

MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE

**NATIONAL TECHNICAL UNIVERSITY
«KHARKIV POLYTECHNIC INSTITUTE»**

METHODICAL RECOMMENDATIONS

for practical classes and individual work

in the discipline «Crisis Management»

for applicants for the second (master's) level of higher education in the
speciality 073 «Management»

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Lesson 1: Global Financial Crises

1.1. Main issues of the topic

1. Global financial crises and their causes
2. History of financial crises.
3. Features of the financial crisis.
4. Top 10 global financial crises.

1.2. Key terms and concepts

Financial regulation, financial market globalisation, currency restrictions, financial crisis, foreign exchange reserves.

1.3. Questions for testing your knowledge

1. Substantial signs of crisis.
2. Types of crises.
3. Levels of Financial Crisis.
4. Financial Crisis at Macro Level.
5. Financial crises causes.
6. The phenomena of global financial crisis.
7. Causes of the micro financial crisis.
8. Types of micro financial crises.
9. Micro financial crisis phases.
10. Operational mechanism of micro financial stabilization.

1.4. Topics of essays

1. The Mexican crisis of 1995.
2. The crisis of Southeast Asia.
3. The dotcom crisis of the early twenty-first century.
4. Global financial crisis as a factor of changes in the global movement of financial resources.

1.5. Homework

Write 5-6 sentences about any crisis using such template. Crisis name, time, country, effect, results.

Lesson 2: Crisis Models

2.1. Main issues of the topic

1. The essence of the company's anti-crisis management policy
2. Crisis Models and their difference.
3. Crisis Diagnosis in Anti-Crisis Management Process in a Company.
4. Main goal of crisis management.
5. Signal detection approach for crisis management.

2.2. Key terms and concepts

Crisis management, crisis models, crisis diagnosis, signal detection approach.

2.3. Questions for testing your knowledge

1. Which differences are between Mitroff Crisis Management and Gonzalez-Herrero Crisis Model?
2. Which differences are between Fink's Crisis Model and Burnett Crisis Model?
3. Name the main directions of implementation the anti-crisis management policy.
4. What essence is in the Signal detection approach for crisis management?
5. What is the main goal of crisis management?

2.4. Topics of essays

1. Crisis Management Model (Mitroff & Pearson, 1993; Mitroff, 2005)
2. Gonzalez-Herrero Crisis Model.
3. The Crisis' Comprehension Diagram.
4. Fink's Crisis Model
5. Burnett Crisis Model.
6. Relational (Jacques) Crisis Model.

2.5. Homework

Explain the crisis model; give its historical feedback and examples of its usage. Use the model depending on your birthday season:

- Winter – Gonzalez-Herrero Model.
- Spring – Mitroff Model.
- Summer – Burnett Model.
- Autumn (Fall) – Relational (Jacques) Model.

Lesson 3. Profit and Income

3.1. Main issues of the topic

1. Profit generation as main anti-crisis decision.
2. Commodity price structure.
3. Income distribution and the formation of the net profit in the company.
4. Profit-making from product sales (operating activities).
5. Profit calculation based on break-even analysis.

3.2. Key terms and concepts

Income (revenue), net income, gross profit, profit before taxation, net profit, variable costs, fixed costs, value added tax, gross margin, breakeven point, operating leverage ratio, contribution ratio.

3.3. Main tasks

Task 3.1

The enterprise produced in the reporting year is 5,000 units. The retail price of the product, including VAT, is UAH 3. The quantity of unsold products of the enterprise at the beginning of the year are equal to UAH 2,000, at the end of the year are equal to UAH 1,000. (The price includes VAT). The enterprise sold US dollars for UAH 3,000. Received income from the sale of raw materials is 2,000 UAH, basic materials is equal to UAH 1,000. Received dividends are equal to UAH 1,000. The enterprise sold stocks of another company for UAH 2,000. Calculate the income and net income of the enterprise from the sale of products in the reporting year.

Solution

$$Inc = Pr \times X + Ib - Ie$$

$$Inc = 5,000 \times 3 + 2,000 - 1,000 = 16,000 \text{ UAH}$$

$$\sum Income_{material} = 16,000 + 2,000 + 1,000 = 19,000 \text{ UAH}$$

The value added tax rate is 20%.

$$Inc = NI + VAT = NI + 0.2NI = 1.2NI$$

$$NI = \frac{19,000}{1.2} = 15,800 \text{ UAH}$$

$$\Sigma NI_{ent} = 15,800 + 3,000 + 1,000 + 2,000 = 21,800 \text{ UAH}$$

Task 3.2

The company sells 2 types of cars: "Dauwoo Lanos", its price is UAH 50,000, volume of sales is 1,000 cars per year; "Chevrolet Aveo", its price is UAH 90,000, volume of sales is 1,000 cars per year. The sales price includes VAT. The full cost of selling products is 60% of the price without VAT for "Dauwoo Lanos" and 55% of the price without VAT for "Chevrolet Aveo". The net profit of the enterprise is distributed as follows: 40% is payment of dividends, 20% is the reserve fund formation. Determine

the net profit of the enterprise, the amount of dividends, the amount of the reserve fund, the amount of retained profit of the enterprise.

Solution

$$\text{Inc} = \text{Pr} \times X$$

$$\text{Inc}_{\text{Dauwoo Lanos}} = 50,000 \times 1,000 = 50,000,000 \text{ UAH}$$

$$\text{Inc}_{\text{Chevrolet Aveo}} = 90,000 \times 1,000 = 90,000,000 \text{ UAH}$$

The value added tax rate is 20%.

$$\text{NI}_{\text{Dauwoo Lanos}} = \frac{50,000,000}{1.2} = 41,600,000 \text{ UAH}$$

$$\text{NI}_{\text{Chevrolet Aveo}} = \frac{90,000,000}{1.2} = 75,000,000 \text{ UAH}$$

Profit before taxation:

$$\text{PBT}_{\text{Dauwoo Lanos}} = 41,600,000 \times (1 - 0.6) = 41,600,000 \times 0.4 = 16,640,000 \text{ UAH}$$

$$\text{PBT}_{\text{Chevrolet Aveo}} = 75,000,000 \times (1 - 0.55) = 75,000,000 \times 0.45 = 33,750,000 \text{ UAH}$$

$$\sum \text{PBT} = 16,640,000 + 33,750,000 = 50,390,000 \text{ UAH}$$

From 2020, the profit tax rate is 18%.

$$\text{NP} = 50,390,000 \times (1 - 0.18) = 41,320,000 \text{ UAH}$$

$$\text{Div} = 41,320,000 \times 0.4 = 16,528,000 \text{ UAH}$$

$$\text{RF} = 41,320,000 \times 0.2 = 8,264,000 \text{ UAH}$$

$$\text{RP} = 41,320,000 - 16,528,000 - 8,264,000 = 16,528,000 \text{ UAH}$$

Task 3.3

JSC "Katyusha" manufactures children's cloths. You work as an enterprise economist. Based on the following data, calculate: gross profit of the enterprise; profit (loss) from ordinary activities, profit (loss) before taxation; net profit (loss) of the enterprise. The volume of products sales is 20,000 units, the sales price of one product, including VAT, is UAH 4. The production cost of one sold product is UAH 1. Administrative expenses and sales expenses are UAH 2,000. Unfinished products of previous year in the amount of UAH 15,000 were sold, their production costs are UAH 8,000, sales costs are UAH 4,000. Profit of previous years, determined in the reporting year is UAH 2,500. Received fines from other enterprises for violation the terms of contracts for the supply of raw materials are UAH 1,500. Bad debt in UAH 3,000 was written off. Determined dividends and interests on securities belonging to the enterprise are UAH 1,000.

Solution

$$\text{Inc}_1 = 20,000 \times 4 = 80,000 \text{ UAH}$$

$$\text{NI}_1 = \frac{80,000}{1.2} = 66,700 \text{ UAH}$$

$$Inc\ 2 = 15,000\ UAH$$

$$NI_2 = \frac{15,000}{1.2} = 12,500\ UAH$$

$$\sum NI = 66,700 + 12,500 = 79,200\ UAH$$

$$GP = 79,200 - (1 \times 20,000) - 8,000 = 51,200\ UAH$$

$$\text{Profit}_{\text{from operating activities}} = 51,200 - 2,000 - 4,000 = 45,200\ UAH.$$

$$\text{Profit}_{\text{from ordinary activities}} = 45,200 - 3,000 + 1,500 + 1,000 = 44,700\ UAH$$

$$\text{Profit}_{\text{before taxation}} = 44,700 + 2,500 = 47,200\ UAH.$$

$$NP = 47,200 \times (1 - 0.18 - 0.015) = 38,704\ UAH$$

Task 3.4

A private entrepreneur sells postcards with the price of UAH 6/unit. without VAT. The wholesale purchase of postcards costs UAH 4, and the entrepreneur can return defective or unsold postcards to the company at the purchase price. The rent in the outlet is UAH 5,000 per month. The sales volume of postcards at this time is equal to 12,000 units per month. Answer the following questions:

- What profit (loss) does the entrepreneur receive from this activity?
- What will be the profit (loss) if the rent increases to UAH 10,000 per month?
- How many postcards must be sold to make a profit of UAH 8,000 per month?

Solution

$$Pr \cdot X = FC + VC \cdot X + \text{Profit}$$

$$Pr \cdot X - FC - VC \cdot X = \text{Profit}$$

$$\text{Profit} = X \cdot (Pr - VC) - FC$$

$$\text{Profit} = 12,000 \cdot (6 - 4) - 5,000 = 19,000\ UAH$$

$$\text{Profit} = 12,000 \cdot (6 - 4) - 10,000 = 14,000\ UAH$$

$$\text{Profit} = X \cdot (Pr - VC) - FC$$

$$\text{Profit} + FC = X \cdot (Pr - VC)$$

$$X = \frac{FC + \text{Profit}}{Pr - VC_1}$$

$$X = \frac{5,000 + 8,000}{6 - 4} = \frac{13,000}{2} = 6,500\ \text{units}$$

- What will be the profit (loss) if the purchase price from supplier increases to UAH 8 per unit?

$$\begin{aligned} \text{Profit} &= X \cdot (Pr - VC) - FC = 12,000 \cdot (6 - 8) - 5,000 = \\ &= -27,000\ UAH \end{aligned}$$

Task 3.5

The company manufactures electric stoves, selling them in the amount of 100 units per month with the price of UAH 2,000 without VAT. Variable costs for 1 electric

stove are UAH 1,000. Fixed costs per month are UAH 50,000. As a result of the analysis and assessment of the situation that has developed at the company and on the market, specialists have made several business proposals. In particular, it is proposed:

- To increase advertising expenses up to UAH 6,000 /month, at the same time, you can expect an increase sales revenue in month by UAH 10,000;
- To use cheap materials that allow you to save UAH 0.5 thousand per product unit. However, such a measure will lead to a decrease in the quality of products and, as a result, to a decrease in the volume of sales to 80 units per month;
- To reduce the sale price by UAH 0.3 thousand and increase advertising costs by UAH 5,000 /month, while you can expect a 20% increase in sales;
- To transfer employees of the sales department from fixed salaries (the total wage fund, which represents UAH 40,000) to a commission fee of UAH 200 from each electric stove sold. At the same time, you can expect a 30% increase in sales volume.

Choose the most profitable offer based on the criterion of profit size and break-even point of the company's activity.

Solution

The criterion for making a decision is making a profit.

$$Profit = X \times (Price - VC) - FC$$

$$Current\ profit = 100 \times (2,000 - 1,000) - 50,000 = 50,000\ UAH$$

$$Profit.\ (1) = 100 \times (2,000 - 1,000) - 56,000 + 10,000 = 54,000\ UAH$$

Profit (1) = If the increase in fixed costs is accompanied by a greater increase in revenue (appearance of additional profit), then such a measure should be adopted.

$$Profit(2). = 80 \times (2,000 - 500) - 50,000 = 70,000\ UAH$$

70000 > 50000 - you can make a decision

$$Profit\ (3) = 120 \times (1,700 - 1,000) - 55,000 = 29,000\ UAH$$

29000 < 50000 the profit is less, it is wrong decision

$$Profit\ (4) = 130 \times (2,000 - 1,200) - 10,000 = 94,000\ UAH$$

94000 > 50000 - a decision can be made

UAH 94,000 is the largest possible profit of all 4 decisions, the last one should be adopted, which provides the greatest profit.

Task 3.6.

"Alf" LLC manufactures ceramic teapots. The sales volume of teapots is equal to 10,000 pcs. The selling price of a product unit without VAT is UAH 10. Variable costs per product are UAH 8, total fixed costs for the annual production volume are UAH 20,000.

You work as a specialist in the company's economic department. Calculate the break-even volume of production of teapots. Determine the profit when realizing the given volume of production and when it is reduced to 7 thousand units.

Solution

$$Pr \cdot X = FC + VC \cdot X$$

$$X = \frac{FC}{Pr - VC} = \frac{20000}{10 - 8} = 10,000 \text{ units.}$$

$$Pr \cdot X = FC + VC \cdot X + Profit$$

$$Profit = X \cdot (Pr - VC) - FC = 10,000(10 - 8) - 20,000 = 0 \text{ UAH}$$

$$Profit = X \cdot (Pr - VC) - FC = 7,000 \cdot (10 - 8) - 20,000 = -6,000 \text{ UAH}$$

Task 3.7.

The price of a product unit without VAT is UAH 20, the planned production volume per year is 8,000 units, the fixed costs for the annual production are UAH 10,000, and the variable costs per unit are UAH 4. Determine:

1. Break-even point, gross margin per unit of production and for the entire production program, contribution ratio and operating leverage ratio.
2. The amount of profit when the company reaches the planned sales volume.
3. How will it affect the amount of profit, the break-even point of a 10% increase in fixed costs, to what extent it is necessary to reduce variable costs to obtain a certain amount of profit.
4. How will a 10% increase in variable costs affect the amount of profit, the break-even point and margin of financial strength, and to what extent it is necessary to reduce fixed costs to obtain a certain amount of profit.

Solution

$$X = \frac{FC}{Pr - VC} = \frac{10,000}{20 - 4} = 625 \text{ units.}$$

$$GM = NI - VC$$

$$GM1 = Pr - VC1 = 20 - 4 = 16 \text{ UAH}$$

Gross margin is the maximum possible amount of fixed costs that the company can afford to break-even point.

Gross margin per unit of production is the maximum possible amount of fixed costs that can be included in the cost price of a unit of production so that production is break-even.

$$GM = GM1 \cdot X = 16 \cdot 8,000 = 128,000 \text{ UAH}$$

$$CR = \frac{GM}{NI} = \frac{GM}{Pr \cdot Q} = \frac{128,000}{20 \cdot 8,000} = \frac{128,000}{160,000} = 0.8 \text{ UAH}$$

For 1 hryvnia of revenue, we get 80 kopecks of profit

$$Profit = Q \cdot (Pr - VC) - FC = 8,000 \cdot (20 - 4) - 10,000 = 128,000 - 10,000 = 118,000 \text{ UAH}$$

$$OLC = \frac{GM}{PBT} = \frac{128,000}{118,000} = 1.085\%$$

When revenue increases by 1%, profit increases by 1.085%

2)

$$Profit = Q \cdot (Pr - VC) - FC = 8,000 \cdot (20 - 4) - 10,000 = 128,000 - 10,000 = 118,000 \text{ UAH}$$

$$3) \text{Profit} = Q \cdot (Pr - VC) - FC = 8.000 \cdot (20 - 4) - 10.000 \cdot 1.1 = 128,000 - 11,000 = 117,000 \text{ UAH}$$

$$X = \frac{FC}{Pr - VC} = \frac{10,000 \cdot 1.1}{20 - 4} = 688 \text{ units.}$$

The smaller the break-even point, the sooner the company will start making a profit.

$$\text{Profit} = Q \cdot (Pr - VC) - FC = 8,000 \cdot (20 - VC) - 10,000 \cdot 1.1 = 118,000 \text{ UAH}$$

$$VC = \frac{Q \cdot Pr - FC - \text{Profit}}{Q} = \frac{8,000 \cdot 20 - 11,000 - 118,000}{8,000} = 1.55 \text{ UAH}$$

$$4) \text{Profit} = Q \cdot (Pr - VC) - FC = 8000 \cdot (20 - 4 \cdot 1.1) - 10,000 = 8,000 \cdot 15.6 - 10,000 = 114,800 \text{ UAH}$$

$$X = \frac{FC}{Pr - VC} = \frac{10,000}{20 - 4 \cdot 1.1} = \frac{10,000}{15.6} = 642 \text{ units.}$$

$$\text{MFS} = 8,000 - 642 = 7,368 \text{ units.}$$

The margin of financial strength shows how much current production exceeds the break-even point.

$$\text{Profit} = Q \cdot (Pr - VC) - FC = 8,000 \cdot (20 - 4) - 10,000 = 128,000 - 10,000 = 118,000 \text{ UAH}$$

$$\text{Profit}(4) = Q \cdot (Pr - VC) - FC = 8,000 \cdot (20 - 4.4) - FC = 118,000 \text{ UAH}$$

$$FC = Q \cdot (Pr - VC) - \text{Profit} = 8,000 \cdot (20 - 4.4) - 118,000 = 6,800 \text{ UAH}$$

Task 3.8.

There are 2 companies with the same net income of UAH 100,000 per month. The total expenses of both companies per month are the same - UAH 50,000. Company A has more fixed costs – UAH 40,000 per month, and company B has more variable costs - UAH 40,000 per month. Determine, at which of the companies is it possible to get more profit faster by increasing the volume of sales? What is the rate of profit growth at both companies, with a 10% increase in sales?

