MINISTRY OF EDUCATION AND SCIENCE OF UKRAINE
CHERNIHIV NATIONAL UNIVERSITY OF TECHNOLOGY

INVESTMENT MANAGEMENT

Handouts for practical classes and
tasks for carrying out case study
for full-time students of the specialty
072 "Finance, Banking and Insurance"

Discussed and recommended at the meeting of the
Department of Finance, Banking and Insurance
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Investment Management. Handouts for practical classes and tasks for carrying out case study for full-time students of the specialty 072 "Finance, Banking and Insurance" / compiled by Remnova L., Shtyrkhun Kh. – Chernihiv: CNUT, 2017. – 56 p.

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INTRODUCTION

Investment management is a part of general management which is related to effective strategies of putting money in different assets for providing both growth and profit. Therefore, it is important to develop professional skills of the students in an effective investment decision making in the conditions of increasing instability and high turbulence of the global environment, negative impact of internal and external factors on investment process.

These "Handouts for practical classes and tasks for carrying out case study" will help students to use quantitative methods of investment analysis and portfolio formation for working out an effective investment strategy and tactics in a specific business situation.

Handouts include individual and group control tasks for checking the level of students` knowledge of the material that they received during lectures, such as: tests, matching, crosswords, cases and topics for discussion.

After the completion of this course students should be able to:

– understand the logic of investment management process and the essential content of its' each stage, functions and principles;

– explain the impact of main external and internal factors on Ukrainian investment environment;

– use various qualitative and quantitative methods for estimating investment effectiveness of the project and evaluating its risk and expected return both for real and financial investments;

– distinguish active and passive investment strategies of portfolio formation as well as understand the psychological issues in investment decision making.

TOPIC 1. ECONOMICAL ESSENCE AND BASIC CONCEPTS OF INVESTMENT MANAGEMENT

Main questions

1.1 Basic terms of investment management
1.2 Evolution of investment management development and its fundamental concepts
1.3 Objectives, functions and principles of investment management
1.4 Investment and financial decisions: comparative aspect

Primary studying goal of the seminar

1. To learn basic terms, characteristics and evolution of investment management
2. To study objects, subjects, functions, principles and tasks of investment management.
3. To make investment and financial decisions on the basis of real examples.

Recommended literature

1. Balan O.S. Par'eva Essence, meaning and classification of investment decisions. [Electronic resource] / O.S. Balan, N.O. Par'eva // Economics: time realities. Scientfic journal. – 2012. – № 3 (4). – P. 52-56. – Available at: http://economics.opu.ua/files/archive/2012/n4-5.html.

2. Brigham, E., Ehrhardt, M. *Financial Management: Theory and Practice* (13th Edition). - United States: South-Western Cengage Learning, 2011. - 1184 p.

3. Kristina Levišauskaite [Electronic resource]. Investment Analysis and Portfolio Management. – Lithuania: Vytautas Magnus University Kaunas, 2010. – 166 p. – Available at: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf.

4. Moiseenko I. P. Investment: Training. guidances [Electronic resource]. - K .: Knowledge, 2006. - 490 p. – Available at: http://ebrary.net/4371/investment/investment.

5. Obi J. N. Investment management analysis I [Electronic resource]. - Nigeria: National open university of Nigeria. - 138 p. – Available at: http://www.nou.edu.ng/uploads/NOUN_OCL/pdf/pdf2/ENT%20331%20INVESTME NT%20MANAGEMENT%20ANALYSIS%20I.pdf.

6. Rufus I.A. Investment decisions; concept, analysis and management. – Lagos: Glorious Hope Publishers (Lagos). – 2004. - 659 p.

7. Костюкевич Р.М. Інвестиційний менеджмент. Навчальний посібник. – Рівне: НУВГП,. 2011. – 270 с.

8. Кравченко О. О. Інвестиційний менеджмент: Навчально- методичний посібник для самостійного вивчення дисципліни для студентів усіх форм навчання спеціальності «Менеджмент організацій». – Київ: ДЕТУТ, 2010. – 255 с.

9. Краус Н.М. Інвестиційний менеджмент: навчально-методичний посібник. – Полтава: Астрая, 2011. – 176 с.

10. Ткаленко Н.В., Ремньова Л.М.,Маргасова В.Г., Виговська В.В., Ніколаєнко Ю.В. Інвестиційний менеджмент : навчальний посібник. Видання друге, доповнене і перероблене. – К.: Кондор-Видавництво , 2016. - 232 с.

Visual materials

1. What makes a good investment?
https://www.lynda.com/Business-Data-Analysis-tutorials/What-makes-good-investment/145931/156905-4.html?utm_medium=integrated-partnership&utm_source=slideshare

2. The role of investment managers explained in 90 seconds
http://www.schroders.com/en/us/professional-investor/insights/global-investor-study/the-role-of-investment-managers-explained-in-90-seconds-200-0006/

3. Investing Basics: The Power of Compounding
https://www.youtube.com/watch?v=immQX0RKFY0

4. The Difference Between Saving, Investing, and Speculating
https://www.youtube.com/watch?v=blnbxbftme0

5. What is Investment Management?
https://www.youtube.com/watch?v=-_Amo6GYckU

6. What you need to know about a career in Investment Management
https://www.youtube.com/watch?v=v5sTV295uP4

7. Інвестиційний менеджмент
https://www.youtube.com/watch?v=RG3aDeKj1MI&t=1s

8. Мультик Пабло и Бруно Водопровод это денежный поток!
https://www.youtube.com/watch?v=kGpnwpq3NV8&t=17s

Main Tasks

1. Form 5 words from all the pieces
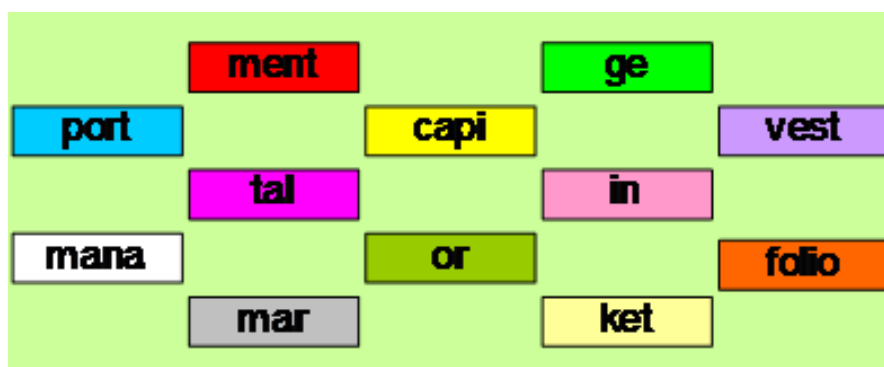
2. Why is it important for investment manager to understand the essence of investments and their classification?

3. Which of the following statements best distinguishes the difference between real and financial assets?

a. Real assets have less value than financial assets.
b. Real assets are tangible; financial assets are not.
c. Financial assets are a claim to the income generated by real assets.
d. Financial assets appreciate in value; real assets depreciate in value.

4. Which of the following are real and financial assets?

a. A patent.
b. A share of stock issued by Bank of New York.
c. A blast furnace in a steel-making factory.
d. A mortgage loan taken out to help pay for a new home.
e. After a successful advertising campaign, potential customers belief that your brand of potato chips is extra crispy.

5. Match the investment management concept with its meaning

1. Priority of owners economic interests	**A.** Time is the most important factor for evaluation of a portfolio. The earlier investor begins to invest, the greater will be the value of his investments because of power of compounding.
2. Time value of money	**B.** Investment managers can rely on market prices of financial instruments and justify the need of their inclusion in the investment portfolio.
3. Exponential growth	**C.** The main objective of investment management is maximization of the enterprise market value, the value of its securities and maximization of the portfolio market value because owners of invested capital are interested in its growing.
4. Compromise between risk and return	**D.** The main task of investment management is to find an optimal combination of risk and return.
5. Cash flows	**E.** All assets are the sources of future cash flows.
6. Capital cost	**F.** This concept is connected with making investment decisions when one participant has more or better information than the other.
7. Effective markets	**G.** An amount of money in the current moment is not equal to expected cash flows in the future due to the influence of inflation, investment risk and liquidity reduction.
8. Asymmetrical information	**H.** The need to define the cost of each source of investment recourses and provide the optimal structure of financial resources for reaching minimization of the invested capital cost.

Your answers: 1.__. 2. __. 3.__. 4. __. 5.__. 6.__. 7. __. 8.__.

