  is the average price level in national economy;

$P_F$  is a change in the average price level in foreign economy.

$$e_R = \frac{0.11 \cdot 1.185}{1.02} = 0.13 \text{ US dollars}.$$

**Task 6.** The exchange rate between the US dollar and the Japanese yen equals 1 : 108.5. The exchange rate between the Ukrainian hryvnia and the US dollar rate equals 1 : 30. Calculate the cross exchange rate between the Japanese yen and the Ukrainian hryvnia.

**Task 7.** The indicators of the balance of payments of the country A (bln franc) are the following: the current account balance is -320; the capital account balance is +220, the visible balance "Errors and omissions" is +65. How much should the reserve assets be reduced in order to counterbalance the balance of payments?

**Task 8.** Study the trade possibilities given in Table 8.5.

Table 8.5

**Trading possibilities of countries Alfa and Beta**

Trading possibilities	Country Alfa		Country Beta	
	Wheat	Bananas	Tomatoes	Tangerines
A	200	0	250	0
B	150	75	220	80
C	120	130	150	140
D	50	170	120	160
E	0	190	0	180

Do the following 1) build a trade possibilities curve for each country; 2) determine in what product(s) each country should specialize.

**Task 9.** Assume that France can produce 25 mln mobile phones and 5 mln notebooks. In turn, South Korea can produce 10 mln mobile phones and 15 mln notebooks. Do the following: 1) calculate the opportunity costs of producing coats in each country; 2) define which country should specialize in which product; 3) define which country has comparative advantage in producing coats?

**Task 10.** The value of consumer basket in Spain equals 4 200 euro and in the United States it is 4 800 US dollars. Calculate the exchange rate between the euro and the dollar if the inflation rate in Spain is 12 % while in the US it is 2.4 %.

## Recommended literature

1. Базилінська О. Я. Мікроекономіка : навчальний посібник / О. Я. Базилінська, О. В. Мініна. – Київ : ЦУЛ, 2019. – 348 с.

2. Гронтковська Г. Е. Макроекономіка : навчальний посібник / Г. Е. Гронтковська, І. Ф. Косик. – Київ : ЦУЛ, 2019. – 672 с.

3. Макроекономіка [Електронний ресурс] : мультимедійний навчальний посібник / М. С. Бріль, О. М. Кліменко, М. А. Мащенко та ін. – Харків : ХНЕУ ім. С. Кузнеця, 2019. – 705 с.

4. Макро- та мікроекономіка [Електронне ресурс] : навчальний посібник для студентів усіх спеціальностей першого (бакалаврського) рівня / М. С. Бріль, О. М. Кліменко, А. В. Литвиненко та ін. ; за заг. ред. д-ра екон. наук, доцента М. А. Мащенко. – Харків : ХНЕУ ім. С. Кузнеця, 2021. – 214 с. – Режим доступу : <http://repository.hneu.edu.ua/handle/123456789/27811>.

5. Черкашина Т. С. Макро- і мікроекономіка [Електронне видання] : методичні рекомендації до самостійної роботи студентів усіх спеціальностей першого (бакалаврського) рівня / уклад. Т. С. Черкашина. – Харків : ХНЕУ ім. С. Кузнеця, 2018. – 122 с. – Режим доступу : <http://repository.hneu.edu.ua/handle/123456789/27809>.

6. Evans M. K. Macroeconomics for managers / M. K. Evans. – London : Blackwell Publishing, 2016. – 838 p.

7. Fundamentals of Economics [Electronic resource] : textbook / M. Mashchenko, L. Ukrainskaya, I. F. Lisna et al. – Kharkiv : S. Kuznets KhNUE, 2021. – 310 p.

8. Garn J. Intermediate Macroeconomics / J. Garn, R. Lester, E. Sims. – Oxford : Oxford University Press, 2018. – 1018 p.
9. Lipsey R. G. Economics / R. G. Lipsey, K. A. Chrystal. – Oxford : Oxford University Press, 2015. – 507 p.
10. McConnell C. R. Economics : Principles, Problems, and Policies / C. R. McConnell, S. L. Brue. – Boston : McGraw-Hill/Irwin, 2019. – 818 p.
11. Macroeconomics [Electronic resource] : guidelines for self-study of Bachelor's (first) degree students of all specialities / compiled by T. Cherkashyna. – Kharkiv : S. Kuznets KhNUE, 2021. – 55 p. (English). – Access mode : <http://repository.hneu.edu.ua/handle/123456789/24903>.
12. Macroeconomics [Electronic resource] : textbook / M. Bril, O. Klimenko, I. Lisna et al. – Kharkiv : S. Kuznets KhNUE, 2020. – 237 p. (English). – Access mode : <http://repository.hneu.edu.ua/handle/123456789/24100>.

# Contents

Introduction .....	3
Content module 1. The main problems of microeconomics .....	4
Theme 1. Utility of economic goods. Economic choice. Analysis of consumer behavior .....	4
Theme 2. The law of supply and demand in a market economy .....	12
Theme 3. The theory of marginal products and microeconomic model of an enterprise. Costs of production and profit .....	17
Theme 4. The theory of market structures .....	24
Content module 2. The main problems of macroeconomics .....	31
Theme 5. Macroeconomic indicators in national accounts .....	31
Theme 6. Household's consumption and private investment. Macroeconomic equilibrium .....	35
Theme 7. Macroeconomic instability. Banking system .....	45
Theme 8. State policy of economic regulation and foreign economic policy .....	53
Recommended literature .....	58

НАВЧАЛЬНЕ ВИДАННЯ

## **МАКРО І МІКРОЕКОНОМІКА**

**Методичні рекомендації  
до практичних завдань  
для студентів спеціальності 073 "Менеджмент"  
освітньої програми "Бізнес-адміністрування"  
першого (бакалаврського) рівня  
(англ. мовою)**

*Самостійне електронне текстове мережеве видання*

Укладач **Черкашина** Тетяна Сергіївна

Відповідальний за видання *Н. Л. Гавкалова*

Редактор *З. В. Зобова*

Коректор *З. В. Зобова*

Подано методичні рекомендації до виконання практичних завдань із навчальної дисципліни, призначені для набуття студентами навичок щодо використання понятійно-категоріального апарату мікро- та макроекономіки, ґрунтового оволодіння сутністю економічних явищ і процесів, забезпечення базової фундаментальної теоретичної підготовки, необхідної для подальшого вивчення циклу економічних дисциплін, глибокого розуміння законів та основних економічних тенденцій розвитку глобального суспільства.

Рекомендовано для студентів усіх спеціальностей першого (бакалаврського) рівня всіх форм навчання.

План 2023 р. Поз. № 135 ЕВ. Обсяг 61 с.

---

Видавець і виготовлювач – ХНЕУ ім. С. Кузнеця, 61166, м. Харків, просп. Науки, 9-А

---

*Свідоцтво про внесення суб'єкта видавничої справи до Державного реєстру  
ДК № 4853 від 20.02.2015 р.*