Solution

When the volume of sales increases (with not increasing the price), revenue (income) increases.

Indicator	Company A	Company B
Net income, th UAH.	100	100
Total expenses, th UAH.	50	50
Variable costs, th UAH.	10	40
Fixed costs, th UAH.	40	10

$$OLC = \frac{GM}{PBT} = \frac{\Delta PBT(\%)}{\Delta NI(\%)} = \frac{GM}{GM - FC}$$

GM = NI – Variable costs

Indicator	Company A	Company B
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Gross margin, th UAH.	100-10=90	100-40=60
Profit before taxation, th UAH.	90-40=50	60-10=50
OLC	$\frac{GM}{PBT} = \frac{90}{50} = 1.8$	$\frac{GM}{PBT} = \frac{60}{50} = 1.2$
ΔPr	$1.8 \cdot 10 = 18\%$	$1.2 \cdot 10 = 12\%$

With an increase in the volume of sales, the profit will grow faster at Company A - with a larger share of fixed costs. However, with a decrease in sales volumes, the company with a larger share of fixed costs will experience losses sooner.

3.4. Homework

Hometask 3.1

The enterprise produced in the reporting year is A thousand units. The retail price of the product, including VAT, is UAH B. The quantity of unsold products of the enterprise at the beginning of the year are equal to UAH C thousand, at the end of the year are equal to UAH D thousand. (The price includes VAT). The enterprise sold US dollars for UAH E thousand. Received income from the sale of raw materials is 2,000 UAH, basic materials is equal to UAH 1,000. Received dividends are equal to UAH 1,000. The enterprise sold stocks of another company for UAH Y thousand. Calculate the income and net income of the enterprise from the sale of products in the reporting year.

Table 3.1 – Output data for home task 3.1

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	8	9	5	7	8	12	15	10	9	8	7	10	11	12
B	8	8	5	6	7	4	8	10	9	5	4	3	8	9	11
C	5	4	6	7	3	2	6	3	4	5	6	4	5	6	5
D	2	1	3	2	3	1	2	2	1	1	3	2	3	2	2
E	4	8	9	12	14	12	15	9	2	5	8	0	8	9	10
F	8	8	5	6	7	4	8	10	9	5	4	3	8	9	11
H	9	9	8	7	9	5	9	8	9	9	9	8	9	7	10
G	12	3	4	8	9	8	0	6	8	11	15	16	22	13	14
Y	2	3	4	1	1	1	3	5	4	6	3	5	2	3	2

Hometask 3.2

The company sells 2 types of cars: "Dauwo Lanos", its price is UAH A thousand, volume of sales is B thousand cars per year; "Chevrolet Aveo", its price is UAH C thousand, volume of sales is D thousand cars per year. The sales price includes VAT. The full cost of selling products is 60% of the price without VAT "Dauwo Lanos" and 55% of the price without VAT "Chevrolet Aveo". The net profit of the enterprise is distributed as follows: 40% is payment of dividends, 20% is the reserve fund formation. Determine the net profit of the enterprise, the amount of dividends, the amount of the reserve fund, the amount of retained profit of the enterprise.

Table 3.2 – Output data for home task 3.2

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	60	65	58	62	55	57	58	60	61	66	63	64	55	58	59
B	2	3	1	1	2	3	1	2	3	1	2	3	1	2	3
C	70	75	69	79	77	76	80	71	69	72	75	70	71	69	70
D	1.5	2	3	2	1.5	2	1.5	1	3	1.5	4	2	1.5	1	1.5
E	35	20	10	10	40	45	10	35	40	30	10	15	40	45	10
F	45	40	15	25	10	35	50	40	10	35	50	40	10	40	25

Hometask 3.3

JSC "Katyusha" manufactures children's cloths. You work as an enterprise economist. Based on the following data, calculate: gross profit of the enterprise; profit (loss) from ordinary activities, profit (loss) before taxation; net profit (loss) of the enterprise.

The volume of sales products is A thousand units, the sales price of one product, including VAT, is UAH B. The production cost of one sold product is UAH C. Administrative expenses and sales expenses are UAH D thousands. Unfinished products of previous year in the amount of UAH E thousands were sold, their production costs are UAH F thousand, sales costs are UAH G thousand. Profit of previous years, determined in the reporting year is UAH 1,000. Received fines from other enterprises for violation the terms of contracts for the supply of raw materials are UAH Y thousands. Bad debt in UAH J thousands was written off. Determined dividends and interests on securities belonging to the enterprise are UAH K thousands.

Table 3.3 – Output data for home task 3.3

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	8	8	5	6	7	4	8	10	9	5	4	3	8	9	11
B	19	9	8	17	19	15	9	8	12	19	19	18	49	27	30
C	12	3	4	8	9	8	4	6	8	11	15	10	22	13	14
D	2	3	4	1	1	1	3	5	4	6	3	5	2	3	2
E	2	3	4	1	1	1	3	5	4	6	3	5	2	3	2
F	5	4	6	7	3	2	6	3	4	5	6	4	5	6	5
H	3	3	3	2	2	2	3	3	3	3	2	1	1	1	1
G	2	1	3	2	3	1	2	2	1	1	3	2	3	2	2
Y	2	3	4	1	1	1	3	5	4	6	3	5	2	3	2
J	1	1	2	2	2	2	1	2	1	3	2	3	2	2	2
K	2	1	3	2	3	1	2	2	1	1	3	2	3	2	2

Hometask 3.4

A private entrepreneur sells postcards with the price of UAH A/unit without VAT. The wholesale purchase of postcards costs UAH B, and the entrepreneur can

return defective or unsold postcards to the company at the purchase price. The rent in the outlet is UAH 3,000 per month. The sales volume of postcards at this time is equal to 12,000 units per month. Answer the following questions:

- What profit (loss) does the entrepreneur receive from this activity?
- What will be the profit (loss) if the rent increases to UAH D thousands per month?
- How many postcards must be sold to make a profit of UAH E thousands per month?

In the table 3.4 provides the initial data for the home task.

Table 3.4 – Output data for home task 3.4.

Indicator	Version														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	12	14	16	9	8	11	14	18	13	15	11	13	16	14
B	8	10	13	9	7	6	8	11	15	10	12	10	12	9	12
C	5	4	6	7	3	2	6	3	4	5	6	4	5	6	5
D	10	10	12	12	12	12	11	12	11	13	12	13	12	12	12
E	5	7	8	5	4	3	11	9	10	11	11	7	9	9	8

Hometask 3.5

The company manufactures electric stoves, selling them in the amount of A units per month with the price of UAH B thousand without VAT. Variable costs for 1 electric stove are UAH C thousand. Fixed costs per month are UAH D thousand. As a result of the analysis and assessment of the situation that has developed at the company and on the market, specialists have made several business proposals. In particular, it is proposed:

- To increase advertising expenses up to UAH E thousand /month, at the same time, you can expect an increase sales revenue in month by UAH F thousand;
- To use cheap materials that allow you to save UAH H thousand per product unit. However, such a measure will lead to a decrease in the quality of products and, as a result, to a decrease in the volume of sales to Y units per month;
- To reduce the sale price by UAH 1,000 and increase advertising costs by UAH K thousand /month, while you can expect a L % increase in sales;
- To transfer employees of the sales department from fixed salaries (the total wage fund, which represents UAH M thousand) to a commission fee of UAH N from each electric stove sold. At the same time, you can expect a 30% increase in sales volume.

Choose the most profitable offer based on the criterion of profit size and break-even point of the company's activity.

Table 3.5 – Output data for task 3.5

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	3200	4700	2300	3200	1300	5500	2300	1400	3200	2600	1600	1400	1600	1300	2200
B	3	4	5	4	3	5	6	5	4	5	6	5	4	5	4
C	2	2	3	2	2	3	3	3	3	2	3	2	2	3	3
D	3000	2300	1200	2100	1200	1200	1000	2000	3000	2300	1500	2500	3000	2400	2100
E	300	1000	1200	1100	1300	1000	400	600	800	1200	1100	1600	1100	1000	400
F	400	1200	1400	1600	1200	1100	1700	900	1200	1500	1300	1700	1200	1100	700
H	0.5	1	0.3	0.7	0.8	1,2	1.5	1.5	1,2	1.1	0.3	0.6	0.4	0.8	0.7
Y	1000	700	650	560	780	1100	1300	1000	260	560	670	780	650	430	230
J	0.9	1.1	1.4	1,2	1.3	1.1	1.8	0.9	0.7	0.6	0.4	0.7	0.2	0.4	0.8
K	200	400	100	600	200	100	150	200	200	150	50	100	230	200	100
L	4	8	9	12	14	12	15	9	2	5	8	10	8	9	10
M	200	150	130	250	400	50	70	90	110	80	170	160	50	90	80
N	100	150	200	170	170	160	100	90	200	240	300	210	160	120	110
P	1	1	2	2	2	2	1	2	1	3	2	3	2	2	2

Hometask 3.6

"Alf" LLC manufactures ceramic teapots. The sales volume of teapots is equal to A thousand pcs. The selling price of a product unit without VAT is UAH B. Variable costs per product are UAH C, total fixed costs for the annual production volume are UAH D thousand.

You work as a specialist in the company's economic department. Calculate the break-even volume of production of teapots. Determine the profit when realizing the given volume of production and when it is reduced to E thousand units.

Table 3.6 – Output data for task 3.6

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	4	8	9	12	14	12	15	9	2	5	8	10	8	9	10
B	70	80	75	95	60	65	70	75	85	95	100	90	85	80	70
C	40	45	30	35	50	45	40	35	40	55	60	55	45	35	30
D	110	101	110	120	150	150	150	140	110	130	150	160	140	140	140
E	1	2	3	5	9	4	6	7	4	6	7	11	12	14	15

Homework 3.7

The price of a product unit without VAT is UAH A, the planned production volume per year is B thousand units, the fixed costs for the annual production are UAH C thousand, and the variable costs per unit are UAH D. Determine:

1. Break-even point, gross margin per unit of production and for the entire production program, contribution ratio and operating leverage ratio.
2. The amount of profit when the company reaches the planned sales volume.
3. How will it affect the amount of profit, the break-even point of a 10% increase in fixed costs, to what extent it is necessary to reduce variable costs to obtain a certain amount of profit.
4. How will a 10% increase in variable costs affect the amount of profit, the break-even point and margin of financial strength, and to what extent it is necessary to reduce fixed costs to obtain a certain amount of profit.

Table 3.7 – Output data for task 3.7

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	5	4	6	7	3	2	6	3	4	5	6	4	5	6	5
B	1	2	3	5	1	2	3	1	1	2	3	2	1	1	1
C	2	1	3	2	1	1	2	2	1	1	3	2	3	2	2
D	1	2	3	5	1	1	3	1	1	2	3	2	1	1	1

Homework 3.8

Data on the performance of two enterprises for the last month are presented.

Enterprise "Aystra" has net revenue from sales in A thousand UAH, fixed costs are B thousand UAH, variable costs are C thousand UAH.

Enterprise "Mriya" has net revenue from product sales in D thousand UAH, fixed costs are E thousand UAH, variable costs are F thousand UAH.

In the table 3.8 it is shown the initial data for the task.

Table 3.8 – Output data for task 3.8

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	11	11	11	12	15	15	15	14	11	13	15	16	14	14	14
B	1	2	3	5	1	2	3	1	1	2	3	2	1	1	1
C	5	4	6	6	3	2	6	3	4	5	6	4	5	6	5
D	11	11	11	12	15	15	15	14	11	13	15	16	14	14	14
E	5	4	6	6	3	2	6	3	4	5	6	4	5	6	5
F	1	2	3	5	1	2	3	1	1	2	3	2	1	1	1

Determine the expected increase in profit with an increase in net income at each enterprise by 12%. To draw conclusions at which enterprise there is a greater risk of receiving losses in the event of a significant deterioration of the market situation.

Lesson 4. Formation of the Equity Fund of the Company

4.1. Main issues of the topic

1. Organizational and legal forms of the companies.
2. The peculiarity of the formation of the equity capital of LLC.
3. Raising and withdrawing capital from the equity fund of LLC.
4. The peculiarity of the equity capital formation of JSC.
5. Features of stock (shares) trading.
6. Money receipt from the issue of stocks (shares).

4.2. Key terms and concepts

Equity fund (authorized capital), stocks (shares), private company, open company, public corporation, joint-stock company (JSC), limited liability company (LLC), natural person –entrepreneur, additional invested capital, additional issue of shares, new market rate of shares, issue income, book value of the company's shares.

4.3. Main tasks

Task 4.1

Three individuals: Ivanov Yu.Yu., Petrov MM, Semenov L.D. made a decision to establish a limited liability company "1 LTD". Formation of the authorized capital of the LLC is characterized by such data. The shares of individual participants in the authorized capital specified in the founding documents are: Ivanov Yu.Yu. – 45%; Petrov M.M. – 30%; Semenov L.D. - 25%.

At the time of registration of LLC Ivanov Yu.Yu. contributed UAH 100,000, M.M. Petrov – UAH 110,000, L.D. Semenov - UAH 90,000, which is 120% of his personal contribution to the authorized capital of the company.

List all items of the first liability section of the balance sheet of the newly created LLC.

Solution

Let's determine the nominal contribution of Semenov's participant to the authorized capital:

$$90,000 : 120 \% \times 100\% = 75,000 \text{ UAH.}$$

Participant Semenov L.D. additionally contributed $90,000 - 75,000 = 15,000$ UAH

$$\text{Nominal authorized capital } 75,000 : 25\% \times 100\% = \text{UAH } 300,000.$$

$$\text{Nominal contribution of participant Ivanov: } 300,000 \times 0.45 = 135,000 \text{ UAH.}$$

$$\text{Participant Ivanov Yu.Yu. did not pay } 100,000 - 135,000 = - 35,000 \text{ UAH.}$$

$$\text{Nominal contribution of participant Petrov: } 300,000 \times 0.30 = 90,000 \text{ UAH.}$$

Participant M.M. Petrov additionally contributed $110,000 - 90,000 = \text{UAH } 20,000$.

And the liability section of the company's balance sheet

The authorized capital is 300,000 UAH

Additional capital $15,000 + 20,000 = 35,000$ UAH

Unpaid capital = UAH - 35,000.

Total = 300,000 UAH

Situation is normal as authorized capital = total own capital

Situation is good if authorized capital < total own capital, company has profit

Situation is bad if authorized capital > total own capital, company has losses

Task 4.2

A decision was made to establish the Demetra public joint-stock company. Placed corporate rights at a rate of 110%. Overhead expenses related to the founding of the company are UAH 15,000. The nominal value of one share is UAH 30, the number of shares is 10,000. Non-current assets at the initial cost of UAH 40,000 were received free of charge.

Enter all items of the first section of the liability balance sheet. Calculate the book value of the company's shares.

Solution

The authorized capital is equal to: $30 \times 10,000 = 300,000$ UAH.

Issue income of 10% of the authorized capital: $0.1 \times 300,000 = 30,000$ UAH.

Additional invested capital is equal to the issue income minus overhead costs:

$30,000 - 15,000 = 15,000$ UAH

The other additional capital is the value of assets received free of charge of UAH 40,000.

And the liability section of the balance sheet:

Authorized capital 300,000 UAH

Additional invested capital 15,000 UAH

Other additional capital 40,000 UAH

Total 355,000 UAH

Situation is good as authorized capital < total own capital, company has profit

The balance sheet rate of shares is the ratio of equity capital to authorized capital:

$355,000 : 300,000 \times 100\% = 118.33\%$,

i.e. by 1 UAH of the authorized capital owner receives 1.18 UAH of own funds.

Task 4.3

The authorized capital of the "Mriya" joint-stock company is UAH 2,000,000. (40 thousand shares with a nominal value of UAH 50). At the general meeting of shareholders, a decision was made to increase the authorized capital by 50%, that is, the ratio with which the issue is made is equal to 2: 1. The market price of shares before the increase of the authorized capital was UAH 100. The issue price of new shares is UAH 70 per share

Determine: the amount of the authorized capital of the enterprise after the additional issue, the new market rate of shares, issue income.

Solution

The market rate of the company's corporate rights after placing the additional issue of shares is calculated according to the formula:

$$K_{pn} = \frac{K_p + K_e}{N},$$

where K_{pn} is the market rate of the company's corporate rights after placing the additional issue of shares, UAH;

K_p is the total market value of shares before the increase of the authorized capital of the enterprise, UAH;

K_e is the total market value of the shares of the additional issue, UAH;

N is the total number of shares after the increase of the authorized capital of the enterprise through the additional issue of corporate rights, thousands of shares.

The value of the emission income is defined as the difference between the market value of the corporate rights of the additional issue and the nominal value of the corporate rights of the additional issue.

Name of indicators	Authorized capital, thousand UAH.	Number of shares, units	Market share price, UAH	Total market value of shares, thousand UAH.
1. Parameters of corporate rights before the increase of the authorized capital	2,000	40,000	100	4,000
2. The amount of the increase in the authorized capital	1,000	20,000	70	1,400
3. Parameters of corporate rights after the increase of the authorized capital	3,000	60,000	90	5,400

The market rate of corporate rights after the increase in the authorized capital:

$(4,000 + 1,400) : 60,000 = 90$ UAH.

Issue income: $5,400 - 3,000 = 2,400$ thousand UAH.

Task 4.4

At the beginning of the reporting year, the authorized capital of the open joint-stock company "Zhytlobud" is UAH 650,000, retained earnings are UAH 20,000, reserve capital is UAH 170,000.