6. What is the difference between managerial approaches to the evolution of Investment Management?

7. Work in groups and choose one or two the most important tasks of investment management. Explain your choice.
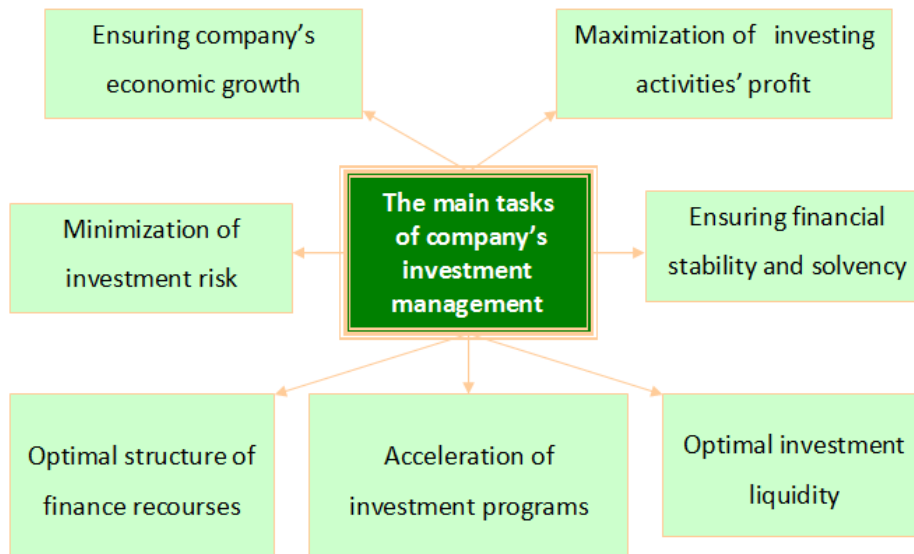
8. Work in groups and choose one or two the most important principles of investment management. Explain your choice.
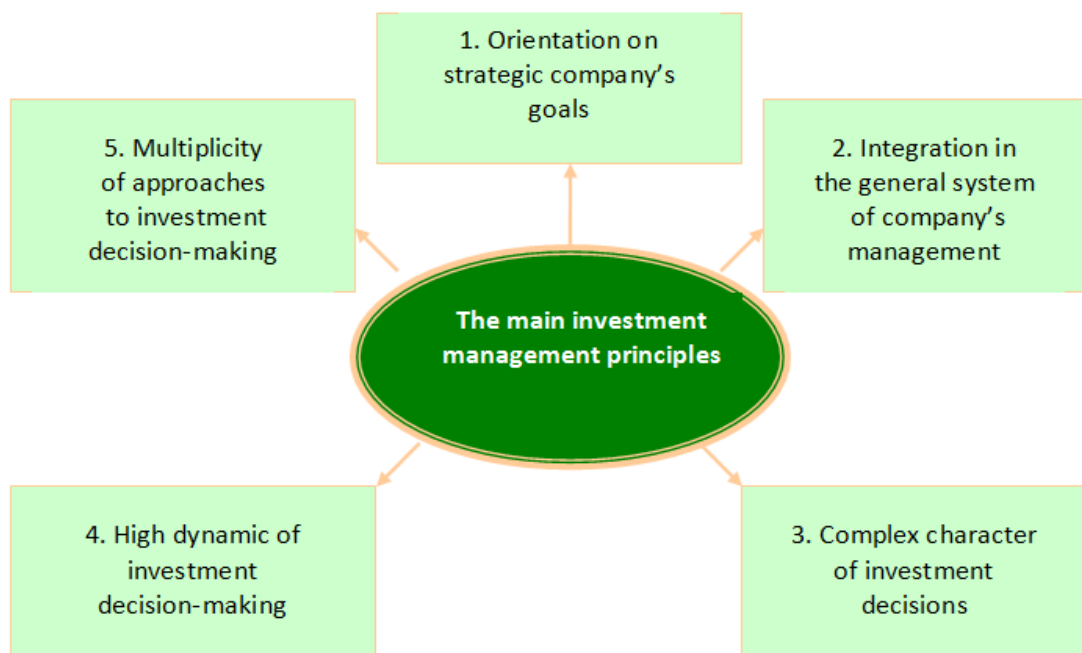
9. Explain each function of investment management and call the most important functions of investment manager.

10. Why is the separation of investment and financing decisions so important? Which type of decision is primary and which one is secondary?

11. Which of the following would be considered as an investment (capital budgeting) decision?
a. Planning to issue common stock rather than issuing preferred stock.

b. A decision to expand into a new line of products, at a cost of $5 million.

c. Repurchasing shares of common stock.

d. Issuing debt in the form of long-term bonds.

12. Which of the following are NOT investment (capital budgeting) decisions?

a. Intel decides to spend $1 billion to develop a new microprocessor.

b. Volkswagen borrows 350 million euros (€350 million) from Deutsche Bank.

c. BP constructs a pipeline to bring natural gas onshore from a production platform in the Gulf of Mexico.

d. Budweiser spends €200 million to launch a new brand of beer in European markets.

e. Pfizer issues new shares to buy a small biotech company.

13. Which of the following are financing decisions?

a. Intel decides to spend $1 billion to develop a new microprocessor.

b. Volkswagen borrows 350 million euros (€350 million) from Deutsche Bank.

c. BP constructs a pipeline to bring natural gas onshore from a production platform in the Gulf of Mexico.

d. Budweiser spends €200 million to launch a new brand of beer in European markets.

e. Pfizer issues new shares to buy a small biotech company.

14. Solve a Crossword Puzzle
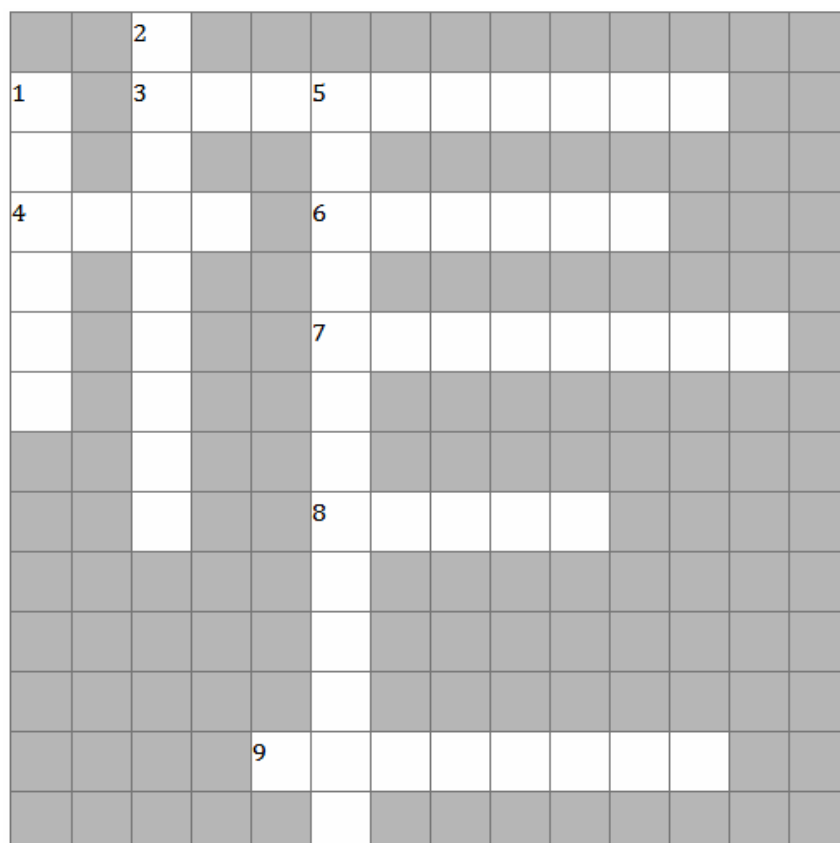
Across:

3. Investors who invest on their own are called…

4. Investments, what are made by organizations and other entities into their productive development through purchasing land, capital goods (machinery, vehicles, buildings, equipment, etc.), intangible and other assets, are called…

6. The economist who created the capital asset pricing model (CAPM).

7. The type of investing that assumes the participation of financial intermediaries

8. The economist who proposed the strategy of including risk-free assets in the portfolio and analyzing factors that influence the portfolio's risk and return.

9. The main objective of investment management is to … company's market value and the value of its securities.

Down:

1. The type of investing when investor is choosing investment objects and investing money in them on his own without help of any intermediary.