The financial activity of the enterprise during the reporting year is characterized by the following data: received non-current assets on a free basis with the initial cost UAH 25,000, received net profit is UAH 60,000. 40% of the net profit is directed to the payment of dividends, 25% is to the replenishment of the reserve fund.

Enter all the positions of the first section of the liabilities of the balance sheet at the beginning and end of the reporting year. Calculate the book value of the company's shares at the beginning and end of the year.

Solution

And the liability section of the company's balance sheet at the beginning of the year:

Authorized capital 650,000 UAH

Reserve capital 170,000 UAH

Retained earnings 20,000 UAH

TOTAL 840,000 UAH

Distribution of net profit:

Payment of dividends: $60,000 \times 0.4 = 24,000$ UAH.

Replenishment of reserve capital: $60,000 \times 0.25 = 15,000$ UAH.

Replenishment of retained earnings: $60,000 - 24,000 - 15,000 = 21,000$ UAH

The value of non-current assets received free of charge is reflected in the item "Other additional capital"

And the liability section of the company's balance sheet at the end of the year:

Authorized capital 650,000 UAH

Other additional capital 25,000 UAH

Reserve capital $170,000 + 15,000 = 185,000$ UAH

Retained earnings $20,000 + 21,000 = 41,000$ UAH

TOTAL 901,000 UAH

Balance share price at the beginning of the year:

$840,000 : 650,000 \times 100\% = 129.23\%$

At the end of the year: $901,000 : 650,000 \times 100\% = 138.62\%$,

that is, the balance sheet rate increased by 9.39% due to the increase in reserve capital, retained earnings and other additional capital.

Task 4.5

Three contributors K, Ch, P create an LLC. K has a 33% share, P - 10%, Ch - 57%. In reality, the amount of Ch is UAH 60,000, of K is UAH 40,000, and of P is UAH 30,000, which is 120% of his nominal contribution. In honor of the creation of the LLC, Y made a gift in the form of a free contribution UAH 10,000. UAH 15,000 was transferred as the right to use the LLC trademark registered by D. During the year of operation, the LLC received a revenue of UAH 120,000 with VAT. The cost of production and sale of products is UAH 60,000. The company paid taxes and at the holder's meeting it was decided that 10% of the net profit would be allocated to holder's income, 60% - to the reserve fund, and the rest - to retained earnings. Compile 1 section of the liability balance for the beginning and end of the year.

Solution

	K	Ch	P
Shares,%	33	57	10
Actual contribution, th UAH	40	60	30
% of nominal expenses			120
			UAH 30,000 – 120% X – 100%
Nominal contribution, th UAH			$x = \frac{30 \cdot 100}{120} =$ $= 25 \text{ th UAH}$
Nominal contribution, th UAH	$x = \frac{25 \cdot 33}{10} =$ $= 82.5 \text{ th UAH}$	$x = \frac{25 \cdot 57}{10} =$ $= 142.5 \text{ th UAH}$	
Nominal contribution, th UAH	82.5	142.5	25

Authorized capital = 82.5 + 142.5 + 25 = 250 thousand UAH

	The beginning of the year, th UAH	The end of the year, th UAH
Authorized capital	250	250
Additional invested capital	$30-25=5$	5
Other additional capital	10	10
Reserve capital	-	19.32
Retained earnings	-	9.66
Unpaid capital	$(40-82.5)+(60-142.5)=-125$	-125
Withdrawn capital	- 15	-15
TOTAL	$250+5+10-125-15=125$	153.98

Net income = $120/1.2 = 100,000$ UAH

Profit before taxation = $100,000-60,000= 40,000$ UAH

Net profit = $40,000 \times (1-0.18-0.015)= 32.2$ thousand UAH

Owners' income = $0.1 \times 32.2 = 3.22$ thousand UAH

Reserve capital = $0.6 \times 32.2 = 19.32$ thousand UAH

Retained earnings = $0.3 \times 32.2= 9.66$ thousand UAH

Situation is bad if authorized capital > total own capital, company has loses (even if a company has profit in business) because 2 of co-owners still did not pay the total amount of their contribution into business.

4.4. Homework

Homework 4.1

Three individuals: Ivanov Yu.Yu., Petrov MM, Semenov L.D. made a decision to establish a limited liability company "1 LTD". Formation of the authorized capital of the LLC is characterized by such data. The shares of individual participants in the authorized capital specified in the founding documents are: Ivanov Yu.Yu. - A%; Petrov M.M. – B%; Semenov L.D. - C%.

At the time of registration of LLC Ivanov Yu.Yu. contributed UAH D thousand, M.M. Petrov – E thousand UAH, L.D. Semenov - UAH F thousand, which is G % of his personal contribution to the authorized capital of the company.

List all items of the first liability section of the balance sheet of the newly created LLC. In the table 4.1 the initial data for the task are provided.

Table 4.1 – Output data for task 4.1

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	33	20	10	25	15	40	40	35	30	35	20	50	15	35	20
B	34	30	30	25	15	40	25	35	35	25	30	40	35	25	20
C	33	50	60	50	70	20	35	30	35	40	50	10	50	40	60
D	20	30	35	46	50	70	65	90	85	75	35	45	55	78	10
E	35	58	80	50	50	80	95	70	58	70	20	30	50	46	10
F	35	70	90	90	95	20	45	50	70	90	70	15	78	80	90
G	75	90	80	120	70	55	90	105	110	80	75	95	80	110	130

Hometask 4.2

A decision was made to establish the Demetra public joint-stock company. Placed corporate rights at a rate of A%. Overhead expenses related to the founding of the company are UAH 1,000. The nominal value of one share is UAH C, the number of shares is D thousand. Non-current assets at the initial cost of UAH E thousand were received free of charge.

Enter all items of the first section of the liability balance sheet. Calculate the book value of the company's shares. In the table 4.2 the initial data for the task are shown.

Table 4.2 – Output data for task 4.2

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	110	120	105	110	130	95	90	110	80	105	110	150	170	125	130
B	20	30	45	15	50	35	40	54	55	60	29	35	75	65	70
C	10	20	25	30	35	45	40	5	50	10	8	15	20	10	25
D	100	80	120	90	70	80	120	105	100	130	200	250	100	80	120
E	45	40	45	40	55	60	45	40	45	40	55	45	40	45	40

Hometask 4.3

The authorized capital of the "Mriya" joint-stock company consists of A thousand shares with a nominal value of UAH. At the general meeting of shareholders, a decision was made to increase the authorized capital by C%. The market price of shares before the increase in the authorized capital D UAH. Issue rate of new E shares UAH per share.

Determine: the amount of the authorized capital of the enterprise after the additional issue, the new market rate of shares, issue income.

In the table 4.3 the initial data for performing the task are shown.

Table 4.3 – Output data for task 4.3

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	45	40	45	40	55	60	45	40	45	40	55	45	40	45	40
B	5	50	10	8	15	20	10	25	10	20	25	30	35	45	40
C	10	20	25	30	35	45	40	5	50	10	8	15	20	10	25
D	8	55	8	8	20	25	10	20	8	15	30	35	30	45	40
E	5	60	15	10	20	30	5	30	15	15	30	40	40	45	50

Homework 4.4

At the beginning of the reporting year, the authorized capital of the open joint-stock company "Zhytlobud" is UAH A thousand, retained earnings are UAH B thousand, reserve capital is UAH C thousand.

The financial activity of the enterprise during the reporting year is characterized by the following data: received non-current assets on a free basis with the initial cost UAH D thousand, received net profit is UAH E thousand. F % of the net profit is directed to the payment of dividends, G % is to the replenishment of the reserve fund.

Enter all the positions of the first section of the liabilities of the balance sheet at the beginning and end of the reporting year. Calculate the book value of the company's shares at the beginning and end of the year.

In the table 4.4 the initial data for the task is shown.

Table 4.4 – Output data for task 4.4

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	110	120	105	110	130	95	90	110	80	105	110	150	170	125	130
B	10	20	25	30	35	45	40	5	50	10	18	15	20	10	25
C	45	40	45	40	55	60	45	40	45	40	55	45	40	45	40
D	20	30	45	15	50	35	40	54	55	60	29	35	75	65	70
E	45	40	45	40	55	60	45	40	45	40	55	45	40	45	40
F	20	30	45	15	50	35	40	5	55	20	29	25	25	15	20
G	15	15	30	40	40	45	50	15	15	30	40	40	45	50	25

Lesson 5. Charging Interests on Loans and Securities

5.1. Main issues of the topic

1. Borrowing funds attraction.
2. Bank loan. Interest schemes for loans. Annuity.
3. Commercial loan.
4. The advantages of leasing.
5. Raising funds using securities and other sources of fundraising.
6. Positive properties of borrowed capital attraction.
7. Negative properties of borrowed capital.

5.2. Key terms and concepts

Bank loan, simple interest, compound interest, annuity, commercial loan, mortgage, leasing, bond, bill, savings certificate, treasury certificate.

5.3. Main tasks

Task 5.1.

An individual deposits money in the bank in the amount of UAH 100,000 for six months at 20% per annum. Determine what amount the bank will return to the client after six months when calculating: a) simple interest; b) compound interest.

Solution

1) Simple interest:

$$P_n = P_0 \times (1 + r \times n) = 100,000 \times (1 + 0.2 \times 0.5) = 100,000 \times 1.1 = 110,000 \text{ UAH}$$

2) Compound interest:

$$P_n = 100 \times (1 + r)^n = 100,000 \times (1 + 0.2)^{0.5} = 100,000 \times \sqrt{1.2} = 100 \times 1.095 = 109,500 \text{ UAH}$$

If the repayment period is less than a year and interest rate is charging per year, the compound interest is cheaper than simple interest for the client.

In all other cases compound interest is always more expensive.

Task 5.2.

Determine what amount had to be deposited 4 years ago at 5% per annum in order to receive UAH 200 now.

$P_n = 200 \text{ UAH}$, $r = 5\%$, $n = 4 \text{ years}$

Solution

$$\text{Simple interest: } P_0 = \frac{P_n}{(1 + r \times n)} = \frac{200}{1 + 0.05 \times 4} = \frac{200}{1.2} = 166.7 \text{ UAH}$$

$$\text{Compound interest: } P_0 = \frac{P_n}{(1+r)^n} = \frac{200}{(1+0.05)^4} = \frac{200}{1.22} = 163.93 \text{ UAH}$$

Task 5.3.

At what % should I deposit UAH 100 for 2 years to get UAH 200?

$$P_0 = 100 \text{ UAH}, P_n = 200 \text{ UAH}, n = 2 \text{ years}$$

Solution

$$P_n = P_0 \times (1+r)^n$$

$$(1+r)^n = \frac{P_n}{P_0}$$

$$1+r = \sqrt[n]{\frac{P_n}{P_0}}$$

$$r = \sqrt[n]{\frac{P_n}{P_0}} - 1$$

$$r = \sqrt[2]{\frac{200}{100}} - 1 = 0.414 = 41.4\%$$

$$P_n = P_0 \times (1+r \times n)$$

$$1+r \times n = \frac{P_n}{P_0}$$

$$r \cdot n = \frac{P_n}{P_0} - 1$$

$$r = \frac{\frac{P_n}{P_0} - 1}{n} = \frac{\frac{200}{100} - 1}{2} = \frac{1}{2} = 0.5 = 50\%$$

Task 5.4.

For what time should I put UAH 100 at 20% per annum in order to get 50% more money?

Solution

$$P_0 = 100 \text{ UAH}$$

$$r = 20\%$$

$$P_n = 100 + 100 \times 0.5 = 150 \text{ UAH}$$

$$n = \frac{\frac{P_n}{P_0} - 1}{r} = \frac{\frac{150}{100} - 1}{0.2} = 2.5 \text{ years}$$

$$P_n = P_0 \times (1+r)^n$$

$$n = \log_{(1+r)} \left(\frac{P_n}{P_0} \right) = \frac{\ln \frac{P_n}{P_0}}{\ln(1+r)} = \frac{\ln 1.5}{\ln 1.2} = 2.2 \text{ years}$$

Task 5.5.

Determine what amount can be received in 2 years, if 100,000 hryvnias have been deposited

With small interest accrual:

- 1) 23% quarterly;
- 2) 30% three times a year;
- 3) 45% every six months;
- 4) 100% once a year.

Solution

$$P_n = P_o \cdot \left(1 + \frac{r}{m}\right)^{n \cdot m}$$

$$1) P_n = 100 \times \left(1 + \frac{0.23}{4}\right)^{2 \times 4} = 100 \times 1.564 = 156.4 \text{ UAH}$$

$$2) P_n = 100 \times \left(1 + \frac{0.3}{3}\right)^{2 \times 3} = 100 \times 1.77 = 177 \text{ UAH}$$

$$3) P_n = 100 \times \left(1 + \frac{0.45}{2}\right)^{2 \times 2} = 100 \times 2.252 = 225.2 \text{ UAH}$$

$$4) P_n = 100 \times \left(1 + \frac{1}{1}\right)^{2 \times 1} = 100 \times 4 = 400 \text{ UAH}$$

Task 5.6

It is necessary to determine the real future value of the invested funds under the following conditions: investment amount is UAH 200; investment period is 2 years; the used interest rate is 30% per year; the expected rate of inflation for the year is 20%.

Solution

Substituting these values into the formula, we get:

$$P_n^{\text{Real}} = P_o \cdot (1+r)^n \cdot \frac{1}{(1+i)^n} = P_o \left(\frac{1+r}{1+i}\right)^n$$

$$P_n^{\text{real}} = 200 \cdot \left(\frac{1+0.3}{1+0.2}\right)^2 = 234.7 \text{ UAH}$$

Task 5.7

Bank "Nadra" accepted UAH 470 as a deposit from an individual. Under the terms of the bank, interest is calculated once a quarter. According to the terms of contract, the interest rates are set as follows: for the 1st quarter – 18% per annum, for the 2nd – 17.6%, for the 3rd – 17.9%, for the 4th – 18.4% per annum.

Determine the amount accrued during the year for the specified deposit.

Solution

Since interest is calculated 4 times a year, you need to use the formula:

$$P_n = P_0 \cdot \left(1 + \frac{r}{m}\right)^{n \cdot m},$$

where P_n is the future value

P_0 is today's value,

r is the interest rate,

m is the period of interest set within a year,

n is the number of years.

If there was only a rate for all quarters of 18% per annum, then the calculation would be as follows:

$$P_n = 470 \cdot \left(1 + \frac{0.18}{4}\right)^{4 \cdot 1} = 470 \cdot 1.045^4 =$$

In our case, the interest rate in each quarter is different, therefore

$$P_n = 470 \cdot (1 + 0.18/4) \cdot (1 + 0.176/4) \cdot (1 + 0.179/4) \cdot (1 + 0.184/4) = 560.35 \text{ UAH}$$

The interest calculated per year is:

$$560.35 - 470 = 90.35 \text{ UAH.}$$

Thus, the accumulated amount of money during the year will be UAH 90.35.

Task 5.8

During the March, PJSC "Orion" used an overdraft. The monthly cash flow of this company is characterized by the following indicators (the numerator is withdrawn from the account, the denominator is given to the current account, thousand hryvnas)

$$02.03 \frac{1,070}{360}, 10.03 \frac{700}{480}, 14.03 \frac{0}{1,090},$$

$$22.03 \frac{370}{240}, 29.03 \frac{788}{780}, 31.03 \frac{320}{500}.$$

The incoming balance (initial balance) for the 02.03 is UAH 500,000. The fee for using this type of loan is 0.50% of the amount for each day in accordance with the agreement between the bank and the company for the current year.

Determine the amount of fees for using an overdraft by this company as needed during the March. Determine the balance of funds on April 1 of the current year, if the bank charges interest accrued for the month for using an overdraft on the last day of the month.

Solution

The fee for using an overdraft is determined by the formula:

$$P_{kr} = S \times D \times P_k,$$

where S is the amount of the loan (overdraft), thousand UAH;
 D is number of days of overdraft usage;
 P_k is the percentage for using the loan for each day.

Cash flow on the company's current account:

02.03. $500 - 1,070 + 360 = -210$ thousand UAH.

10.03. $-210 - 700 + 480 = -430$ thousand UAH.

14.03. $-430 - 0 + 1,090 = 660$ thousand UAH.

22.03. $660 - 370 + 240 = 530$ thousand UAH.

29.03. $530 - 788 + 780 = 522$ thousand UAH.

31.03. $522 - 320 + 500 = 702$ thousand UAH.