2. The type of investments when investor buys securities, monetary instruments, corporate rights by entities and individuals

5. Investors are entities such as investment funds and companies, commercial banks, insurance companies, pension funds and other financial institutions that are providing investment activity on professional base and very often play the role of investment intermediaries, are called…

TOPIC 2. METHODOLOGY AND ANALYTICAL TOOLS OF INVESTMENT MANAGEMENT

Main questions

2.1 Stages in capital investment decision making
2.2 The main approaches to investment analysis
2.3 Capital budgeting evaluation techniques and decision rules
    2.3.1 Payback and discounted payback period techniques
    2.3.2 Net presented value technique
    2.3.3 Profitability index technique
    2.3.4 Internal rate of return technique
    2.3.5 Accounting rate of return technique
    2.3.6 Modified internal rate of return technique
2.4 Comparing evaluation techniques and building NPV-profile

Primary studying goal of the seminar

1. To learn the main stages in capital investment decision making.

2. To distinguish the main approaches to investment analysis on the basis of real examples.

3. To study how to indicate the correct accept–reject decision for investment projects based on the calculation of the PP, the DPP, the NPV, the PI, the IRR, the MIRR, the ARR and NPV-profile.

Recommended literature

1. Chapter 10. The Basics of Capital Budgeting: Evaluating Cash Flows [Electronic resource]. – Available at: http://ebooks.narotama.ac.id/files/Corporate%20Finance;%20A%20Focused%20Approach%20(4th%20Edition)/CHAPTER%2010%20The%20Basics%20of%20Capital%20Budgeting;%20Evaluating%20Cash%20Flows.pdf

2. Chapter 11. Capital investment appraisal [Electronic resource]. – Available at: http://ebooks.narotama.ac.id/files/Management%20Accounting%20(2nd%20Edition)/Chapter%2011%20%20Capital%20Investment%20Appraisal.pdf

3. Investment Appraisal Methods – A Comparisons of NPV, ARR and Payback Methods [Electronic resource]. – Available at: http://businessessays.net/economics-and-finance/investment-appraisal-methods-a-comparisons-of-npv-arr-and-payback-methods/

4. Kengatharan Lingesiya. Capital Budgeting Theory and Practice: A Review and Agenda for Future Research [Electronic resource] / Research Journal of Finance and Accounting // Lingesiya Kengatharan. – 2016. – Vol.7. – No.1.– Available at: http://iiste.org/Journals/index.php/RJFA/index

5. Milis Koen. Evaluation of the applicability of investment appraisal techniquesfor assessing the business value of IS services // Koen Milis, Monique Snoeck, Raf Haesen [Electronic resource]. – Belgium: KULeuven. – 19 p. – Available at: https://lirias.kuleuven.be/bitstream/123456789/247210/1/KBI_0910.pdf

6. Peterson-Drake Pamela. Advantage and disadvantages of the different capital budgeting techniques // Pamela Peterson-Drake [Electronic resource]. – Available at: educ.jmu.edu/~drakepp/principles/module6/advdistable.pdf

7. Schwulst Brigitta. Capital Budgeting Techniques – Using ARR to Determine Investment // Brigitta Schwulst [Electronic resource]. – May 12, 2014 – Available at: https://blog.udemy.com/capital-budgeting-techniques/

8. Viswanath P.V. Some Alternative Investment Rules // P.V. Viswanath [Electronic resource]. – Available at:
http://webpage.pace.edu/pviswanath/notes/corpfin/invrules.html

9. Погасій С. О. Інвестиційний менеджмент (в прикладах і завданнях): навч. посібник / С. О. Погасій, О. В. Познякова, Ю. В. Краснокутська; Харк. нац. акад. міськ. госп.-ва. – Х.: ХНАМГ, 2009. – 337 с.

10. Теплова Т. В. Корпоративные финансы : учебник для бакалавров / Т. В. Теплова. — М. : Из датель ст во Юрайт, 2013. — 655 с.

Visual materials

1. Bottom-Up Investing
http://www.investopedia.com/terms/b/bottomupinvesting.asp
2. Discounted Payback Period
http://www.investopedia.com/terms/d/discounted-payback-period.asp
3. Fundamental Analysis
http://www.investopedia.com/terms/f/fundamentalanalysis.asp
4. Horizontal Analysis
http://www.investopedia.com/terms/h/horizontalanalysis.asp
5. Internal Rate Of Return - IRR
http://www.investopedia.com/terms/i/irr.asp
6. Modified Internal Rate Of Return - MIRR
http://www.investopedia.com/terms/m/mirr.asp
7. Net Present Value - NPV
http://www.investopedia.com/terms/n/npv.asp
8. Payback Period
http://www.investopedia.com/terms/p/paybackperiod.asp
9. Profitability Index
http://www.investopedia.com/terms/p/profitability.asp
10. Qualitative Analysis
http://www.investopedia.com/terms/q/qualitativeanalysis.asp
11. Quantitative Analysis
http://www.investopedia.com/terms/q/quantitativeanalysis.asp
12. Ratio Analysis
http://www.investopedia.com/terms/r/ratioanalysis.asp

13. Technical Analysis
http://www.investopedia.com/terms/t/technicalanalysis.asp
14. Vertical Analysis
http://www.investopedia.com/terms/v/vertical_analysis.asp
15. Which is a better measure for capital budgeting, IRR or NPV?
http://www.investopedia.com/ask/answers/05/irrvsnpvcapitalbudgeting.asp

Main Tasks

1. What are the most important stages in the capital budgeting process?

2. What are the main objectives of investment analysis?

3. Match an investment term in English with its translation into Ukrainian

1. Quantitative Analysis	**A.** Рівномірні щорічні надходження
2. Accounting Rate of Return	**B.** Цінний папір (акція або облігація)
3. Modified Internal Rate of Return	**C.** Амортизація
4. Qualitative Analysis	**D.** Еквівалентний річний ануїтет
5. Depreciation	**E.** Індекс рентабельності
6. Discounted Payback Period	**F.** Період окупності
7. Uneven Cash Inflows	**G.** Облікова норма рентабельності
8. Internal Rate of Return	**H.** Нерівномірні щорічні надходження
9. Net Present Value	**I.** Внутрішня норма рентабельності
10. Equivalent Annual Annuity	**G.** Дисконтований період окупності
11. Profitability Index	**K.** Чиста приведена вартість
12. Security (stock or bond)	**L.** Коефіцієнтний аналіз
13. Payback Period	**M.** Якісний аналіз
14. Even Cash Inflows	**N.** Кількісний аналіз
15. Ratio Analysis	**O.** Модифікована внутрішня норма рентабельності

4. Determine the types of investment analysis on the basis of given examples:

Situation 1.
Imagine an investor wants to invest in company XYZ. The investor may wish to determine how the company grew over the past year. Assume that in company XYZ's base year, it reported net income of $10 million and retained earnings of $50 million. In the current year, company XYZ reported net income of $20 million and retained earnings of $52 million. Consequently, it has in increase of $20 million in its net income and $2 million in its retained earnings year over year. Therefore, company XYZ 's net income grew by 100%, while its retained earnings only grew by 4%.

Situation 2.

Analysts looked at fundamental indicators of the S&P 500 (Stock Index) for the week of July 4 to July 8, 2017. During this time period, the S&P rose to 2129.90 after the release of a positive jobs report in the United States. In fact, the market just missed a new record high, coming in just under the May 2016 high of 2132.80. The economic surprise of an additional 287,000 jobs for the month of June specifically increased the value of the stock market on July 8, 2017.

Situation 3.

Suppose XYZ Corporation has three assets: cash and cash equivalents worth $3 million, inventory worth $8 million and property worth $9 million. If this kind of analysis is used, the asset column looks like:

Cash and cash equivalents: 15%
Inventory: 40%
Property: 45%

Situation 4.

An investor wants to invest in company XYZ. He starts from getting to know a company's management, including their educational and professional backgrounds. One of the most important factors is their experience in the industry. More abstractly, do they have a record of hard work and prudent decision-making, or are they better at knowing – or being related to – the right people? Their reputations are also key: are they respected by their colleagues and peers? Their relationships with business partners are also worth exploring, since these can have a direct impact on operations.

Situation 5.

An investor wants to invest money. He begins his investigation from the specific to the general. He will look for companies that they believe will perform well over time, based on such determinants as the company's management team, low price to earnings (P/E) ratios and earnings growth potential. If the company seems to be a strong one, this investor believes that it will continue to perform well over time, regardless of how the overall market may be doing. He will pay little attention to market conditions or industry fundamentals, and rather focus on how one company in a sector is performing compared to another one, in order to choose the stock they believe is more likely to rise in price.

Situation 6.

An investor wants to invest money. Investor evaluates securities and attempt to forecast their future movement by analyzing statistics gathered from trading activity, such as price movement and volume. Investor focuses on charts of price movement and various analytical tools to evaluate a security's strength or weakness and forecast future price changes.

Situation 7.
An investor wants to invest in company XYZ. First of all, he starts from examining statistical data and evaluates figures such as sales revenue, profit margins or return on assets (ROA), discounted cash flow etc.