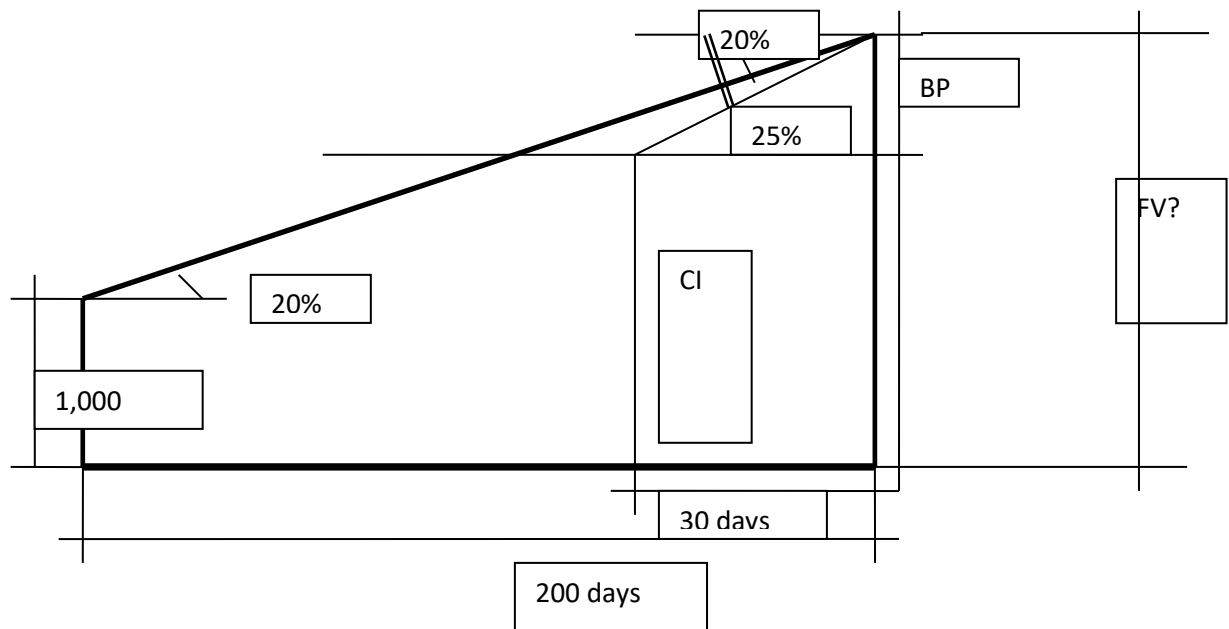
Calculation of interest for the use of credit is:

$210 \times 0.005 \times 8 + 430 \times 0.005 \times 4 = 17$ thousand UAH.

Balance of funds at the 01.04: $702 - 17 = 685$ thousand UAH.

Task 5.9

A bill of exchange (transferred bill) for UAH 1,000 was issued for 200 days at 20% per annum, 30 days before the maturity of the bill it was sold to the bank at a rate of 25%. Determine how much money the bank will make and how much the lender will make?



FV is the future value

CI is the creditor's income

BI is the bank's income

Solution

$$FV = PV \cdot (1 + r \cdot n) = 1,000 \cdot \left(1 + 0.2 \cdot \frac{200}{365}\right) = 1,110 \text{ UAH}$$

$$CI = \frac{1,110}{\left(1 + 0.25 \cdot \frac{30}{365}\right)} = 1087 \text{ UAH}, \text{ that is, the creditor's profit will be UAH } 87$$

BP = 1,110 – 1,087 = 23 UAH. , this is the bank's profit (bank's income is our future value).

Tasks 5.10

Bonds of the "Forum" company are issued with a nominal interest rate of 15%. The nominal value of the bond is UAH 1,000. Issue rate is UAH 850, repayment rate is UAH 1,100 at the end of their circulation period. The bond circulation period is 10 years. One-time overhead costs related to the issue of bonds are 5% of the nominal value. Determine the effective bond interest rate for the issuer and for the investor.

In case of repayment of the bond at the end of the period, the effective interest rate is calculated according to the formula:

$$R_e = \frac{i + d/n}{K_e},$$

where

R_e is effective bond interest rate, %;

i is fixed interest rate;

d is discount, %;

n is bond circulation period, years;

K_e is bond issue rate, %.

Solution

$$K_e = \left(\frac{\text{Issue rate}}{\text{Nominal value}}\right) \times 100\% = \frac{850}{1,000} \times 100\% = 85\%$$

$$d = \left(\frac{\text{Repayment rate}}{\text{Nominal value}} - \frac{\text{Issue rate}}{\text{Nominal value}}\right) \times 100\%$$

$$d = \left(\frac{1,100}{1,000} - \frac{850}{1,000}\right) \times 100\% = (110\% - 85\%) = 25\%$$

The investor's effective rate:

$$Re_{inv} = \frac{15 + \frac{25}{10}}{85} \times 100\% = 20.59\%$$

The issuer's effective rate takes into account the emission costs:

$$Ke_{is} = 85\% - 5\% = 80\%$$

$$d_{is} = \left(\frac{1,100}{1,000} - Ke_{is} \right) \times 100\% = (110\% - 80\%) = 30\%$$

Issuer's effective rate

$$Re_{is} = \frac{15 + \frac{30}{10}}{80} = 22.5\%$$

Find the same situation, if repayment is carried out annually.

The calculation of the effective interest rate for bonds that are repaid annually in equal amounts is carried out according to the formula:

$$Re = \frac{i + \frac{d}{t}}{Ke}$$

where t is the average bond maturity, $t = \frac{n+1}{2}$.

$$t = \frac{n+1}{2} = \frac{11}{2} = 5.5 \text{ years}$$

The investor's effective rate is:

$$Re_{inv} = \frac{i + \frac{d}{t}}{Ke} = \frac{15 + \frac{25}{5.5}}{85} = 22.99\%$$

Issuer's effective rate is:

$$Re_{is} = \frac{i + \frac{d_e}{t}}{Ke_{is}} = \frac{15 + \frac{30}{5.5}}{80} = 25.57\%$$

The more often the interest is accrued, the greater the investor's income and the greater the issuer's expenses.

5.4. Homework

Hometask 5.1

It is necessary to determine the future value of the initial amount of the contribution to the bank's deposit account in UAH A after a year, subject to the accrual of simple and compound interest. Interest charges are made quarterly and amount to B% per quarter.

Table 5.1 - Output data for task 5.1

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	100	80	120	90	70	80	120	105	100	130	200	250	100	80	120
B	8	11	4	2	8	14	10	6	3	7	4	9	11	16	7

Hometask 5.2

It is necessary to determine the initial amount of the contribution based on simple and compound interest per year under the following conditions: the final amount of the contribution is determined in the amount of UAH A; the interest rate is B% per quarter.

Table 5.2 - Output data for task 5.2

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	55	25	30	35	45	40	20	50	50	30	55	120	40	85
B	8	20	8	8	20	25	10	5	8	15	8	5	10	5	10

Hometask 5.3

It is necessary to determine the interest rate (simple and compound) for the entire investment period under the following conditions: the initial cost of the contribution - UAH A; future value - UAH, investment period - C years.

Table 5.3 - Output data for task 5.3

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	30	20	25	30	35	45	40	5	50	10	37	120	20	50	25
B	100	80	120	90	70	80	120	105	100	130	200	250	100	80	120
C	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7

Hometask 5.4

Determine the period after which the promissory note with a face value of UAH A must be repaid with an interest rate of B%, so that interest payments are half of the nominal price. Redemption of the security is carried out at face value.

Table 5.4 - Output data for task 5.4

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	40	45	45	25	20	53	45	50	40	30	25	45	46	55	55
B	8	8	5	6	7	4	8	10	9	5	4	3	8	9	11

Homework 5.5

The investor faces the task of placing A thousand UAH for a deposit in the bank for a term of B year. One bank offers an investor an income using compound interest of 23% per annum quarterly; the second - in the amount of 30% per annum once every four months; the third - in the amount of 45% per annum twice a year; the fourth - in the amount of 100% per annum once a year. Determine the best investment option.

Table 5.5 - Output data for task 5.5

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	100	80	120	90	70	80	120	105	100	130	200	250	100	80	120
B	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7

Homework 5.6

It is necessary to determine the real future value of the invested funds under the following conditions: investment volume - UAH A; investment period - B years; the interest rate used is C% per year; the expected rate of inflation for the year is D %.

Table 5.6 - Output data for task 5.6

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	100	80	120	90	70	80	120	105	100	130	200	250	100	80	120
B	5	6	7	8	5	6	7	8	5	6	7	8	5	6	7
C	10	55	25	30	35	45	40	20	50	50	30	55	120	40	85
D	2	3	4	4	4	2	3	3	4	3	3	3	4	3	2

Homework 5.7

The investor faces the task of placing A thousand UAH or a deposit in the bank for a term of B years under C % per annum. However, the bank may charge interest on the invested amount:

- 1) annually;
- 2) two times a year;
- 3) quarterly;
- 4) monthly;

5) every day.
Determine the best investment option.

Table 5.7 - Output data for task 5.7

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	55	25	30	35	45	40	20	50	50	30	55	120	40	85
B	2	3	4	4	4	2	3	3	4	3	3	3	4	3	2
C	30	20	25	30	35	45	40	5	50	10	30	12	20	50	25

Homework 5.8

During the March, PJSC "Orion" used an overdraft. The monthly cash flow of this enterprise is characterized by the following indicators (the numerator is withdrawn from the account, the denominator is received on the current account, thousand UAH):

$$02.03 \frac{A}{B}, 10.03 \frac{700}{480}, 14.03 \frac{320}{500},$$

$$22.03 \frac{370}{240}, 29.03 \frac{788}{780}, 30.03 \frac{C}{D}.$$

The incoming balance (initial balance) on 01.03 is E thousand UAH. The fee for using this type of loan is F % of the amount for each day in accordance with the agreement between the bank and the company for the current year. Determine the amount of fees for using an overdraft by this company as needed during the March. Determine the balance of funds on April 1 of the current year, if the bank charges interest accrued for the month for using an overdraft on the last day of the month.

Table 5.8 - Output data for task 5.8

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	600	600	700	700	550	800	850	650	600	700	800	600	500	700	500
B	50	100	300	50	100	400	300	100	150	50	50	150	50	100	50
C	100	50	40	150	300	280	320	400	50	40	10	80	190	230	200
D	400	450	400	400	600	650	740	700	400	300	300	500	500	600	500
E	500	400	300	600	400	300	400	500	400	600	700	300	400	500	400
F	0.5	0.6	0.4	0.3	0.4	0.7	0.6	0.5	0.4	0.5	0.4	0.6	0.8	0.7	0.4

Hometask 5.9

Bonds of the "Forum" company are issued with a nominal interest rate of A%. Nominal value of bond B UAH. The issue rate is UAH C, the repayment rate is UAH D at the end of their circulation period. The bond circulation period is E years. One-time overhead costs related to bond issuance is F% of the nominal value. Determine the effective bond interest rate for the issuer and for the investor.

Table 5.9 - Output data for task 5.9.

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	15	20	22	17	18	21	19	14	24	23	22	26	18	15	14
B	1000	1100	1050	950	1000	900	930	950	1200	1000	1100	1200	900	940	1000
C	850	900	750	830	810	850	840	830	790	780	760	800	820	840	900
D	1100	1300	1200	1000	1200	1300	1120	1100	1300	1070	1150	1300	1030	1100	1200
E	10	9	10	11	12	10	9	7	8	9	11	13	10	11	12
F	5	4	5	6	5	4	5	7	6	5	4	5	6	5	4

Hometask 11.3

The need of PJSC "Kosmos" for financial resources is set by issuing bonds. Nominal value of a bond is A UAH. Issue rate is B UAH, repayment is set at the nominal value. The nominal interest rate is C % per annum. The term of circulation of bonds is D years.

Determine the effective interest rate if the bonds are repaid: at the end of their term; annually in equal shares. The table 11.3 shows the data for performing the task.

Table 11.3 - Output data for task 11.3

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	500	600	650	550	700	680	580	540	590	530	520	510	620	610	640
B	400	420	450	470	440	410	450	390	490	480	440	420	410	400	470
C	10	12	13	14	10	9	12	13	11	10	9	8	9	10	12
D	10	11	13	12	9	8	7	9	8	10	12	14	12	11	12

Hometask 11.4

A bill of exchange was issued for UAH A for B days at C% per annum, for D days before the maturity it was sold to the bank at the rate of E%. Determine, how much money will earn the bank and how much will earn the creditor? The table 11.4 shows the initial data for performing the task.

Table 11.4 - Output data for task 11.4

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	500	600	650	550	700	680	580	540	590	530	520	510	620	610	640
B	50	100	300	50	100	400	300	100	150	50	50	150	50	100	50
C	20	22	23	24	20	29	22	23	21	20	29	25	29	20	22
D	10	11	13	12	9	8	7	9	8	10	12	14	12	11	12
E	25	25	25	26	22	30	30	30	32	25	32	30	32	25	25

Lesson 6. Assets Decisions

6.1. Main issues of the topic

1. The essence of fixed assets, their composition and structure. Fixed assets valuation. Depreciation of fixed assets
2. Key features of intangible assets. Types of Intangible Assets
3. Working (current) assets.
4. Financial cycles of working capital.
5. Financing the enterprise assets. Current Asset Financing Models

6.2. Key terms and concepts

Fixed assets, depreciation rate, accelerated depreciation, fund-intensity, intangible assets, brand, working (current) assets, turnover rate, working capital utilization ratio, duration of one working capital turnover, net working capital, ABC-analysis

6.3. Main tasks

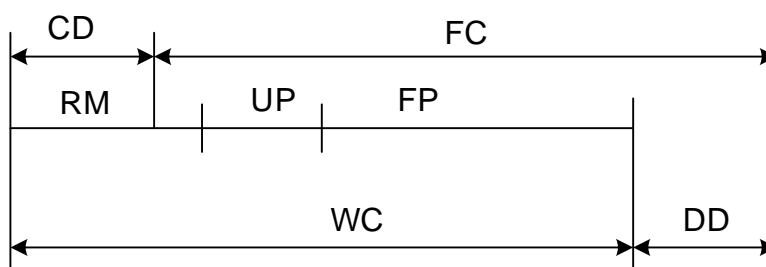
Task 6.1

The company produces batteries 1,500 units/day with a cost of UAH 6/unit. The company needs 22 days for raw materials to turn into goods. The company provides buyers with a 40-day payment delay. The company itself has the opportunity to pay for delivery services within 30 days.

Find: during what period of time does the company's money make turn over (financial cycle)? What amount of working capital is needed for this production program?

Solution

The company's financial cycle consists of:



$$FC = WC + DD - CD = 22 + 40 - 30 = 32 \text{ days.}$$

As a result of the calculation, it can be seen that such working strategy is not profitable for the company. Despite the fact that the production cycle is 22 days, it is necessary to have own money in working capital to operate for 32 days. That is, money for sold finished products will arrive with a greater delay than we have to pay for raw materials.

$$\text{The amount of working capital} = 1,500 \cdot 6 \cdot 32 = \text{UAH } 288,000.$$

Under the conditions of situation 9.1, determine what amount of working capital is necessary for the enterprise to reduce the period of debtor's debts circulation to 35 days?

Solution

$$FC = WC + DD - CD = 22 + 35 - 30 = 27 \text{ days.}$$

$$\text{The amount of working capital} = 1,500 \cdot 6 \cdot 27 = \text{UAH } 243,000.$$

Conclusion: such an operation is profitable if it does not lead to decrease in the demand for finished products.

Under the conditions of situation 9.1, it is assumed that a new technology will be introduced, which will increase production to 1,800 units per day and will contribute to shortening the production cycle to 20 days, but will increase the cost to UAH 7 per unit.

Solution

The financial cycle of the firm in this case is:

$$FC = 20 + 40 - 30 = 30 \text{ days.}$$

$$\text{The amount of working capital} = 1,800 \cdot 7 \cdot 30 = 378,000 \text{ UAH.}$$

Conclusion: if the increase in working capital will be accompanied by profit, and its growth rate should be higher than the growth rate of working capital it is good.

If nothing is known about the profit, then this situation is threatening, because the need for the company's funds increases.

Task 6.2

The enterprise is producing the condensed milk. In a year, it can produce and sell: $G = 600$ units. Variable costs associated with the sale of 1 unit are $x = 1$ UAH. The company buys raw materials from the supplier at the price of $P = 0.5$ UAH for producing 1 unit. Fixed costs for 1 order of raw materials are $y = 1,000$ UAH. Determine the optimal value of 1 order of raw materials.