Situation 8.
Due to this kind of analysis, an investor begins investigation from the general to the specific. For example, if the price of a commodity such as oil goes up and the company he is considering investing in, uses large quantities of oil to make their product, the investor will consider how strong an affect the rise in oil prices will have on the company's profits, if any. So this approach starts out very broad, looking at the macro economy, then at the sector and then at the stocks themselves.

Situation 9.
An investor uses this type of analysis which is based on the balance sheet, income statement and cash flow statement. He evaluates various aspects of a company's operating and financial performance such as its efficiency, liquidity, profitability and solvency. The trend of the results over time is studied to check whether they are improving or not.

5. What ratios are used in investment analysis?

6. Work in groups and explain capital budgeting evaluation techniques and decision rules (Payback and discounted payback period, Net presented value, Profitability index, Internal rate of return, Accounting rate of return, Modified internal rate of return). **Remind as many advantages and disadvantages of each technique as possible:**

7. What is the difference between Payback Period and Discounted Payback Period?

8. When do we have the conflict of NPV and IRR?

9. Find the Payback Period for the project with the following cash flows.

0	1	2	3	4	5	6
$-1,400	$300	$0	$200	$200	$200	$600
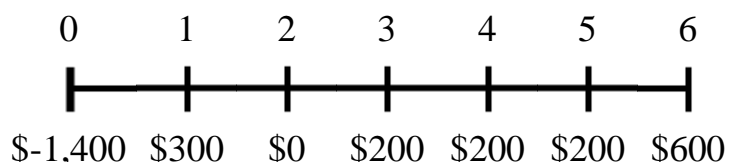
a) 4.76 years
b) 5.83 years
c) 6.64 years
d) 8.65 years

10. Find the NPV of the project with the following cash flows if the cost of capital is 3%.

```
   0    1    2    3    4    5    6
   ├────┼────┼────┼────┼────┼────┤
$-1,100 $100 $300 $300 $500 $200 $300
```
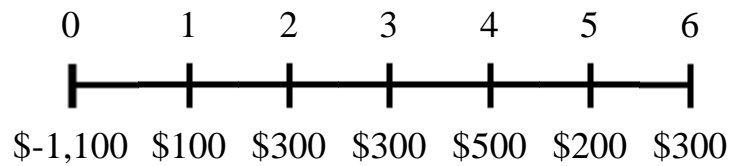
a) $419.67
b) $422.42
c) $431.19
d) $434.19

11. Find the IRR of the project with the following cash flows.

```
   0    1    2    3    4    5
   ├────┼────┼────┼────┼────┤
$-1,400 $100 $500 $500 $500 $300
```
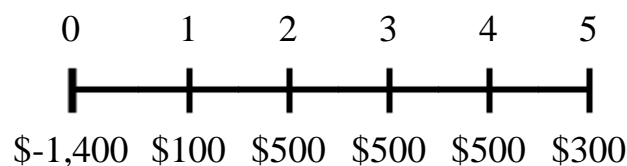
a) 10.19%
b) 13.11%
c) 14.67%
d) 18.85%

12. An initial investment of $130,000 is expected to generate annual cash inflow of $32,000 for 6 years. Depreciation is allowed on the straight line basis. It is estimated that the project will generate scrap value of $10,500 at end of the 6th year. Calculate its accounting rate of return assuming that there are no other expenses on the project.

13. Edelman Engineering is considering including two pieces of equipment, a truck and an overhead pulley system, in this year's capital budget. The projects are independent. The cash outlay for the truck is $17,100 and that for the pulley system is $22,430. The firm's cost of capital is 14%. After-tax cash flows, including depreciation, are as follows:

Year	Truck	Pulley
1	$5,100	$7,500
2	5,100	7,500
3	5,100	7,500
4	5,100	7,500
5	5,100	7,500

Calculate PP, DPP, NPV, PI, IRR, MIRR and NPV-profile for each project, and indicate the correct accept–reject decision for each.

14. Determine PP, DPP, NPV, PI, IRR and MIRR for investment project with the following cash flows (in thousands of US dollars). Construct NPV profile. Analyze the results.

Cost of Capital,%	12	Calculate	Result
Period	Cash Flow, $	PP	
0	-1,100	DPP	
1	800	NPV	
2	800	PI	
3	800	IRR	
4	800	MIRR	
5	600		
6	200		
7	900		
8	500		

15. Solve a Crossword Puzzle
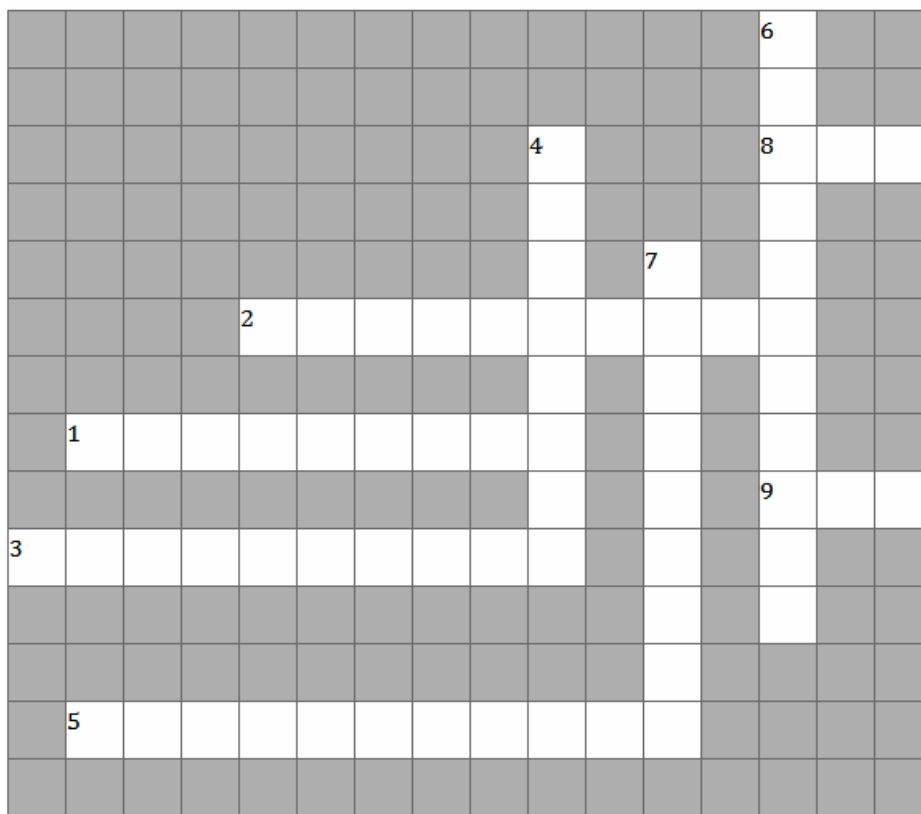
Across:

1. … planning identifies the main directions and priorities of company's investment policy in accordance with its corporate goal.

2. … analysis forms the methodological base of investment management and its results are very important for decision making .

3. The analysis that typically shows the changes from the base period in money units (dollar, grivnya etc.) and percentage (growth rate), is called…

5. The analysis that used for evaluation of a security (stock, bond) by measuring its intrinsic value on the base of exploring related economic, financial and other qualitative and quantitative factors is called…

8. The … is used in investment appraisal for quick estimation of what return the investment will generate in terms of net income over its lifespan.

9. The … technique is widely used in investment decision making as it helps to evaluate the rate of return the project is likely to generate.

Down:

4. The analysis that is based on relative terms which are calculated as a proportion of the total account is called…

6. The securities analysis that uses subjective judgment based on qualitative factors and unquantifiable information, such as management expertise, industry cycles, reputations, brand strength, labor relations etc. is called…

7. The analysis, which believes that past trading activity and market price changes of a security are better indicators of its future price movements than the intrinsic value of the security, is called…

TOPIC 3. INVESTMENT ENVIRONMENT AND INVESTMENT MANAGEMENT PROCESS

Main questions

3.1 Key elements and factors affecting investment environment
3.2 Financial markets as important component of investment environment
3.3 Investment climate in Ukraine and investment decision making

Primary studying goal of the seminar

1. To analyze the key factors effecting investment environment and decision making basing on real examples.
2. To characterise finance markets as important component of investment environment and find out the link between investor's motives and decision making.
3. To evaluate the Ukrainian investment climate and discuss the major obstacles for foreign direct investment.