Solution

The criterion for solving this problem is the minimization of costs, that is, the search for the optimal number of cans in the order, in which the total costs are minimal.

$$\text{Costs} = \text{Fixed costs} + \text{Variable costs} + \text{Acquisition costs}$$

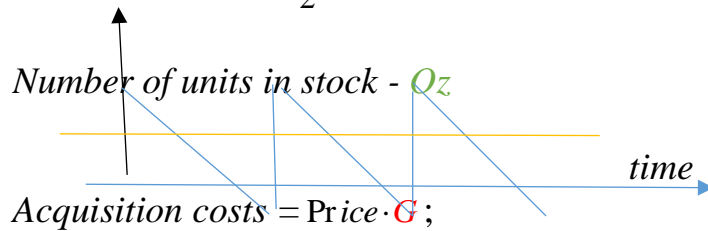
$$\text{Fixed costs} = y \cdot n = y \cdot \frac{G}{O_z},$$

where

O_z is the optimal volume of the order,

n is a number of orders per year;

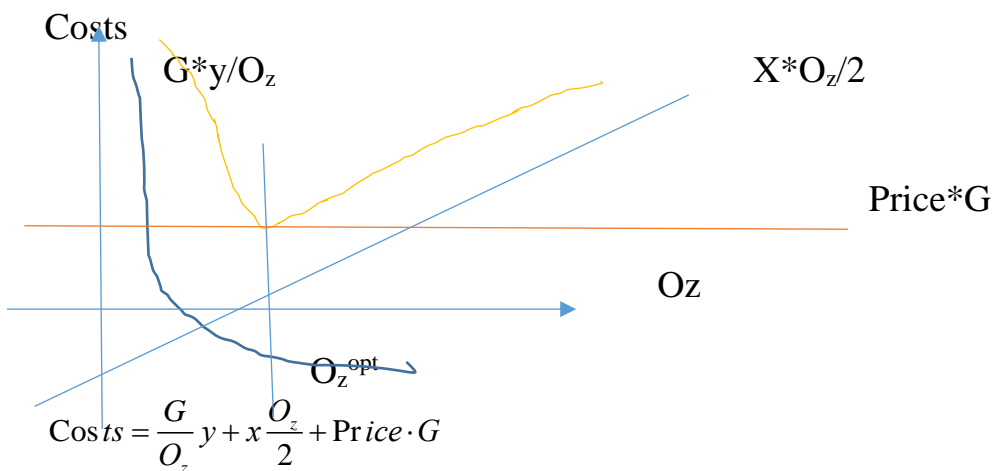
$$\text{Variable costs} = x \frac{O_z}{2};$$



Then the amount of expenses for the year will be:

$$\text{Costs} = \frac{G}{O_z} y + x \frac{O_z}{2} + \text{Price} \cdot G$$

The optimal order will be the one that ensures minimum costs. To do this, we find the extremum of the cost function: we find its derivative with respect to O_z and set it equal to zero:



$$\text{Costs}' = -y \frac{G}{O_z^2} + \frac{x}{2};$$

$$-y \frac{G}{O_z^2} + \frac{x}{2} = 0;$$

$$O_z^2 = \frac{2yG}{x};$$

$$O_z = \sqrt{\frac{2yG}{x}} = \sqrt{\frac{2 \cdot 1,000 \cdot 600}{1}} = \sqrt{1,200,000} = 1,095 \text{ units}$$

Conclusion: for 1 time it is necessary to order raw materials for the production of 1,095 units of condensed milk.

$$\text{Expences} = \frac{G}{O_z} y + x \frac{O_z}{2} + \text{Price} \cdot G$$

$$\text{Expences} = \frac{1,000 \cdot 600}{1,095} + \frac{1 \cdot 1,095}{2} + 1,000 \cdot 0.5 =$$

$$= 548 + 547.5 + 500 = 1196.5 \text{ UAH}$$

$$n = \frac{G}{O_z} = \frac{600}{1,095} \approx 1 \quad - \quad \text{once a year}$$

Task 6.3

Based on the data of the company's financial balance sheets (table 10.1) for three years, determine the working capital management model, provided that in the first year 20%, in the second year 50%, and in the third year 30% of working capital is their permanent part.

Draw conclusions.

Financial balance (thousand UAH)

Assets	1 year	2 year	3 year	Liabilities	1 year	2 year	3 year
Money	10	10	5	Short-term loans	20	20	30
Receivable debts	10	20	10	Long-term loans	10	10	20
Costs	20	10	30	Statutory fund	60	60	60
Fixed assets	50	60	55	Undivided profit	0	10	-10
Total assets	90	100	100	Total liabilities	90	100	100

Solution

Model selection algorithm:

1. If the company's own funds are negative, then this is a crisis model.
2. If the company does not have short-term loan funds, then this is a conservative model.
3. If the volume of short-term loan funds at the enterprise is equal to the working capital of the enterprise, then this is an ideal model.
4. If short-term loan capital is equal to the variable part of working capital, then this is an aggressive model.
5. In the compromise model, 50% of the variable part is financed by short-term borrowings.

Model selection algorithm:

6. If the company's own funds are negative, then this is a crisis model.
7. If the company does not have short-term loan funds, then this is a conservative model.
8. If the volume of short-term loan funds at the enterprise is equal to the working capital of the enterprise, then this is an ideal model.
9. If short-term loan capital is equal to the variable part of working capital, then this is an aggressive model.
10. In the compromise model, 50% of the variable part is financed by short-term borrowings.

assets	liabilities
1. Fixed capital 50	1. Equity (own funds) 60
2. Permanent part of WC: $8=(10+10+20)*0.2$	2. Long-term loans 10
3. Variable part of WC: $32=40-8$	3. Short-term loans 20

This model is between aggressive and compromise.

assets	liabilities
1. Fixed capital 60	1. Equity (own funds) $70=60+10$
2. Permanent part of WC: $20=(10+10+20)*0.5$	2. Long-term loans 10
3. Variable part of WC: $20=(10+10+20)*0.5$	3. Short-term loans 20

The model is aggressive.

assets	liabilities
1. Fixed capital 55	1. Equity (own funds) $50=60-10$
2. Permanent part of WC: $(5+10+30)*0.3=13.5$	2. Long-term loans 20
3. Variable part of WC: $45-13.5=31.5$	3. Short-term loans 30

The model looks like aggressive.

Task 6.4

The cost of the machine is UAH 10.6 million, the service life is 8 years, installation costs are UAH 0.3 million, the residual value is UAH 0.5 million. Determine the annual

amount of depreciation deductions, the rate of depreciation and calculate the amount of accumulated depreciation over the years using the straight-line method.

Solution

$$D_a = \frac{FA_{in} - FA_l}{FA_{in} \cdot T} \cdot 100\%$$

$$Da = \frac{(10.6 + 0.3) - 0.5}{(10.6 + 0.3) \cdot 8} \cdot 100\% = 11.9\%$$

$$A_i = \frac{\sum_{i=1}^n FA_{in} \cdot Da_i}{100}$$

$$A = \frac{11.9}{100} \cdot (10.6 + 0.3) = 1.3 \text{ mln. UAH}$$

For 1 year - 1.3 million UAH

In 2 years – 1.3*2 = 2.6 million UAH

In 3 years 1.3 *3 = 3.9 million UAH

.....

For 8 years = 1.3*8 = 10.4 million UAH

Check: 10.6+0.3-0.5=10.4 million UAH

Task 6.5

The weaving shop has 16 machines, the initial cost of each machine is 140,000 UAH. The service life of the machines is 15 years. The costs for the installation of all machines amounted to UAH 1,250,000. Liquidation value of worn-out machines is 1,300 thousand UAH. Determine the rate and amount of annual depreciation using 2 methods.

Solution

$$D_a = \frac{FA_{in} - FA_l}{FA_{in} \cdot T} \cdot 100\%$$

$$Da = \frac{16 \cdot 140,000 + 1,250,000 - 1,300,000}{(16 \cdot 140,000 + 1,250,000) \cdot 15} \cdot 100\% \approx 4.1833\%$$

$$A_i = \frac{\sum_{i=1}^n FA_{in} \cdot Da_i}{100}$$

$$A = \frac{4.1833}{100} \cdot (16 \cdot 140,000 + 1,250,000) = 145,986.7 \text{ UAH}$$

$$\text{Check: } 145,986.7 \cdot 15 = \text{UAH } 218,995.76$$

$$16 \cdot 140,000 + 1,250,000 - 1,300,000 = 219,000 \text{ UAH}$$

$$\text{UAH } 218,995.76 \approx \text{UAH } 219,000$$

$$Da = \left(1 - \sqrt[15]{\frac{FA_l}{FA_{in}}} \right) \cdot 100\%$$

$$Da = \left(1 - \sqrt[15]{\frac{1,300,000}{16 \cdot 140,000 + 1,250,000}} \right) \cdot 100\% = 3.9\%$$

$$A_i = \frac{Da}{100} \cdot (FA_{in} - A_{i-1})$$

$$A_1 = \frac{3.9}{100} \cdot (16 \cdot 140,000 + 1,250,000 - 0) =$$

$$A_2 = \frac{3.9}{100} \cdot (16 \cdot 140,000 + 1,250,000 - A_1) =$$

$$A_3 = \frac{3.9}{100} \cdot (16 \cdot 140,000 + 1,250,000 - A_2) =$$

.....

.....

$$A_{p15} = \frac{3.9}{100} \cdot (16 \cdot 140,000 + 1,250,000 - A_{14}) =$$

Task 6.6

The company purchased production equipment by 579.8 thousand UAH, the liquidation value is 11% of its initial value, the useful life is 12 years. Calculate depreciation using the straight-line method and the residual value method.

Solution

Let's determine the liquidation value of the equipment.

$$579.8 \cdot 0.11 = 63.778 \text{ thousand UAH.}$$

Linear method

$$D_a = \frac{FA_{in} - FA_l}{FA_{in} \cdot T} \cdot 100\%$$

$$Da = \frac{579,800 - 63,778}{579,800 \cdot 12} \cdot 100\% = 7.417\%$$

$$A_i = \frac{\sum_{i=1}^n FA_m \cdot Da_i}{100}$$

$$A = \frac{7.417}{100} \cdot 579,800 = 43,003.77 \text{ UAH}$$

Accelerated depreciation

$$Da = \left(1 - \sqrt[T]{\frac{FA_l}{FA_m}} \right) \cdot 100\%$$

$$Da = \left(1 - \sqrt[12]{\frac{63,778}{579,800}} \right) \cdot 100\% = 16.8\%$$

$$A_i = \frac{Da}{100} \cdot (FA_m - A_{i-1})$$

$$A1 = \frac{16.8}{100} \cdot (579,800 - 0) = 97,406.4 \text{ UAH}$$

$$A2 = \frac{16.8}{100} \cdot (579,800 - 97,406.4) = 81,042.12 \text{ UAH}$$

Ar3	67,427.05
Ar4	56,099.3
Ar5	46,674.62
Ar6	38,833.28
Ar7	32,309.29
Ar8	26,881.33
Ar9	22,365.27
Ar10	18,607.9
Ar11	15,481.78
Ar12	12,880.84

Check: the amount of Ar for 12 years should be equal to $579,800 - 63,778 = 516,022 \text{ UAH}$

6.4. Homework

Task 6.1

The price of the machine is UAH A thousand, the service life is B years, the installation costs are UAH C thousand, the residual value is UAH D thousand. Determine the annual amount of depreciation deductions, the rate of depreciation and calculate the amount of accumulated depreciation over the years using the straight-line method and the method of decreasing residual value.

Table 6.1 – Output data for task 6.1

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	5	7	15	20	15	17	14	13	15	8	9	9.5	11	13
B	50	44	45	55	25	35	30	33	28	20	19	17	26	24	23
C	0.3	0.5	0.7	0.9	1	2	2.5	1.5	0.8	0.6	0.4	1.1	1.2	1.3	1.4
D	1	0.3	0.5	2	3	2	1	4	3	2	0.1	1	0.5	5	5

Task 6.2

The weaving shop has installed A machines, the initial cost of each machine is B thousand UAH. The service life of the machines is C years. The costs for the installation of all machines is D thousand hryvnias. Liquidation value of worn-out machines is E thousand UAH. Determine the rate of depreciation and the amount of depreciation for years by the linear method and the method of reducing the residual value.

Table 6.2 – Output data for task 6.2

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	5	4	10	11	15	20	6	8	14	9	10	12	7	10	12
B	14	13	15	8	9	9.5	11	10	5	7	15	20	15	13	14
C	60	15	25	35	30	40	45	55	50	44	45	55	25	35	33
D	5	4	3	2	1	1	5	2	3	4	1	2	3	4	5
E	0.3	0.5	3	2	15	7.5	10	15	12	10	15	15	15	20	11

Task 6.3

The enterprise purchased production equipment with the price UAH A thousand, the liquidation value is B% of its value, the useful life is C years. Calculate depreciation using the straight-line method and the residual value method.

Table 6.3 – Output data for task 6.3

	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	100	200	300	400	100	500	50	120	150	220	250	350	450	55	75
B	5	10	15	10	5	7	15	20	3	2	15	7.5	10	15	12
C	50	40	20	25	35	45	55	60	15	25	35	30	40	45	55

Task 6.4

The company produces of A units in one production cycle, unit cost is B UAH. The company needs C days to turn raw materials into goods. The company can provide customers with:

- delay of payment for D days.
- prepayment E days.

The company itself has the option to pay for delivery services within F days, or to prepay for G days.

Find: during what period of time does the company's capital make turn over (financial cycle)? What amount of working capital must be maintained for this production program?

Table 6.4 – Output data for task 6.4

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	10	100	2000	400	600	500	1000	20	5000	200	800	900	5	1200	1800
B	20000	5000	800	3500	8000	4000	9000	50000	100	4000	2000	1200	110,000	200	100
C	40	20	60	50	80	40	35	60	50	40	35	90	80	50	60
D	20	10			25	10			25	15			30	10	
E			15	20			20	15			10	20			30
F	10		30		15		25		15		20		10		15
G		20		20		20		20		30		40		20	

Task 6.5

Under the conditions of situation 14.4, the introduction of a new technology is expected, which will increase production to X units, and will reduce the production cycle to Y days, but will increase the cost to H UAH per unit.

Table 6.5 – Output data for task 6.5

Indicator	VARIANT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
X	20	15	20	42	70	55	19	25	55	20	90	92	50	12	20
H	2200	5500	820	3900	9000	4200	9200	5500	300	4200	3000	1500	120	500	300
Y	30	18	50	45	75	20	27	58	45	30	25	80	70	45	55

Task 6.6

Determine the working capital management model based on the data of the company's financial balance sheets (table 10.1) for three years, if in the first year A%, in the second year B%, and in the third year C% of working capital is its permanent part.

Table 6.6 – Financial balance (thousand UAH)

Assets	1 year	2 year	3 year	Liabilities	1 year	2 year	3 year
Money	D	H	L	Short-term loans	F	E	G
Receivable debts	E	D	M	Long-term loans	G	D	D
Costs	F	K	D	Statutory fund	E	H	L
Fixed assets	G	E	G	Undivided profit	D	K	M
Total assets				Total liabilities			

Table 6.7 – Output data for task 6.6

Indicator	VARIANT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	50	60	40	50	45	55	65	60	50	55	40	35	60	40	30
B	40	50	40	35	40	45	50	45	45	50	45	50	40	50	40
C	30	40	50	40	30	50	40	50	50	40	50	60	50	55	45
D	200	300	500	600	700	500	400	300	600	100	500	100	200	300	400
E	700	500	400	600	500	400	100	500	300	400	600	200	500	800	500
F	100	200	500	400	300	200	300	400	500	200	300	400	200	100	300
G	800	500	600	100	300	500	400	500	400	300	500	500	100	500	200
H	100	200	100	200	300	400	100	200	100	200	300	400	100	500	200

Indicator	Variant														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	500	300	400	600	200	500	800	500	400	300	500	500	100	500	200
K	300	200	300	400	500	200	300	400	100	500	100	200	300	400	200
L	100	300	500	400	500	400	300	100	300	500	400	500	400	300	100
M	200	100	200	300	400	100	500	200	200	100	200	300	400	100	500

Lesson 7: Probability of Bankruptcy

7.1. Main issues of the topic

1. Analysis of bankruptcy.
2. factor model for assessing the probability.
3. method of rating assessment of financial conditio.
4. Evaluation using the financial strategy matrix.
5. Other methods of bankruptcy evaluation.

7.2. Key terms and concepts

Bankruptcy, probability of bankruptcy, factor models of bankruptcy probability, classes of solvency.

7.3. Theoretical material

The most commonly used models for assessing the financial condition of an enterprise and its susceptibility to bankruptcy in the world are the following econometric models based on financial ratios:

- E. Altman's two-factor model for assessing the probability of bankruptcy;
- five-factor model for assessing the probability of bankruptcy based on E. Altman's Z-score;
- Roman Lys's model for assessing financial condition;
- assessment of the financial condition according to the indicators of W. Beaver;
- The forecasting model of R. Taffler and G. Tishaw;
- R-model for predicting bankruptcy risk;
- a generalized model developed on the basis of a discriminant function (Tereshchenko's model);
- PAS-coefficient;
- The model of J. Conan and M. Alder;
- Fulmer's model;
- Springate's model;
- method of rating assessment of financial condition (rating number).

There are other models as well. We will consider only those that can be determined using Ukrainian financial statements.

The most common method of determining bankruptcy in the world practice is based on the models of Edward I. Altman. The literature often identifies two of his models for diagnosing the probability of bankruptcy. The first model allows tracking the probability of bankruptcy on a specific date (usually the date of the balance sheet) - the two-factor Altman model. The second model determines the probability of bankruptcy for a certain period of time (usually a month, quarter, year) - the five-factor Altman model.

One of the simplest models for predicting the probability of bankruptcy is the two-factor model. It is based on two key indicators: the current liquidity ratio and the leverage ratio, which determine the probability of a company's bankruptcy. These indicators are multiplied by the weights of the coefficients found empirically, and the results are then combined with a constant value, also obtained by the same empirical and statistical method. If the result of Z is negative, the probability of bankruptcy is low. A positive value of Z indicates a high probability of bankruptcy.

The essence of the two-factor Altman model is to model the generalized Z score, determined on the basis of additionally determined coefficients, according to the formula:

$$Z = - 0.3877 - 1.0736 R_{TL} + 0.579 BF_L, (7.1)$$

where R_{TL} is the term liquidity ratio,

BF_L is the share of borrowed funds in liabilities (Table 7.1).

If $Z > 0$, the probability of bankruptcy is high, and if $Z < 0$, the probability of bankruptcy is low.

The bankruptcy probability indicator is based only on the financial component of the company's activities. For example, in calculations based on the two-factor model, a company is considered bankrupt if it has a large amount of borrowed capital on its balance sheet and cannot use its available funds and the sale of receivables to repay its accounts payable.

To obtain a more accurate forecast, American practice recommends taking into account the level and trend of changes in the profitability of products sold, as this indicator significantly affects the financial stability of the enterprise. This allows you to simultaneously compare the bankruptcy risk indicator Z and the level of profitability of sales. If the first indicator is within safe limits and the level of product profitability is high enough, the probability of bankruptcy is very low.