Recommended literature

1. Analytical Review of the Asset Management Market in Ukraine Q4 2015 and the Full Year 2015 Results [Electronic resource]. – Kyiv : Ukrainian Association Of Investment Business, 2016. – 25 p. – Available at: http://www.uaib.com.ua/files/articles/2385/80/En_Q4_2015___Full_2015_final.PDF
2. Best-practice guide for a positive business and investment climate / [co-ordinator Bernard Snoy] [Electronic resource]. - Vienna : OSCE, 2006. - 157 p. – Available at: http://www.osce.org/eea/19768?download=true
3. Corruption and lack of trust in the judiciary in Ukraine are the largest obstacles for foreign investors [Electronic resource] / Dragon Capital and the European Business Association survey results. – Available at: http://www.dragon-capital.com/en/about/media/press_releases/corruption_and_lack_of_trust_in_the_judiciary_in_ukraine_are_the_largest_obstacles_for_foreign_investors.html
4. Kristina Levišauskaite. Investment Analysis and Portfolio Management [Electronic resource]. – Lithuania: Vytautas Magnus University Kaunas, 2010. – 166 p. – Available at: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf
5. SELLING BRAND UKRAINE: Kyiv needs a consistent investment message in 2017 [Electronic resource]. – Available at: http://bunews.com.ua/investment/item/selling-brand-ukraine-kyiv-needs-to-focus-on-consistent-investment-message-in-2017
6. The Ukrainian Banking Sector Looks Set to Regenerate New Growth [Electronic resource]. Available at: http://emerging-europe.com/sectors/financial/ukrainian-banking-sector-looks-set-to-regenerate-new-growth/

7. UKRAINE: KEY FACTS [Electronic resource]. – Available at: http://new.mtu.gov.ua/inv

8. Колесников А.О. Биржевые индексы: специфические особенности и направления использования [Electronic resource]. – Available at: http://dspace.nbuv.gov.ua/bitstream/handle/123456789/93192/64-Kolesnikov.pdf?sequence=1

9. Ткаленко Н.В., Ремньова Л.М., Маргасова В.Г., Виговська В.В., Ніколаєнко Ю.В. Інвестиційний менеджмент : навчальний посібник. Видання друге, доповнене і перероблене. – К.: Кондор-Видавництво , 2016. - 232 с.

Visual materials

1. ALBATROS. Grow Ukraine. Reasons to invest to Ukraine
https://www.youtube.com/watch?v=-uSBQpOX8gQ
2. Bond market
http://www.investopedia.com/terms/b/bondmarket.asp
3. Capital markets
http://www.investopedia.com/terms/c/capitalmarkets.asp
4. Financial Market
http://www.investopedia.com/terms/f/financial-market.asp
5. Foreign Direct Investment (FDI)
http://www.investopedia.com/terms/f/fdi.asp
6. Foreign exchange market
http://www.investopedia.com/terms/forex/f/foreign-exchange-markets.asp
7. Insurance
http://www.investopedia.com/terms/i/insurance.asp
8. Money market
http://www.investopedia.com/terms/m/moneymarket.asp
9. Primary market
http://www.investopedia.com/terms/p/primarymarket.asp
10. Secondary market
http://www.investopedia.com/terms/s/secondarymarket.asp
11. Stock market
http://www.investopedia.com/terms/s/stockmarket.asp
12. Ukraine: Destination for the world's hottest business startups?
https://www.youtube.com/watch?v=_mqqBX3zP8M
13. 'Ukraine Is A Good Place To Invest', Richard Branson
https://www.youtube.com/watch?v=Wr_K-gA2rOE
14. Ukraine. Open for U.
https://www.youtube.com/watch?v=jdSQuanI8Z8
15. What is Sustainable Economic Growth? - Definition & Overview
http://study.com/academy/lesson/what-is-sustainable-economic-growth-definition-lesson-quiz.html

Main Tasks

1. Match the name of the market with its determination.

1. Financial market	**A.** A financial market where its participants sell/buy debt securities
2. Primary market	**B.** A place for selling/buying financial instruments which help investors to control a financial risk
3. Secondary market	**C.** A place where insurers give insured a financial protection or reimbursement against losses
4. Money market	**D.** A global decentralized market in which participants are able to buy, sell, exchange and speculate on currencies
5. Capital market	**E.** A place where sellers and buyers exchange financial securities and consumer goods at prices determined by the relation between demand and supply
6. Stock market	**F.** A marketplace where you can buy highly liquid financial instruments with maturity less than 1 year
7. Bond market	**G.** A location where investors can buy previously issued securities from other investors
8. Derivatives market	**H.** A market which helps to attract long-term financing (over 1 year)
9. Foreign exchange market	**I.** A market we you can buy and (or) sell stocks which are the shares in company's ownership
10. Insurance market	**J.** A market where you can sale or purchase newly issued securities (stocks, bonds, futures, options, swaps)

Answers:

1.	**3.**	**5.**	**7.**	**9.**
2.	**4.**	**6.**	**8.**	**10.**

2. Work in 3 groups.

You plan to invest $100 thousand as FDI in attractive business that will guarantee you high return on invested money. Give 3 positive and 3 negative examples of investment environment influence on your decision making concerning investing money in:

1) Ukrainian IT industry;

2) Ukrainian IT industry comparatively to Indian IT industry;

3) Ukrainian IT industry comparatively to Ukrainian agribusiness.

Fill in the table and then present your results for further discussion.

Think how to use different analysis models for a deep investigation of the investment environment.

Name of the factor	Factor group	Positive impact	Negative impact

3. How do stock indexes characterize an investment environment? What main conclusions can you do basing on the illustrated trend of the Ukraine stock market index PFTS in 2016?

4. Why is it important to take into account a behavior factor for a market evaluation? Explain what is the difference between economic cycle and cycle of market emotions? What would you recommend to use behavioral aspects for more efficient investment decision making?
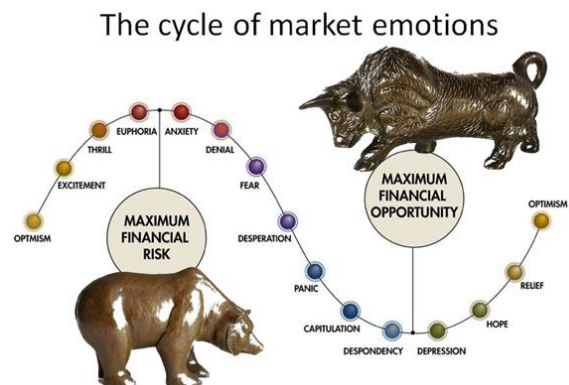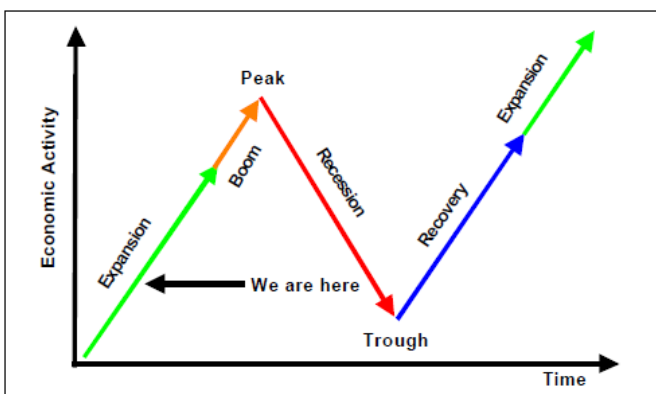
5. Answer the questions:
– Are the positive reasons to invest in Ukraine stronger than the negative ones?
– How to increase the flow of FDI to Ukraine? How to stop FDI outflow?

6. Work in groups.
Range the major obstacles for foreign direct investment in Ukraine and explain your choice. Think to what factor group do that obstacles belong. What factors should you include in the list if you provide your own survey of TOP-10 major obstacles?

The name of obstacle	Factor group	Ranking
Cumbersome legislation		
Restrictive capital		
Complicated tax administration		
Widespread corruption		
Unpredictable currency and unstable financial system		
Weak prospects for economic recovery		
Lack of trust in judiciary		
Military conflict with Russia		
Low consumer purchasing power		
High tax rates		

7. Ukraine starts 2017 with a number of **positive indicators** which show that the economy of the country begins to grow.

The loss of access to Russian markets and the continuing war in the Western Ukraine stimulate our country to search **for new international partners**.

Since 2014 the Ukrainian government has staged a number of **two-sided business forums to promote Ukrainian investment on the global stage**, while the private sector has also aimed to meet growing international interest to invest in Ukraine because foreigners consider Ukraine as Europe's last great emerging market. But foreign direct investments **are not enough.**

What urgent actions should be done to improve an investment climate in our country and create more positive investment brand for further attraction of FDI?

8. One of the international experts Myron B. Rabij says that stability of the government, the tax system and tax load, low profitability, and, of course, corruption **are the key problems** concerning the Ukraine market entry for potential investors. At the same time, experienced investors understand that corruption cannot be completely removed in developing markets. It exists in all markets.

What should be done in Ukraine to ensure investors that their business has a chance to develop when it faces with corruption?

9. According to expert's opinion, Ukraine needs to keep working on lowering the tax load, and reducing and simplifying the bureaucracy. There have been considerable achievements but the process must go further.