It should be borne in mind that this model was developed for the United States, and our country has different inflation rates, different macro- and microeconomic cycles, as well as different capital, energy and labor intensities of production, labor productivity, and a different tax burden. As a result, it is not possible to automatically apply the above coefficient values to Ukrainian conditions. However, the model itself, with numerical values that correspond to the realities of the Ukrainian market, could be applied if domestic accounting and reporting provided sufficiently representative information about the financial condition of the enterprise.

The considered two-factor model does not provide a comprehensive assessment of the financial condition of the enterprise, and therefore, very significant deviations of the forecast from reality are possible.

The five-factor model also relies on the financial component of activity. However, it pays more attention to the formation and distribution of the company's profit. In addition, the five-factor model uses indicators of results from stock market operations (e.g., stock price).

Table 7.1 - Probability of bankruptcy according to the two-factor Altman model

Name of indicators	Formula for calculation	Meaning.				
		At the beginning of the 1st period	At the end of the 1st, the beginning of the 2nd period	At the end of the 2nd, the beginning of the 3rd period	At the end of 3rd period	
1. Term liquidity ratio	R_{TL}	$R_{TL} = (RD + A_{ML}) / L3$				
Accounts receivable	RD	sum of rows. 1125...1155				
Most liquid assets	A_{ML}	sum of rows 1160...1170				
Current liabilities and provisions	L3	row 1695				
2. Share of borrowed funds in liabilities	BF_L	$BF_L = (L2 + L3) / TB$				
Long-term liabilities and provisions	L2	row 1595				
Balance sheet summary	TB	row 1900				
	Z					

This model is based on a creditworthiness index built using the multiplicative discriminant analysis technique.

In constructing the index, Altman studied 66 companies, half of which went bankrupt between 1946 and 1965 and half of which were successful, and 22 analytical coefficients that could be useful for predicting possible bankruptcy. From these indicators, he selected the five most significant ones and built a multivariate regression equation. Thus, the Altman index is a function of some indicators that characterize the economic potential of an enterprise and its performance over the past period.

The probability of bankruptcy under this model is calculated using the formula:

$$\zeta = 1.21 \cdot x_1 + 1.4 \cdot x_2 + 3.3 \cdot x_3 + 0.6 \cdot x_4 + 0.999 \cdot x_5 \quad (7.2)$$

The calculation of the factors is shown in Table 11.3. In contrast to the two-factor model, the five-factor model determines the probability of bankruptcy for a certain period (year, quarter, etc., i.e., the period of financial statements under study).

Since the two-factor model takes into account fewer indicators and is calculated for a specific date rather than for the entire period, it is possible that the probability obtained by the two-factor model contradicts the probability obtained by the five-factor

model. For example, according to the two-factor model, the probability of bankruptcy is high, while according to the five-factor model, it is low, or vice versa. In this case, you should focus on the result obtained by the five-factor model.

Table 7.2 - Probability of bankruptcy according to the five-factor Altman model

Indicator.	Formula.	Value. for ____ year	Value for ____ year
x_1	$x_1 = (A2_{av.} - L3_{av.}) / TB_{av.}$		
Average current assets	$A2_{av.}$		
Average amount of current liabilities	$L3_{av.}$		
Average balance sheet total	$TB_{av.}$		
x_2	$x_2 = RE_{av.} / PBT$		
Retained earnings (RE)	row 1420 $_{av.}$		
Profit before tax (PBT)	row 2290 - row 2295		
x_3	$x_3 = PBT / TB_{av.}$		
x_4	$x_4 = VS / (L2_{av.} + L3_{av.})$		
Market value of shares (VS)	row 2600 × share price data		
Average amount of borrowed funds	$L2_{av.} + L3_{av.}$		
x_5	$x_5 = NIS / TB_{av.}$		
Net income from sales	row 2000		
ζ	$Z = 1.21 \cdot x_1 + 1.4 \cdot x_2 + 3.3 \cdot x_3 + 0.6 \cdot x_4 + 0.999 \cdot x_5$		

The following factors can be used to draw conclusions about the results of an enterprise's production and business activities:

x_1 - determines the share of net working capital in the total balance sheet of the enterprise.

x_2 - monitors the results of all activities of the company (production and financial), in particular, determines the share of retained earnings in the total amount of profit before tax. In this case, profit before tax is an indicator of the company's performance over a certain period of time, and retained earnings indicate positive results of the company's activities and the availability of free funds. A special case may be a situation in which an enterprise incurs uncovered losses. The values of uncovered losses in the formula for x_2 are taken with a minus sign, which significantly increases the likelihood of bankruptcy and indicates the withdrawal of part of the company's own funds.

x_3 - determines the share of profit before tax in the balance sheet total. x_3 indicates the growth rate of the balance sheet total. This factor has the greatest impact on the value of the Z indicator (on the probability of bankruptcy), since the presence of stable balance sheet profit and a stable increase in the balance sheet total indicate

positive trends in its development. However, unprofitable operations significantly increase the likelihood of bankruptcy.

x_4 - monitors the financial performance of the company and assesses the ratio of funds received from raising equity capital through shareholder's equity and long-term and short-term borrowed capital (usually bank loans and short-term accounts payable). Although the influence of this factor is the smallest, it can be decisive for joint-stock companies due to the large amount of their own funds (the company's authorized capital).

x_5 - characterizes the company's market opportunities, the stability of demand for its products or services. It is defined as the ratio of net sales revenue to the balance sheet total

The results of many calculations based on the Altman model have shown that the generalizing indicator Z can take values in the range $[-14, +22]$. At the same time, enterprises with $Z > 2.99$ are considered financially stable, enterprises with $Z < 1.81$ are definitely insolvent, and the interval $[1.81 - 2.99]$ is a zone of uncertainty.

However, this model has a common serious drawback: it can only be used for relatively larger companies that are listed on stock exchanges. It is for such companies that an objective market valuation of equity can be obtained.

In 1983, Edward Altman proposed a modified version of his formula for unlisted companies:

$$Z = 0.717 K_1 + 0.847 K_2 + 3.107 K_3 + 0.42 K_4 + 0.995 K_5, \quad (7.3)$$

where the K_4 coefficient takes into account the book value, not the market (exchange rate) value of shares, i.e., only data from financial statements can be used to calculate it.

The "threshold" value for this formula is 1.23. That is, enterprises with $Z > 1.23$ are considered financially stable, while enterprises with $Z < 1.23$ are insolvent.

In Ukrainian practice, numerous attempts have been made to use the Altman Z -score to assess solvency and diagnose bankruptcy, and a computer model for predicting bankruptcy diagnosis has been used. However, differences in external factors that affect the functioning of the enterprise (the degree of development of the stock market, mainly the weak development of the secondary securities market, tax legislation, and accounting regulations), and thus the economic indicators used in the Altman model, distort the probable estimates.

However, the experience of using these models in a number of countries, including the United States, Canada, Brazil, and Japan, has shown that the probability of bankruptcy can be predicted with 90% accuracy for 1 year, 70% for 2 years, and 50% for 3 years using the five-factor model.

It is worth noting that there have been many attempts around the world to create their own system for assessing the likelihood of bankruptcy. Let us focus on some of them that are of some interest and can also be used in Ukraine.

Table 7.3 - Probability of bankruptcy according to the modified fivefactor Altman model

Indicator.	Formula.	Value. for ____ year	Value for ____ year
K_1	$K_1 = (A2_{av.} - L3_{av.}) / TB_{av.}$		
Average current assets	$A2_{av.}$		
Average amount of current liabilities	$L3_{av.}$		
Average balance sheet total	$TB_{av.}$		
K_2	$K_2 = RE_{av.} / PBT$		
Retained earnings	row 1420 _{av.}		
Profit before tax (PBT)	row 2290 - row 2295		
K_3	$K_3 = PBT / TB_{av.}$		
K_4	$K_4 = BV / (L2_{av.} + L3_{av.})$		
Book value of shares (BV)	row. 2600 × row. 2610		
Average amount of borrowed funds	$L2_{av.} + L3_{av.}$		
K_5	$K_5 = NI / TB_{av.}$		
Net income	row. 2000		
Z	$Z = 0.717 K_1 + 0.847 K_2 + 3.107 K_3 + 0.42 K_4 + 0.995 K_5$		

In 1972 Roman Lys proposed the following formula for UK enterprises [10]:

$$Z = 0.063 X_1 + 0.092 X_2 + 0.057 X_3 + 0.001 X_4, \quad (7.4)$$

where. X_1 - working capital / amount of assets;

X_2 - operating profit / amount of assets; X_3 -

retained earnings / amount of assets; X_4 -

equity/debt capital.

The "threshold" value for this model is 0.037. That is, enterprises with $Z > 0.037$ are among the financially stable ones, while enterprises with $Z < 0.037$ are insolvent.

Similar to the Altman five-factor model, the Roman Lys model determines the probability of bankruptcy over a certain period of time. The form with data sources for the calculation is shown in Table 7.4.

Table 7.4 - Probability of bankruptcy according to the Roman Lys model

Indicator.	Formula.	Value for ____ year	Value for ____ year
X_1	$X_1 = A2_{av.} / TB_{av.}$		
Average value of current assets	$A2_{av.}$		
Average balance sheet total	$TB_{av.}$		

X_2	$X_2 = \text{OAP} / \text{TB}_{\text{av}}$		
Profit from operating activities (OAP)	row. 2190 - row. 2195		
X_3	$X_3 = \text{RE}_{\text{av.}} / \text{TB}_{\text{av.}}$		
Retained earnings	row 1420 _{av.}		
X_4	$X_4 = \text{L1}_{\text{av.}} / (\text{L2}_{\text{av.}} + \text{L3}_{\text{av.}})$		
Equity capital	L1_{av}		
Average amount of borrowed funds	$\text{L2}_{\text{av.}} + \text{L3}_{\text{av.}}$		
Z	$Z = 0.063 X_1 + 0.092 X_2 + 0.057 X_3 + 0.001 X_4$		

The American financial analyst William Beaver proposed his own system of indicators for assessing the financial condition of an enterprise. For the purpose of diagnosing bankruptcy, he recommended to study the trends of several indicators at once without building a single generalized indicator. W. Beaver's system of indicators and their values for diagnosing bankruptcy are presented in Table 7.5. Grouping of indicators for calculations is shown in Table 7.6. As in the previous models, the Beaver model uses indicators to assess the probability of bankruptcy for a period. However, the main difference from the other models is the determination of the forecasting time: 5 years before bankruptcy, 1 year before bankruptcy.

However, this methodology also does not reflect all aspects of a company's operations and is not a universal methodology for predicting the likelihood of bankruptcy.

Table 7.5 - Indicators of bankruptcy of W. Beaver

Indicators.	Calculation.	The value of the indicator		
		Stable company	5 years before bankruptcy	1 year before bankruptcy
Biver's Coefficient	(net income - net profit depreciation) / non-current liabilities	0.4 – 0.45	0.17	-0.15
Return on assets	Net profit / assets · 100%	6-8	4	-22
Financial leverage	(long-term + short-term liabilities)/assets	< 37	< 50	< 80
Coverage ratio 1	(equity – non-current assets)/assets	0,4	< 0,3	0,06
Coverage ratio 2	Current assets / current liabilities	< 3.2	< 2	< 1

Table 7.6 - Grouping of indicators for calculations in the Beaver model

Indicators.	Formula for calculation	The value of the indicator	
		Value for _____ year	Value for _____ year
Biver's Coefficient	$(NP - Am_{av}) / L2_{av}$		
Net profit (NP)	row 2350 - row 2355		
Depreciation and amortization (Am)	row 1002 _{av.}		
Long-term liabilities (L2)	row 1595 _{av.}		
Return on assets	$(NP / TB_{av.}) \cdot 100\%$		
Balance sheet summary (TB _{av.})	row 1300 _{av.}		
Financial leverage	$(L2_{av.} + L3_{av.}) / TB_{av.}$		
Short-term liabilities (L3)	row 1695 _{av.}		
Coverage ratio 1	$(L1_{av.} - A1_{av.}) / TB_{av.}$		
Equity (L1)	row 1495 _{av.}		
Non-current assets (A1)	row 1095 _{av.}		
Coverage ratio 2	$A2_{av.} / L3_{av.}$		
Current assets (A2)	row 1195 _{av.}		

Also there was proposed a four-factor model for predicting bankruptcy risk (model R), which looks like this:

$$R = 8.38 K_1 + K_2 + 0.054 K_3 + 0.63 K_4, \quad (7.5)$$

where. K_1 - working capital/assets;

K_2 - net profit/equity;

K_3 - net sales revenue / assets;

K_4 - net profit/integral costs.

The grouping of indicators for calculations is shown in Table 11.7.

Table 7.7 - Probability of bankruptcy according to the R model

Indicator.	Formula	Value for _____ year	Value for _____ year
K_1	$K_1 = A2_{av.} / TB_{av.}$		
Average value of current assets	$A2_{av.}$		
Average balance sheet total	$TB_{av.}$		
K_2	$K_2 = NP / L1_{av.}$		
Net profit (NP)	row 2350 - row 2355		
Equity capital	$L1_{av.}$		
K_3	$K_3 = NI / TB_{av.}$		
Net income (NI)	row 2000		
K_4	$K_4 = NP / TC$		
Total (integrated) costs (TC)	row 2550.		
R	$R = 8.38 K_1 + K_2 + 0.054 K_3 + 0.63 K_4$		

The advantages of this model include the fact that the mechanism of its development and all the main stages of calculations are quite simple and can be explained and justified in detail. It should be noted, however, that when assessing a company's susceptibility to bankruptcy and calculating bankruptcy probability ratios, it is necessary to take into account the industry specifics of enterprises. Therefore, in order to make a more accurate assessment of the probability of an enterprise's bankruptcy, it is necessary to develop and use industry-specific bankruptcy probability ratios, which may differ significantly for each industry and each country.

The probability of bankruptcy of the enterprise in accordance with the value of the model R is determined as follows (Table 7.8).

Table 7.8 - Estimation of bankruptcy by the R model

The value of R (bankruptcy probability ratio)	Probability of bankruptcy, %.
Less than 0	Maximum (90-100)
0-0.18	High (60-80)
0.18-0.32	Average (35-50)
0.32-0.42	Low (15-20)
More than 0.42	Minimum (up to 10)

Another British model of bankruptcy assessment was proposed in 1977 by R. Taffler and G. Tishaw. Taffler proposed a four-factor predictive model, which used the following approach.

They applied Altman's approach and, having studied more than 80 British companies, built a four-factor predictive model of financial insolvency (Z) based on their data, described by the following equation:

$$Z = 0.53 X_1 + 0.13 X_2 + 0.18 X_3 + 0.16 X_4, \quad (7.7)$$

where. X_1 - operating profit / short-term liabilities;

X_2 - current assets / amount of liabilities;

X_3 - short-term liabilities / amount of assets;

X_4 - net sales revenue / amount of assets.

If $Z > 0.3$, it indicates that the probability of bankruptcy is low (the "green zone"). If $0.2 < Z < 0.3$, the company is in the zone of uncertainty (the "gray zone"), and if $Z < 0.2$, bankruptcy is more than likely (the "red zone").

The grouping of indicators for calculations is shown in Table 7.8.

The French model for assessing the solvency of firms was proposed in 1979 by J. Conan and M. Holder using a sample of 95 firms studied during 1970-1975:

$$Z = -0.16 X_1 - 0.22 X_2 + 0.87 X_3 + 0.10 X_4 - 0.24 X_5, \quad (7.8)$$

where X_1 is the ratio of money and receivables to the balance sheet total;

X_2 - the ratio of equity and long-term liabilities to the balance sheet total;

X_3 - the ratio of long-term and current liabilities to net income (revenue) from sales of products;

X_4 - the ratio of staff labor costs to the financial result from operating activities (after tax);

X_5 - the ratio of revenue from product sales to borrowed capital.

Table 7.8 - Probability of bankruptcy according to the model of R. Taffler and G. Tishaw

Indicator.	Formula.	Value for ____ year	Value for ____ year
X_1	$X_1 = OP/L3_{av.}$		
operating profit (OP)	row 2190 - row 2195		
short-term liabilities	$L3_{av.}$		
X_2	$X_2 = A2_{av.} / (L2_{av.} + L3_{av.})$		
current assets	$A2_{av.}$		
long-term liabilities	$L2_{av.}$		
X_3	$X_3 = L3_{av.} / TB_{av.}$		
Balance sheet summary	$TB_{av.}$		
X_4	$X_4 = NI / TB_{av.}$		
Net income (NI)	row 2000		
Z	$Z = 0.53 X_1 + 0.13 X_2 + 0.18 X_3 + 0.16 X_4$		

The grouping of indicators for calculations is shown in Table 7.9.

Table 7.9 - Probability of bankruptcy according to the model of J. Conan and M. Alder

Indicator.	Formula.	Value for ____ year	Value for ____ year
X_1	$X_1 = (M_{av.} + AR_{av.}) / TB_{av.}$		
Money (M)	row 1160 _{av.} + row 1165 _{av.}		
Accounts receivable (AR)	sum of rows (1125...1155) _{av.}		
Balance sheet summary	$TB_{av.}$		
X_2	$X_2 = (L1_{av.} + L2_{av.}) / PB_{av.}$		
Equity capital	$L1_{av.}$		
Long-term liabilities	$L2_{av.}$		
X_3	$X_3 = (L2_{av.} + L3_{av.}) / NI$		
Short-term liabilities	$L3_{av.}$		
Net income (NI)	row 2000		
X_4	$X_4 = LC / OP$		
Labor costs (LC)	row 2505 + row 2510		
Operating profit (OP)	row 2190 – row 2195		
X_5	$X_5 = NI / TB_{av.}$		
Z	$Z = -0.16 X_1 - 0.22 X_2 + 0.87 X_3 + 0.10 X_4 - 0.24 X_5$		

The probability of bankruptcy of an enterprise, depending on the value of Z, can be presented in the form of Table 7.10.