Creating incentives for IT innovation, privatizing land, debating internal court reform, and further relaxation of currency regulations are the areas of the reform process that offer **the greatest potential for short-term improvements** in the Ukrainian investment climate.

Do you agree or disagree with recommended short-term improvements? Why?

TOPIC 4. INVESTMENT DECISION MAKING IN CAPITAL INVESTMENT PROJECTS

Main questions

4.1 Different types of capital investment projects and decision making
4.2 Capital rationing management approaches
4.3 Evaluating NPV on the base of FCFF and FCFE
4.4 Risk adjusting investment strategies
4.4.1 Decision tree analysis
4.4.2 Sensitivity of NPV and scenario analysis
4.4.3 Evaluating of real options

Primary studying goal of the seminar

1. To learn various kinds of capital investment projects and decision making
2. To learn modified techniques of NPV evaluation
3. To study risk adjusting investment strategies

Recommended literature

1. Bailes J., Nielsen J. Using decision trees to manage capital capital budgeting risk [Electronic resource]. – Available at:
https://www.imanet.org//media/44f3f6d2794e4beb97f1a8a06d085d79.ashx
2. Chapter 7. Asset Investment Decisions and Capital Rationing [Electronic resource]. – Available at: https://hkiaatevening.yolasite.com
3. Chapter 9. Project Analysis. Chapter Outline [Electronic resource]. – Available at: www.yorku.ca/yildirim/ADMS3530/chapter9.ppt
4. Difference between NPV, Decision Trees, and real options [Electronic resource]. – Available at: http://www.actuarialbookstore.com/samples/Actex%208FET-ACT-11FFC-P%20sample%205-6-11.pdf
5. Kheirollahi H. and Tofigh F. Sensitivity and risk analysis of the economic evaluation of investment projects case study: development plan in Sufian Cement Plant. – International Journal, 2015. – Vol. 5 (S3), PP. 344-355. [Electronic resource]. – Available at www.cibtech.org/sp.ed/jls/2015/03/jls.htm
6. Mirela Iloiu, Diana Csiminga. Project risk evaluation methods – sensitivity analysis. – Annals of the University of Petroşani, Economics, 2009. – Vol. 9(2), PP. 33-38. [Electronic resource]. – Available at: http://upet.ro/annals/economics/pdf/2009/20090205.pdf
7. Pike Richard. Corporate finance and investment: decisions & strategies/Richard Pike and Bill Neale. — 6th ed., 2009 – 826 p. [Electronic resource]. – Available at:

http://197.14.51.10:81/pmb/GESTION2/FINANCE/Corporate%20Finance%20-%20Investisement.pdf

8. Van Horne, James C. Fundamentals of financial management / James C. Van Horne, John M. Wachowicz. – 13th ed, 2008, – 719 p. [Electronic resource]. – Available at: https://yamanfc.files.wordpress.com/2015/01/fundamentals-of-financial management.pdf

9. Ткаленко Н.В., Ремньова Л.М., Маргасова В.Г., Виговська В.В., Ніколаєнко Ю.В. Інвестиційний менеджмент : навчальний посібник. Видання друге, доповнене і перероблене. – К.: Кондор-Видавництво , 2016. - 232 с.

Visual materials

1. Book Value
http://www.investopedia.com/terms/b/bookvalue.asp
2. Capital rationing
 https://www.youtube.com/watch?v=76EouyVkqTI
3. Capital rationing multi period
 https://www.youtube.com/watch?v=m2XV9mlu9Ac
4. Capital rationing single period
https://www.youtube.com/watch?v=LxBC0DQx7YI
5. Cash Flow
http://www.investopedia.com/terms/c/cashflow.asp
6. Discount Rate
http://www.investopedia.com/terms/d/discountrate.asp
7. Earnings Before Interest & Tax – EBIT
http://www.investopedia.com/terms/e/ebit.asp
8. EBITDA
http://www.investopedia.com/video/play/earnings-before-interest-taxes-depreciation-and-amortization-ebitda/
9. Fixed Asset
http://www.investopedia.com/terms/f/fixedasset.asp
10. Fixed Cost
http://www.investopedia.com/terms/f/fixedcost.asp
11. Free Cash Flow For The Firm – FCFF
http://www.investopedia.com/terms/f/freecashflowfirm.asp
12. Incremental Cash Flow
http://www.investopedia.com/terms/i/incrementalcashflow.asp
13. Mutually Exclusive
http://www.investopedia.com/terms/m/mutuallyexclusive.asp
14. Net Income – NI
http://www.investopedia.com/terms/n/netincome.asp
15. Operating Cash Flow – OCF
http://www.investopedia.com/terms/o/operatingcashflow.asp
16. Rational Choice Theory
http://www.investopedia.com/terms/r/rational-choice-theory.asp

17. Sensitivity Analysis
http://www.investopedia.com/terms/s/sensitivityanalysis.asp
18. Variable Cost
http://www.investopedia.com/terms/v/variablecost.asp
19. Working Capital
http://www.investopedia.com/terms/w/workingcapital.asp

Main Tasks

1. Match the name of the term with its definition.

1. Single period capital rationing	**A.** Limitation of funds that can be used for investment, for a certain period
2. Indivisible project	**B.** An interconnected decision when one project is accepted if only another one is accepted as well
3. Decision tree analysis	**C.** A method of making decisions based on constructing diagrams illustrating alternative solutions and their consequences
4. Capital rationing	**D.** A project which can be accepted for realization both as a whole project, and its separate part
5. Expansion project	**E.** A project which provides development of already existing business
6. Upgrade project	**F.** A project that can be approved for realization only as a whole project
7. Divisible project	**G.** Setting a limit of money that can be used for investment during several periods
8. Multi-period capital rationing	**H.** A decision about change of old fixed assets by new ones, based on an analysis of cash flows from both an old and a new object)
9. Contingent decision	**I.** Setting a limit of money that can be used for investment during one period
10. Replacement decision	**J.** A project providing modernization of business assets

Answers:

1.	**3.**	**5.**	**7.**	**9.**
2.	**4.**	**6.**	**8.**	**10.**

2. Solve the problem "Expansion project evaluation on the base of total costs"

An enterprise is planning to buy a piece of equipment. On the base of cost data given in the table select the best piece of equipment if a normal rate of return per year is 16%.

	Alternative pieces of equipment		
	Project A	**Project B**	**Project C**
Initial investment, $	25,000	30,000	35,000
Annual cost, $	6,500	5,200	5,700
Life cycle (years)	8	8	8
Salvage value, $	500	600	750

3. Solve the problem "Replacement project evaluation on the base of total costs"

An enterprise is looking for the replacement of an old piece of equipment which needs an additional capital cost for renewal with a new more productive piece of equipment. On the base of cost data given in the table select what is better: to invest in an old piece of equipment renewal or to purchase a modern piece of equipment if a normal rate of return per year is 16%.

	An old piece of equipment	A new piece of equipment
Initial investment, $	–	25,000
Salvage value (Year 0)	500	
Annual cost, $	6,500	5,200
Capital cost for renewal (Year 0)	1,500	–
Salvage value (Year 0)	0	1,000
Life cycle (years)	8	8

4. Solve the problem "Capital rationing if projects are divisible or indivisible"

Suppose that company is working out capital rationing investment strategy having fund limit of $75,000. The information about available projects A, B, C and D is given in table. Determine the optimal project mix within available capital budget assuming that projects are:
1) divisible;
2) indivisible.

Project	Investment required, $	PV of cash inflows, $	NPV, $	PI	PI ranking
A	22,700	25,900			
B	14,350	17,300			
C	17,800	22,600			
D	30,500	35,450			

5. Solve the problem "Building of investment decision tree"

The company is choosing between two investment proposals:
1) expansion project that needs UAH 35 mln for building new productive facilities and provides total earnings of UAH 52 mln over its project life In case of

strong demand on company's products (probability is 35%) and UAH 27 mln In case of weak demand (probability is 65%);

2) upgrade project that needs UAH 12 mln in modernization of existing productive facilities and provides total earnings of UAH 20 mln over its project life in case of strong demand on company's products (probability is 35%) and UAH 15 mln in case of weak demand (probability is 65%).

Build investment decision tree and determine the best alternative for investing money.

6. Solve the problem "Sensitivity analysis" (in case of changingt one variable at a time)

Using the information in the table calculate NPV in base case and determine how sensitive is it to the changes of sales by (+20%) in optimistic conditions and (-10%) in pessimistic situations. Cost of capital is 10%, tax rate is 18%. Variable costs are constant 70% of sales. All numbers in thousands of UAH.

	Base case
Investment	- 10,500
Sales	30,700 *(variable factor)*
Variable cost *(dependent from sales)*	
Fixed cost	-3,500
Depreciation	- 1,000
EBIT	
Tax (18%)	
Net income	
Annual operating cash flow (Year 1-10)	

7. Solve the problem "Scenario analysis"

Using the information about base case in a Table analyze project risk in the scenario of increased market competition from Year 5 that will reduce sales to UAH 28,500 thous. and simultaneously increase variable cost to 75% because of labour demand and fixed cost to UAH 3,675 thous. At the same time, the cost of capital will be reduced from 10% at the beginning to 8% in the Year 5.

	Base case	Scenario of increased market competition	
		Year 1-4	Year 5-10
Investment (Year 0)	-10,500		
Sales	30,700		
Variable cost *(dependent from sales)*	-21,490		
Fixed cost	-3,500		
Depreciation	-1,000		
EBIT			
Tax (18%)			
Net income			
Annual operating cash flow (Year 1-10)			
Discount rate	**10%**		

8. Solve the problem "Calculation of NPV on the base of FCFF and FCFE"

The company is planning to invest UAH 2,600 thous. in the development of new product (UAH 400 thous. in working capital and UAH 2,200 thous. in fixed assets that will be totally amortized at the end of Year 4 without salvage value). It is planned to finance fixed assets through increasing equity with the capital cost 17% and take a bank loan for financing working capital with the capital cost 22%. Annual project EBITDA is estimated as 680 thousand UA.

1) Determine NPV using free cash flows to firm (FCFF) and make decision concerning project feasibility.

2) Determine NPV on the base of free cash flows to equity (FCFE) and make decision concerning project feasibility.

9. Solve the problem "Sensitivity indicator and switching value"

Using the results of the sensitivity analysis given in the table determine:
1) sensitivity indicator towards NPV;
2) sensitivity indicator towards IRR;
3) switching value towards NPV;
4) switching value towards IRR.

	Basic case	Scenario 1
Key variable factor – Price, $	1,300	1,105 (15% change)
NPV, $	37,900	14,300
IRR,%	15.2	13.6
d,%	10	10

10. Solve the problem "*Real options valuation*"

The initial investment in a new product is UAH 70,000 thous. and the capital cost is 18%. The demand on new product is uncertain. The investment timing option assumes *one year project delay* (wait one year and see) before the situation about market demand on new product becomes clear. Risk-free rate is 15%. Taking into

consideration the information about the size and probability of project cash flows in the situation of high, average and low demand on a new product analyze project risk using:

1) traditional NPV analysis and

2) real options analysis.

By comparing achieved results determine the real option value. All numbers are in thousands of UAH.

Demand	Probability	Annual cash flow (Year 1-4)
High	0.2	45,000
Average	0.4	30,000
Low	0.4	15,000

TOPIC 5. PORTFOLIO THEORY AND INVESTMENT DECISION MAKING IN FINANCIAL ASSETS

Main questions

5.1 Types of investment portfolios
5.2 Risk and return evaluation in the Modern Portfolio Theory (MPT)
5.3 Portfolio Beta coefficient and CAPM model
5.4 Basic strategies of asset allocation and portfolio diversification

Primary studying goal of the seminar

1. To distinguish investment portfolio types on the base of their key features, goals and principles.
2. To analyze investment portfolio risk and return using different evaluating techniques.
3. To study basic asset allocation strategies and portfolio diversification principles.

Recommended literature

1. Brigham, E., Ehrhardt, M. *Financial Management: Theory and Practice* (13th Edition). - United States: South-Western Cengage Learning, 2011. - 1184 p.
2. Gareth D. Myles, Investment Analysis, 2003. [Electronic resource]. – Available at: http://people.exeter.ac.uk/gdmyles/Teaching/IAPM/finb1.pdf
3. Levišauskaite, K. Investment Analysis and Portfolio Management. – Lithuania: Vytautas Magnus University Kaunas, 2010. – 166 p. [Electronic resource]. – Available at: http://www.bcci.bg/projects/latvia/pdf/8_IAPM_final.pdf
4. Iyiola, O., Munirat, Yu., Nwufo, C. The modern portfolio theory as an investment decision tool. Journal of Accounting and Taxation, 2012, Vol. 4(2), pp. 19-28. [Electronic resource]. – Available at: http://www.academicjournals.org/JAT
5. Ryan Barnes, How To Create A Modern Fixed-Income Portfolio [Electronic resource]. – Available at:
http://www.investopedia.com/articles/bonds/07/fiportfolio.asp#ixzz4e3fW5Q1B
6. Van Horne, James C.Fundamentals of financial management / James C. Van Horne, John M. Wachowicz. – 13th ed, 2008, 719 p. [Electronic resource]. – Available at: https://yamanfc.files.wordpress.com/2015/01/fundamentals-of-financial management.pdf
7. Лимитовский М.А., Лобанова Е.Н., Паламарчук В.П. Финансовый менеджмент как сфера прикладного использования корпоративних финансов. В 2-х частях. Часть I. Прикладные корпоративные финансы /Лимитовский М.А., Паламарчук В.П.- М.: ВШФМ РАНХиГС при Президенте РФ, 2011. – 392 с.
8. Лимитовский М.А., Лобанова Е.Н., Паламарчук В.П. Финансовый

менеджмент как сфера прикладного использования корпоративних финансов. В 2-х частях. Часть II. Корпоративный финансовый менеджмент / Лобанова Е.Н.- М.: ВШФМ РАНХиГС при Президенте РФ, 2011. – 734 с.

9. Ткаленко Н.В., Ремньова Л.М., Маргасова В.Г., Виговська В.В., Ніколаєнко Ю.В. Інвестиційний менеджмент : навчальний посібник. Видання друге, доповнене і перероблене. – К.: Кондор-Видавництво, 2016. - 232 с.

Visual materials

1. 6 Asset Allocation Strategies That Work
http://www.investopedia.com/articles/04/031704.asp
2. Aggressive Investment Strategy
http://www.investopedia.com/terms/a/aggressiveinvestmentstrategy.asp
3. Coefficient Of Variation - CV
http://www.investopedia.com/terms/c/coefficientofvariation.asp
4. Correlation Coefficient
http://www.investopedia.com/terms/c/correlationcoefficient.asp
5. Covariance
http://www.investopedia.com/terms/c/covariance.asp
6. Diversification
http://www.investopedia.com/terms/d/diversification.asp
7. Efficient Frontier
http://www.investopedia.com/terms/e/efficientfrontier.asp
8. Market Risk Premium
http://www.investopedia.com/terms/m/marketriskpremium.asp
9. Security Market Line - SML
http://www.investopedia.com/terms/s/sml.asp
10. Sharpe Ratio
http://www.investopedia.com/terms/s/sharperatio.asp
11. Standard Deviation
http://www.investopedia.com/terms/s/standarddeviation.asp
12. Treynor Ratio
http://www.investopedia.com/terms/t/treynorratio.asp
13. What is Asset Allocation? | Define Asset Allocation
https://www.youtube.com/watch?v=a99o10W5VYY

Main Tasks

1. Connect the classification feature with the types of portfolios

Classification feature	Types of portfolios

Classification feature

A.
By investment strategy
and risk tolerance level

B.
By matching
investment goals

C.
By level of
risk concentration

D.
By investment goals

Types of portfolios

1. Balanced portfolio

2. Conservative portfolio

3. Growth portfolio

4. Concentrated portfolio

5. Income portfolio

6. Defensive portfolio

7. Unbalanced portfolio

8. Widely diversified portfolio

9. Moderate portfolio

10. Hybryd portfolio

11. Aggressive portfolio

12. Speculative portfolio

Answers:
A.
B.
C.
D.

2. Write down the main features of each type of investment portfolio

Type of investment portfolio	Main features
Balanced portfolio	
Unbalanced portfolio	
Concentrated portfolio	
Widely diversified portfolio	
Aggressive portfolio	
Moderate portfolio	
Conservative portfolio	
Growth portfolio	
Income portfolio	
Defensive portfolio	
Speculative portfolio	
Hybryd portfolio	

3. Match a formula with its name.

1. Beta coefficient	**A.** $r_s = \sum_{i=1}^{n} r_i \cdot p_i$
2. Expected return rates	**B.** $\sigma = \sqrt{\sum_{i=1}^{n} (r_i - r_s)^2 \cdot p_i}$
3. Covariance	**C.** $CV_n = \dfrac{\sigma_n}{r_s}$
4. Standard deviation (risk)	**D.** $COV(r_A, r_B) = \dfrac{\sum_{i=1}^{n}(r_{Ai} - r_{As}) \cdot (r_{Bi} - r_{Bs})}{n-1}$
5. Coefficient of variance	**E.** $\beta p = \sum w_i \times \beta i$

Answers:

1.   **2.**   **3.**   **4.**   **5.**

4. Solve the problem "Portfolio expected return and risk"

Suppose that the investment portfolio consists of stocks A and B in equal parts ($w_A = 0.5$; $w_B = 0.5$). Using data given in the table about stocks' return in different economical situations determine:

1) expected returns of individual stocks and portfolio;

2) variation and standard deviation of returns of individual stocks and portfolio.