Table 7.10 - Values of the probability of bankruptcy of an enterprise

Z	3,0	2,8	2,5	2,1	1,8	1,6	1,5	1,1	1,0
Probability of bankruptcy of the enterprise, %.	100	90	80	70	50	40	30	20	10

The Ukrainian economist O. Tereshchenko proposed a "universal discriminant function" for predicting bankruptcy, which can be represented in the form of an equation:

$$Z = 1.5 X_1 + 0.08 X_2 + 10 X_3 + 5 X_4 + 0.3 X_5 + 0.1 X_6, \quad (11.9)$$

where X_1 - money / liabilities;

X_2 - money / balance sheet currency;

X_3 - profit / balance sheet currency;

X_4 - profit / revenue from sales;

X_5 - production inventory / sales revenue;

X_6 - turnover of fixed assets (sales revenue / balance sheet currency). The grouping of indicators for calculations is shown in Table 7.11.

Table 7.11 - Probability of bankruptcy according to Tereshchenko's model

Indicator.	Formula.	Value for _____ year	Value for _____ year
X_1	$X_1 = M_{av.} / (L2_{av.} + L3_{av.})$		
Money (M)	row 1160 _{av.} + row 1160 _{av.}		
Long-term liabilities	L2 _{av.}		
Short-term liabilities	L3 _{av.}		
X_2	$X_2 = M_{av.} / TB_{av.}$		
Balance sheet summary	TB _{av.}		
X_3	$X_3 = NP / TB_{av.}$		
Net profit (NP)	row 2350 – row 2355		
X_4	$X_4 = NP / NI$		
Net income (NI)	row 2000		
X_5	$X_5 = I_{av.} / NI$		
Inventories (I)	row 1100 + row 1110		
X_6	$X_6 = NI / PB_{av.}$		
Z	$Z = 1.5 X_1 + 0.08 X_2 + 10 X_3 + 5 X_4 + 0.3 X_5 + 0.1 X_6$		

The obtained values of the Z-score help determine the probability of bankruptcy:

$Z > 2$ - the company is considered to be financially stable and is not threatened with bankruptcy;

$1 < Z < 2$ - the financial equilibrium (financial stability) of the company is not stable, but it is not in danger of bankruptcy if it transitions to crisis management;

$0 < Z < 1$ - the company faces bankruptcy if it does not take rehabilitation actions;

$Z < 0$ - bankrupt company.

Based on the financial statements of 40 Canadian companies, Gordon Springate proposed his own model at Simon Fraser University. It somewhat coincides in coefficients with those used by E. Altman.

G. Springate's bankruptcy model can be represented as a formula:

$$Z = 1.03 K_1 + 3.07 K_2 + 0.66 K_3 + 0.4 K_4 \quad (7.10)$$

where K_1 - Working capital / Assets;

K_2 - (Profit before tax + Interest payable) / Assets;

K_3 - Profit before tax / Short-term liabilities;

K_4 - Revenue / Assets.

The grouping of indicators for calculations using this model is shown in Table 7.12.

Table 7.12 – Probability of bankruptcy according to the G. Springate model

Indicator.	Formula.	Value for _____ year	Value for _____ year
K_1	$K_1 = A2_{av.} / TB_{av.}$		
Working capital	$A2_{av.}$		
Balance sheet summary	$TB_{av.}$		
K_2	$K_2 = PBT / IP$		
Profit before tax (PBT)	row 2290 - row 2295		
Interest payable (IP)	row 2250		
K_3	$K_3 = PBT / L3_{av.}$		
Short-term liabilities	$L3_{av.}$		
K_4	$K_4 = NI / TB_{av.}$		
Net income (NI)	row 2000		
Z	$Z = 1.03 K_1 + 3.07 K_2 + 0.66 K_3 + 0.4 K_4$		

The threshold value in G. Springate's bankruptcy model is 0.862. If $Z < 0.862$, the bankruptcy of the enterprise is likely, and if $Z > 0.862$, the bankruptcy of the enterprise is unlikely.

Another model for predicting the bankruptcy of an enterprise was developed by the American scientist D. Fulmer for US enterprises in 1983. To develop the model,

he used financial reports from 60 US companies, 30 of which went bankrupt and 30 remained financially stable.

D. Fulmer's bankruptcy model can be represented as a formula:

$$H = 5.528 K_1 + 0.212 K_2 + 0.073 K_3 + 1.27 K_4 + 0.12 K_5 + 2.235 K_6 + 0.575 K_7 + 1.083 K_8 + 0.984 K_9 - 3.075 \quad (11.11)$$

where $K_1 = \text{Retained earnings of previous years} / \text{Assets}$;

$K_2 = \text{Sales revenue} / \text{Assets}$;

$K_3 = (\text{Profit before tax} + \text{Interest payable}) / \text{Equity}$;

$K_4 = \text{Net cash flow} / (\text{Short-term} + \text{long-term liabilities})$;

$K_5 = \text{Long-term liabilities} / \text{Assets}$;

$K_6 = \text{Short-term liabilities} / \text{assets}$;

$K_7 = \text{Lg (tangible assets)}$;

$K_8 = \text{Working capital} / (\text{Long-term} + \text{Short-term liabilities})$; $K_9 = \text{Lg} [(\text{Profit before tax} + \text{Interest payable}) / \text{Interest payable}]$.

The grouping of indicators for calculations using this model is shown in Table 7.13.

Table 7.13 - Probability of bankruptcy according to the Fulmer model

Indicator.	Formula.	Value for year	Value for year
K 1	$K_1 = \text{RPF}_{\text{av.}} / \text{TB}_{\text{av.}}$		
Retained earnings of previous years (RPF)	row 1420 _{av.}		
Balance sheet summary	$\text{TB}_{\text{av.}}$		
K 2	$K_2 = \text{NI} / \text{TB}_{\text{av.}}$		
Net income (NI)	row 2000		
K 3	$K_3 = (\text{PBT} + \text{IP}) / \text{L1}_{\text{av.}}$		
Profit before tax (PBT)	row 2290 – row 2295		
Interest payable (IP)	row 2250		
Equity capital	$\text{L1}_{\text{av.}}$		
K 4	$K_4 = \text{NCF} / (\text{L2}_{\text{av.}} + \text{L3}_{\text{av.}})$		
Net cash flow (NCF)	row 3400		
Long-term liabilities	$\text{L2}_{\text{av.}}$		
Short-term liabilities	$\text{L3}_{\text{av.}}$		
K 5	$K_5 = \text{L2}_{\text{av.}} / \text{TB}_{\text{av.}}$		
K 6	$K_6 = \text{L3}_{\text{av.}} / \text{TB}_{\text{av.}}$		
K 7	$K_7 = \text{Lg} (\text{A1}_{\text{av.}})$		
Non-current assets	$\text{A1}_{\text{av.}}$		
K 8	$K_8 = \text{A2}_{\text{av.}} / (\text{L2}_{\text{av.}} + \text{L3}_{\text{av.}})$		

Long-term liabilities	L2 _{av.}		
Short-term liabilities	L3 _{av.}		
Current assets	A2 _{av.}		
K 9	$K_8 = Lg[(PBT. + IP.) / IP]$		
Profit before tax (PBT)	row 2290 – row 2295		
Interest payable (IP)	row 2250		
H	$H = 5.528 K_1 + 0.212 K_2 + 0.073 K_3 + 1.27 K_4 + 0.12 K_5 + 2.235 K_6 + 0.575 K_7 + 1.083 K_8 + 0.984 K_9 - 3.075$		

The main disadvantage of using this model is the complexity of calculating the decimal logarithms (Lg) in the coefficients 7 and 9 and the need to use Form 3 for calculation of net cash flow (or use the methodology for its calculation, which will be described in paragraph 12 of this manual). D. Fulmer defined 0 as the "threshold" value in his model. If $H < 0$, then bankruptcy of the enterprise is likely, if $H > 0$, the company's bankruptcy is unlikely.

In addition to searching for a single generalized indicator, the probability of bankruptcy can be assessed using scoring.

The credit scoring methodology was first proposed by the American economist D. Durand in early 1940. The essence of this methodology is to classify enterprises by risk based on the actual level of financial strength indicators and the rating of each indicator expressed in points based on expert opinions. An example of a scoring model is shown in Table 7.14.

Table 7.14 - Grouping of enterprises into classes according to their solvency

Indicators.	Class boundaries by criteria				
	I class	II class	III class	IV class	V class
Return on equity, %.	30 and above (50 points)	29.9 - 20 (49.9-35 points)	19.9-10 (34.9 - 20 points)	9.9-1 (19.9-5 points)	less than 1 (0 points)
Current liquidity ratio	2.0 and above (30 points)	1.99-1.7 (29.9-20 points)	1.69-1.4 (19.9-10 points)	1.39:1.1 (9.9-1 points)	1 and below (0 points)
Financial independence ratio	0.7 and above (20 points)	0.69-0.45 (19.9-10 points)	0.44-0.30 (9.9 - 5 points)	0.29-0.20 (5-1 points)	less than 0.2 (0 points)
Class boundaries	100 points and above	99-65 points	64-35 points	34-6 points	0 points

The calculation of Return on equity ratio, total liquidity, and autonomy (financial independence) is discussed below.

Class I - companies with a good margin of financial stability, which allows them to be confident in the repayment of borrowed funds;

Class II - enterprises that demonstrate some debt risk but are not yet considered risky;

Class III - problem enterprises;

Class IV - enterprises with a high risk of bankruptcy even after taking financial rehabilitation measures;

Class V - high-risk enterprises that are practically insolvent.

Indicator.	Formula for calculation	Value for _____ year	Value for _____ year
Return on equity ratio	$[OP / (L1_{av.} + L4_{av.})] \cdot 100\%$		
Profit from operating activities (OP)	row 2190 - row 2195		
Current liquidity ratio	$A2_{av.} / L3_{av.}$		
Financial independence ratio	$(L1_{av.} + L4_{av.}) / TB_{av.}$		

7.4. Test questions by section:

1. Using the two-factor Altman model, we determine:
 - a) the probability of bankruptcy on a particular date;
 - b) excess or shortage of sources of funds for inventory and expenses;
 - c) probability of bankruptcy for the period;
 - d) cash flow.
2. In the two-factor Altman model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 2.99;
 - b) the generalized Z score is less than 0;
 - c) the generalized Z-score is less than 1.8;
 - d) the generalized Z score is greater than 0.
3. In Altman's five-factor model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 2.99;
 - b) the generalized Z score is less than 0;
 - c) the generalized Z-score is less than 1.8;
 - d) the generalized Z score is greater than 0.
4. Using Altman's five-factor model, determine:
 - a) the probability of bankruptcy on a particular date;

- b) excess or shortage of sources of funds for inventory and expenses;
 - c) probability of bankruptcy for the period;
 - d) cash flow.
5. In the Fulmer model, the probability of bankruptcy is high if:
 - a) the generalized H index is greater than 2.99;
 - b) the generalized indicator H is less than 0;
 - c) the generalized H index is less than 1.8;
 - d) the generalized indicator H is greater than 0.
 6. In Tereshchenko's model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 2.99;
 - b) the generalized Z score is less than 0;
 - c) the generalized Z-score is less than 1.8;
 - d) the generalized Z score is greater than 0.
 7. In the Springate model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 2.99;
 - b) the generalized Z score is less than 0;
 - c) the generalized Z-score is less than 0.862;
 - d) the generalized Z-score is greater than 0.862.
 8. In the model of the Irkutsk State Economic Academy, the probability of bankruptcy is high if:
 - a) the generalized R-index is greater than 0.3;
 - b) the generalized indicator R is less than 0;
 - c) the generalized R-index is less than 1.8;
 - d) the generalized indicator R is greater than 0.
 9. In the model of R. Taffler and G. Tishaw, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 0.3;
 - b) the generalized Z score is less than 0;
 - c) the generalized Z-score is less than 0.3;
 - d) the generalized Z score is greater than 0.
 10. In Roman Lys's model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 2.99;
 - b) the generalized Z-score is less than 0.037;
 - c) the generalized Z-score is less than 1.8;
 - d) the generalized Z-score is greater than 0.037.
 11. In Conan and Alder's model, the probability of bankruptcy is high if:
 - a) the generalized Z-score is greater than 3;
 - b) the generalized R-value is less than 0.037;

- c) the generalized Z-score is less than 3;
 - d) the generalized R-value is greater than 0.037.
12. In the Beaver model, the probability of bankruptcy is high if:
- a) the generalized R-index is greater than 2.99;
 - b) Beaver's coefficient is less than -0.15;
 - c) the generalized H index is less than 1.8;
 - d) Beaver's coefficient is greater than 0.

7.5 Practical session

Analysis of the probability of bankruptcy

Determine the probability of bankruptcy of an enterprise using the two- and five-factor Altman model, Lys, Springate, Taffler, Tereshchenko, and Beaver models.

ASSET (UAH thousand)	String code	At the beginning of the period	At the end of the period
<u>I. Non-current assets</u>	1095	11 248,50	10 339,00
<u>II. Current assets</u>			
Inventory.	1100	1990,1	1608,8
Receivables for products, goods, works, services	1125	1803,1	1912,2
Receivables from settlements: for advances issued	1130	2068,2	1869,8
on budget	1135	3,1	18,3
Other current receivables	1155	0,4	15
Current financial investments	1160	10	3,1
Money and moneyequivalents	1165	412,9	908,6
Prepaid expenses	1170	103,8	148,5
Other current assets	1190	0,5	50
Total for section II	1095	6 392,10	6 534,30
<u>III. Non-current assets held for sale and disposal groups</u>	1120	0,9	1,1
BALANCE	1130	17 641,50	16 874,40
BALANCE SHEET (UAH thousand)	String code	At the beginning of the period	At the end of the period
<u>I. Shareholders' equity</u>			
Registered (share) capital	1400	317,7	317,7
Equity in revaluations	1405	64,9	64,9
Additional capital	1410	12	18
Reserve capital	1415	95,3	190
Retained earnings (uncovered loss)	1420	2220	1580
Total for section I	1495	2 709,90	2 170,60
<u>II. Long-term liabilities and collateral</u>	1595		
<u>III. Current liabilities and collateral</u>			

Short-term loans from banks	1600	366,1	255
Current accounts payable for: long-term liabilities	1610		53,9
goods, works, services	1615	305,5	2294,8
settlements with the budget	1620	1939,9	3124,5
insurance settlements	1625	653	
payroll settlements	1630	7280,2	2106,9
Current collateral	1660	12,6	1112,6
Deferred income	1665	2793,8	3403,9
Other current liabilities	1690	1580,5	2352,2
Total for section III	1695	14 931,60	14 703,80
IV. Liabilities related to non-current assets held for sale and disposal groups	1700		

BALANCE	1900	17 641,50	16 874,40
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Article.	Code. lines	2016
Net income from sales of products (goods, works, services)	2000	3 054
Gross: profit	2090	351
loss	2095	
Financial result from operating activities: profit	2190	297
loss	2195	
Financial result before tax: profit	2290	303
loss	2295	
Net financial result: profit	2350	211
loss	2355	
Article	String code	For the reporting period
Average annual number of ordinary shares	2600	2568000
Adjusted average annual number of ordinary shares	2605	2568000
Net income (loss) per ordinary share	2610	0,001
Adjusted net income (loss) per ordinary share	2615	0,0005
Dividends per ordinary share	2650	0,00025

An example of analysis

Let's analyze the probability of bankruptcy of Zakhidpromavtomatika OJSC according to the two-factor Altman model in Table 7.16.

Table 7.16 - Probability of bankruptcy according to the two-factor Altman model

Indicator.	Data			
	The beginning of 2014	End of 2014, beginning of 2015	End of 2015, beginning of 2016	End of 2016
1. Current ratio	1,257	1,064	0,716	1,184
2. Share of borrowed funds in liabilities	0,076	0,135	0,171	0,233
z	-1,693	-1,452	-1,058	-1,524

Thus, based on the fact that the calculated result z has a negative value in all analyzed periods, we can say that the probability of bankruptcy for the enterprise is low.

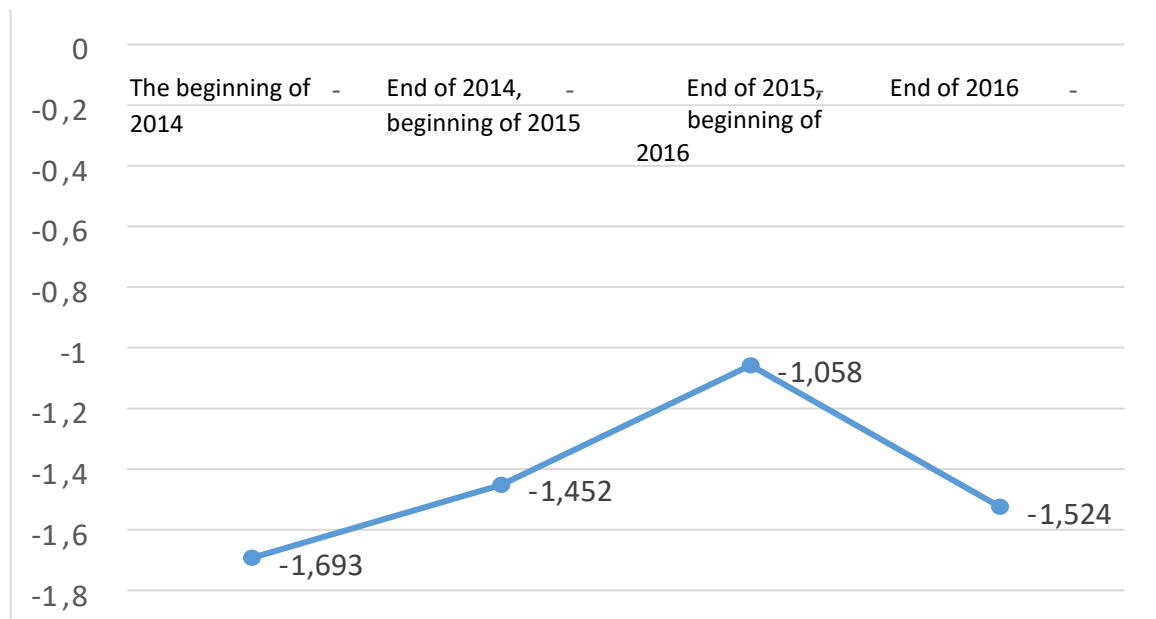


Figure 7.1 - Probability of bankruptcy according to the two-factor Altman model

We will also analyze the probability of bankruptcy of Zakhidpromavtomatika OJSC according to the five-factor Altman model in Table 7.17. The results of the calculations in Table P.11.2 are presented graphically in Fig. 7.2.

Table 7.17 - Probability of bankruptcy according to the five-factor Altman model

Source of information	Value. for 2014	Value for 2015	Value for 2016
x_1	0,13	0,12	0,16
Average current assets	729,55	794,40	1129,25
Average amount of current liabilities	328,15	444,15	644,20
Average balance sheet total	3104,75	2925,65	3123,30
x_2	5,65	3,29	-1,44
Retained earnings	-657,10	-862,40	-775,00
Profit before taxation	-116,40	-262,20	537,90
x_3	-0,04	-0,09	0,17
x_4	0,00	0,00	0,00
The value of shares	0,00	0,00	0,00
Average amount of borrowed funds	328,15	444,15	644,20
x_5	0,52	0,76	1,45
Net sales revenue	1605,20	2217,10	4530,30
z	8,45	5,21	0,19

Based on the calculations, it can be said that in 2014 and 2015 the company is financially stable, because the generalized Z-score in these periods exceeds the value of 2.99. In 2016, the company can be characterized as insolvent, because in this period the Z-score is less than 1.81. It is worth noting that the Z-score has a common serious drawback: it can essentially only be used for relatively larger companies that list their shares on stock exchanges. However, since the shares of Zakhidpromavtomatika OJSC were not listed on the Ukrainian financial market between 2014 and 2016, it is impossible to obtain an objective market assessment of its equity using this model.

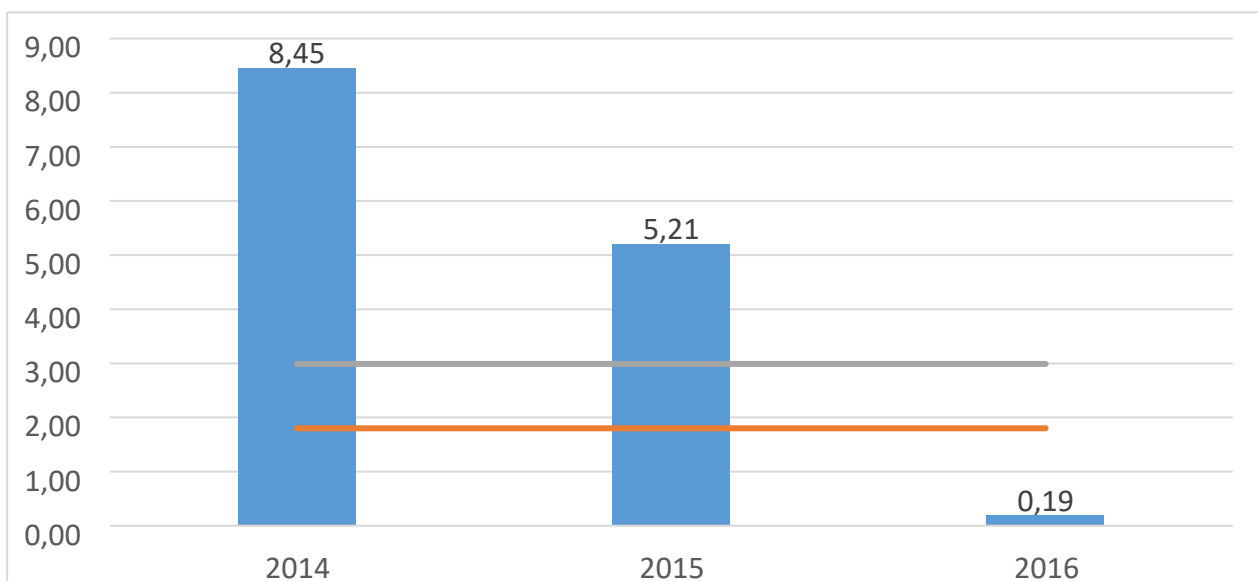


Figure 7.2 - Probability of bankruptcy according to the five-factor Altman model

It should also be noted that the greatest impact on the probability of bankruptcy in each of the periods under consideration is exerted by the factor x_2 , which tracks the results of all enterprise activities (production and financial), in particular, determines the share of retained earnings in the total amount of profit before tax. In this case, pre-tax profit is an indicator of the company's performance over a certain period of time, and retained earnings indicate the company's performance and the availability of free funds.

7.6. Homework

Using Form 1 and Form 2 (Annex) of financial statement access the probability of bankruptcy of a company using five models you choose. Use the tables for calculations. Make a conclusion about probability after each model.

Company JOINT STOCK COMPANY "TURBOATOM"

Organizational joint-stock company legal
form of business

Type of economic activity Manufacture of engines and turbines, except for aircraft, motor
vehicles and motorcycle engines

Average number of employees 2949

Asset	Code. lines	At the beginning of the reporting period	At the end of the reporting period
1	2	3	4
I. Non-current assets			
Intangible assets	1000	1268	199
original cost	1001	8120	8089
accumulated depreciation	1002	6852	7890
Capital investments in progress	1005	17547	13981
Property, plant and equipment	1010	2087275	1962816
original cost	1011	10614477	10619220
wear and tear	1012	8527202	8656404
Investment real estate	1015	0	0
<i>the initial cost of investment property</i>	1016	0	0
<i>depreciation of investment property</i>	1017	0	0
Long-term biological assets	1020	0	0
<i>cost of long-term biological assets</i>	1021	0	0
<i>Accumulated depreciation of long-term biological assets</i>	1022	0	0
Long-term financial investments:			
accounted for using the equity method of accounting	1030	0	0
other financial investments	1035	0	0
Long-term receivables	1040	56510	0
Deferred tax assets	1045	0	0
<i>Goodwill</i>	1050	0	0
<i>Deferred acquisition costs</i>	1060	0	0
<i>Balance in centralized insurance reserve funds</i>	1065	0	0
Other non-current assets	1090	1075917	1089479
Total for section I	1095	3238517	3066475

1	2	3	4
II. Current assets			

Inventory.	1100	1692447	1575810
<i>Inventories of production</i>	1101	351343	305910
<i>Work in progress</i>	1102	1253210	1046040
<i>Finished products</i>	1103	87884	223840
<i>Products.</i>	1104	10	20
Current biological assets	1110	0	0
<i>Reinsurance deposits</i>	1115	0	0
<i>Promissory notes received</i>	1120	0	0
Receivables for products, goods, works, services	1125	1895684	2340122
Receivables from settlements:			
on advances issued	1130	326617	207067
on budget	1135	24	0
including income tax	1136	0	0
<i>Receivables from accrued income settlements</i>	1140	0	0
<i>Accounts receivable from internal settlements</i>	1145	0	0
Other current receivables	1155	4172	3988
Current financial investments	1160	0	0
Money and money equivalents	1165	72343	230089
<i>Cash</i>	1166	0	0
<i>Bank accounts</i>	1167	72343	230089
Prepaid expenses	1170	0	0
<i>Reinsurer's share of insurance reserves</i>	1180	0	0
<i>including in:</i>			
<i>provisions for non-current liabilities</i>	1181	0	0
<i>loss or benefit provisions</i>	1182	0	0
<i>reserves for unearned premiums</i>	1183	0	0
<i>Other insurance reserves</i>	1184	0	0
Other current assets	1190	189755	134435
Total for section II	1195	4181042	4491511
III. Non-current assets held for sale and disposal groups	1200	0	0
Balance	1300	7419559	7557986

Liability	Code. lines	At the beginning of the reporting period	At the end of the reporting period
1	2	3	4
I. Shareholders' equity			
Registered (share) capital	1400	105624	105624
Contributions to unregistered authorized capital	1401	0	0
Equity in revaluations	1405	1788701	1788701
Additional capital	1410	0	0
<i>Share premium</i>	1411	0	0
<i>Accumulated exchange rate differences</i>	1412	0	0

Reserve capital	1415	61064	61064
Retained earnings (uncovered loss)	1420	3405684	3564258
Unpaid capital	1425	(0)	(0)
Withdrawn capital	1430	(0)	(0)
<i>Other provisions</i>	1435	0	0
Total for section I	1495	5361073	5519647
II. Long-term liabilities and collateral			
Deferred tax liabilities	1500	191417	174862
<i>Pension obligations</i>	1505	0	0
Long-term loans from banks	1510	0	0
Other non-current liabilities	1515	0	0
Long-term provisions	1520	9841	10300
<i>Long-term employee benefit plans</i>	1521	0	0
Targeted financing	1525	0	0
<i>Charitable assistance</i>	1526	0	0
<i>Insurance reserves</i>	1530	0	0
<i>including:</i>	1531	0	0
<i>provision for non-current liabilities</i>		0	0
<i>provision for losses or provision for due payments</i>	1532	0	0
<i>reserve for unearned premiums</i>	1533	0	0
<i>Other insurance reserves</i>	1534	0	0
<i>Investment contracts</i>	1535	0	0
<i>The prize fund</i>	1540	0	0
<i>Reserve for the jackpot payout</i>	1545	0	0
Total for section II	1595	201258	185162
III. Current liabilities and collateral			
Short-term loans from banks	1600	100000	491995
<i>Promissory notes issued</i>	1605	0	0
Current accounts payable for: long-term liabilities	1610	0	0
goods, works, services	1615	388535	316728
settlements with the budget	1620	31137	25875
including income tax	1621	18708	4518
insurance settlements	1625	9746	3301
payroll settlements	1630	37461	14168
<i>Current accounts payable for advances received</i>	1635	829777	612468
<i>Current accounts payable for settlements with participants</i>	1640	369080	312795
<i>Current accounts payable from internal settlements</i>	1645	0	0
<i>Current accounts payable for insurance activities</i>	1650	0	0
Current collateral	1660	39947	35461
Deferred income	1665	0	0
<i>Deferred commission income from reinsurers</i>	1670	0	0
Other current liabilities	1690	51545	40386
Total for section III	1695	1857228	1853177
IV Liabilities related to non-current assets held for sale and disposal groups	1700	0	0
V. Net value of assets of a non-state pension fund	1800	0	0
Balance	1900	7419559	7557986

Statement of financial results (Statement of comprehensive income)
for 2020

I. FINANCIAL RESULTS		Form No. 2	
Article.	String code	For the reporting period	For the same period of the previous year
1	2	3	4
Net income from sales of products (goods, works, services)	2000	1465531	2822845
<i>Net written insurance premiums earned</i>	2010	0	0
<i>Premiums signed, gross amount</i>	2011	0	0
<i>Premiums ceded for reinsurance</i>	2012	0	0
<i>Change in unearned premium reserve, gross</i>	2013	0	0
<i>Changes in the share of reinsurers in the unearned premium reserve</i>	2014	0	0
Cost of sales (goods, works, services)	2050	(1178156)	(1826131)
<i>Net incurred claims on insurance payments</i>	2070	(0)	(0)
Gross: profit	2090	287375	996714
loss	2095	(0)	(0)
<i>Gain (loss) on changes in provisions for non-current liabilities</i>	2105	0	0
<i>Income (expense) from changes in other insurance reserves</i>	2110	0	0
<i>Change in other insurance reserves, gross</i>	2111	0	0
<i>Change in the share of reinsurers in other insurance reserves</i>	2112	0	0
Other operating income	2120	32624	45178
<i>Gain from changes in value of assets measured at fair value</i>	2121	0	0
<i>Gain on initial recognition of biological assets and agricultural products</i>	2122	0	0
<i>Income from the use of tax-exempt funds</i>	2123	0	0
Administrative expenses	2130	(143738)	(180908)
Selling expenses	2150	(42674)	(69425)
Other operating expenses	2180	(51263)	(257183)
<i>Losses from changes in value of assets measured at fair value</i>	2181	(0)	(0)
<i>Expenses on initial recognition of biological assets and agricultural products</i>	2182	(0)	(0)
	2190	82324	534376
Financial result from operating activities: profit			

loss	2195	(0)	(0)
Income from equity participation	2200	0	0
Other financial income	2220	64775	58921
Other income	2240	181608	113
<i>Income from charitable assistance</i>	2241	0	0
Financial expenses	2250	(50827)	(4355)
Losses from equity participation	2255	(0)	(0)
Other expenses	2270	(1586)	(205494)
<i>Gain (loss) from inflation on monetary items</i>	2275	0	0
	2290	276294	383561
Financial result before tax: profit			
loss	2295	(0)	(0)

Income tax expense (income)	2300	(49760)	(69496)
Profit (loss) from discontinued operations after tax	2305	0	0
	2350	226534	314065
Net financial result: profit			
loss	2355	(0)	(0)

II. COMPREHENSIVE INCOME

Article.	String code	For the reporting period	For the same period of the previous year
1	2	3	4
Revaluation (impairment) of non-current assets	2400	0	0
Revaluation (impairment) of financial instruments	2405	0	0
Accumulated exchange rate differences	2410	0	0
Share of other comprehensive income of associates and joint ventures	2415	0	0
Other comprehensive income	2445	0	0
Other comprehensive income before taxation	2450	0	0
Income tax related to other comprehensive income	2455	0	0
Other comprehensive income after tax	2460	0	0
Total income (sum of lines 2350, 2355 and 2460)	2465	226534	314065

III. ELEMENTS OF OPERATING EXPENSES

Article title	String code	For the reporting period	For the same period of the previous year
1	2	3	4
Material costs	2500	414284	982268
Labor costs	2505	385009	512866

Contributions to social activities	2510	87695	113261
Depreciation and amortization	2515	141304	199802
Other operating expenses	2520	314804	633744
Total	2550	1343096	2441941

IU. CALCULATION OF SHAREHOLDER RETURN INDICATORS

Article title	String code	For the reporting period	For the same period of the previous year
1	2	3	4
Average annual number of ordinary shares	2600	422496520	422496520
Adjusted average annual number of ordinary shares	2605	422496520	422496520
Net income (loss) per ordinary share	2610	0,53	0,74
Adjusted net income (loss) per ordinary share	2615	0,53	0,74
Dividends per ordinary share	2650	0	0

Course materials and recommended reading

Compulsory materials

1. Pursiainen, C. (2018). *The Crisis Management Cycle*. New York: Routledge.
2. Crandall, W. R., Parnell J. A., & Spillan J. E. (2014). *Crisis Management: Leading in the New Strategy Landscape*. Washington: Sage Publications inc.
3. Boin, A., Hart, P., Stern, E., & Sundelius, B. (2017). *The Politics of Crisis Management*. Cambridge: Cambridge University Press.
4. Gilpin D. R., & Murphy, P. J. (2018). *Crisis Management in a Complex World*. Oxford: Oxford University Press
5. Borghesi, A., Gaudenzi, B. (2012). *Risk Management: How to Assess, Transfer and Communicate Critical Risks*. Milan, New York: Springer
6. Fater, D. H. (2010) *Essentials of Corporate and Capital Formation*. John Wiley & Sons; 1st edition
7. Metrick, A., Yasuda, A. (2010) *Venture Capital and the Finance of Innovation*. John Wiley & Sons; 2nd edition
8. Sherman, A. J. (2012) *Raising Capital: Get the Money You Need to Grow Your Business*. AMACOM; 3rd edition
9. Ramirez, J. (2011) *Handbook of Corporate Equity. Derivatives and Equity Capital Markets*. John Wiley & Sons

Additional materials

10. Cohen, B. (2013) *What Every Angel Investor Wants You to Know: An Insider Reveals How to Get Smart Funding for Your Billion Dollar Idea*. McGraw-Hill Education; 1st edition
11. Ogier, T. (2004) *The Real Cost of Capital: A Business Field Guide to Better Financial Decisions*. Ft Pr; 1st edition
12. Van, Ho Tran (2002). *Economic Crisis Management: Policy Practice, Outcomes and Prospects*. Northampton: Edward Elgar Publishing inc.
13. Regester, M., & Larkin J. (2005). *Risk Issues and Crisis Management in Public Relations: A Casebook of Best Practice*. London: Kogan Page
14. Guilhon, B., Montchaud, S. (2020) *Venture Capital and the Financing of Innovation*. ISTE Ltd
16. Phillips, Pul., Phillips, Pat., Paone, G., Hu, C. (2019) *Value for Money*. Scrivener Publishing; 1st edition

Навчальне видання

Методичні вказівки до практичної і самостійної роботи з курсу «Кризовий менеджмент» для студентів освітнього рівня магістр спеціальності 073 “Менеджмент”

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