Make conclusion how diversification of investment between two assets influence on portfolio risk.

State of economy	Probability	Rate of return,%	
		Stock A	Stock B
Boom	0.25	40	30
Normal	0.40	26	15
Recession	0.35	- 2	8

5. Solve the problem "Covariance Matrix for portfolio of two assets"

Using the initial data of Task 1 and its results for portfolio consisting of stocks A and B (w_A= 0.5; w_B = 0.5) calculate the covariance between stocks and correlation coefficient. Determine variance and standard devation of portfolio and analyse its sensitivity to correlation coefficient changes from 1 to (-1).

State of economy	Probability	Rate of return,%	
		Stock A	Stock B
Boom	0.25	40	30
Normal	0.40	26	15
Recession	0.35	- 2	8

6. Solve the problem "Portfolio Beta"

Suppose that the investment portfolio consists of stocks A, B, C and D. Using data given in the table about stocks Beta calculate Beta coefficient for the whole portfolio.

Security	Beta coefficient, β_i	Weigh in the portfolio, w_i	w_i x β_i
A	1.50	0.25	
B	0.75	0.15	
C	1.05	0.23	
D	0.36	0.37	
Total portfolio	x	1.0 (100%)	

7. Solve the problem "Security market line (SML)"

Suppose that the market risk premium 12%. The risk free return rate is 10%. Draw the SML. Show how the SML will change in the situation of decreasing market risk premium to 8%.

8. Solve the problem "Alpha, Treynor and Sharpe ratios"

Using historical data of return rates of securities A,B,C and D during last 6 years and different variants of asset allocation within portfolio given in tables below calculate the following statistics and make investment decision concerning portfolio optimal structure:
1) expected portfolio return rate;
2) portfolio deviation;
3) portfolio Beta;

4) coefficient of variance;
5) Jensen's Alpha;
6) Treynor ratio;
7) Sharpe ratio.

For calculations assume that average deviation from planned return rate at the market is 16%, risk free return is 19%, market return is 29%.

Year	Return rate of securities,%			
	A	B	C	D
2012	16	35	12	40
2013	20	40	30	16
2014	22	45	30	20
2015	15	15	30	8
2016	17	15	5	4
2017	15	20	10	1

Variant	Share of security in the portfolio,%			
	A	B	C	D
1	20	35	30	25
2	15	25	25	10
3	35	20	20	25
4	30	20	25	30

CASE STUDY
(made in a group of 3-5 students)

You are working in the investment management team of the large transnational company which is going to invest big capital in Ukraine. The possibilities of both real and financial investment are considered. You have to find the best industry for investing money and to choose the more efficient of two alternative investment projects. Besides you have to select three different stocks of Ukrainian companies that are traded on the PFTS Stock Exchange, include them into the portfolio and analyze the effectiveness of its possible variants to choose the best one. While developing your company's investment program you are free to imagine any data you need for calculations.

For making investment decisions use the following algorithm:

1. Analyze in Table 1 the key factors influencing investment environment in chosen industries and spheres of activity

2. Calculate Net Income (NI) and Free Cash Flows to Firm (FCFF) for projects A and B using Table 2. Determine on the base of FCFF: 1) NPV (A) and NPV (B); IRR (A) and IRR (B). Make decision concerning projects' profitability.

3. Work out debt repayments schedule of projects A and B using Table 3. Calculate Net Income (NI) and Free Cash Flows to Equity (FCFE) of projects A and B using Table 4. Determine on the base of FCFE: 1) NPV(A) and NPV(B); IRR(A) and IRR(B). Make decision concerning projects' profitability.

4. Using the results of Table 5 build NPV-profiles of projects A and B. Make up a summary of NPV-profiles of projects A and B in Table 6.

5. Analyze sensitivity of project A on the base of FCFF using Table 7 (you can change any variable (one or more) you consider the most significant for the project. Explain your choice of changing variables in the model taking into account conditions of doing business in Ukraine. Calculate for the base case, optimistic and pessimistic conditions: 1) NPV(A) and IRR(A). Make decision concerning their sensitivity by means of: a) Sensitivity indicator towards NPV; 2) Sensitivity indicator towards IRR; 3) Switching value towards NPV; 4) Switching value towards IRR.

6. Analyze sensitivity of project B on the base of FCFF using Table 8 (you can change any variable (one or more) you consider the most significant for the project. Explain your choice of changing variables in the model taking into account conditions of doing business in Ukraine. Calculate for the base case, optimistic and pessimistic conditions: 1) NPV(B) and IRR(B). Make decision concerning their sensitivity by means of: a) Sensitivity indicator towards NPV; 2) Sensitivity indicator towards IRR; 3) Switching value towards NPV; 4) Switching value towards IRR.

7. Present the summary of sensitivity analysis of project A and B in Table 9 and make conclusions about project risk.

8. Analyze the probability of high, low and average demand and the outcomes of different project scenarios with the help of decision tree technique. Make investment decisions concerning alternative projects A and B basing on the achieved results.

9. Find out how the one year delay option will influence projects' estimated NPV with the help of Table 10. Compare the achieved results with the previous results without using an option in the decision tree and make conclusions concerning option's influence on ENPV.

10. Using historical month data of PFTS Stock Exchange during last two years choose 3 stocks of Ukrainian companies with best results to include them in the portfolio. Determine their return rates basing on the results of their trading prices' changes during last two years in Table 11. Make up your propositions concerning portfolio alternative structure in Table 12. For each of stocks analyze return and risk in Table 13. In Table 14 analyze portfolio risk, return and effectiveness and make investment decision concerning portfolio optimal structure. For that purpose calculate the following statistics: 1) expected portfolio return rate: 2) portfolio deviation; 3) portfolio Beta; 4) coefficient of variance; 5) Jensen's Alpha; 6) Treynor ratio; 7) Sharpe ratio. For calculations your own data of average deviation from planned return rate at the market and risk free return. Market return take from the Table 11 (on the base of average changes of PFTS index).

Besides, you are to free choose any additional statistics, survey's results, and your own research and observations. Formalize the results of your propositions concerning company's investment program in Tables 1-14 and make conclusions. For making correct investment decisions use the existing decision rules. Use the sample of case title (Annex A).

To present your investment program before the Board of Directors prepare a brief presentation (no more than 12 slides). Use the sample of presentation title (Annex B). Non-traditional ideas and original approaches both to case study solution and preparation of presentation are welcome.

Chernihiv National University of Technology

Faculty of Finance and Economics

Department of Finance, Banking and Insurance

Case Study

in Investment Management

Prepared by master student …………………………………..

Group …………..

Chernihiv, 2017

Table 1

The key factors influencing investment environment in chosen industries and spheres of activity

Key factors	Group of factors	Positive influence	Negative influence

Table 2

Calculation of Net Income (NI) and Free Cash Flows to Firm (FCFF) for projects A and B, in thousands of UAH

	Project A				Project B			
	Year 1	Year 2	……	Year n	Year 1	Year 2	……	Year n
Investment								
Sales								
Variable cost *(dependent from sales)*								
Fixed cost								
EBITDA (Earning before interest, taxis and depreciation)								
Depreciation								
EBIT (Earning before interest and taxis)								
Interest								
EBT (Earning before taxis)								
Taxis (18%)								
NI (Net income)								
Depreciation								
Change in working capital								
Salvage value								
Debt repayments								
FCFF (Free cash flow to firm)								

Table 3

Calculation of debt repayments schedule for projects A and B, in thousands of UAH

Period	Project A						Project B				
	Beginning balance	Interest (…%)	Debt repayment	Total annual payment (3 + 4)	Ending balance (2-4)	Beginning balance	Interest (…%)	Debt repayment	Total annual payment (8+ 10	Ending balance (7-9)
1	2	3	4	5	6	7	8	9	10	11
Year 1										
Year 2										
Year 3										
Year 4										
Total										

Table 4

Calculation of Net Income (NI) and Free Cash Flows to Equity (FCFE) of projects A and B, in thousands of UAH

	Project A				Project B			
	Year 1	Year 2	……	Year n	Year 1	Year 2	……	Year n
Investment								
Sales								
Variable cost (dependent from sales)								
Fixed cost								
EBITDA (Earning before interest, taxis and depreciation)								
Depreciation								
EBIT (Earning before interest and taxis)								
Interest								
EBT (Earning before taxis)								
Taxis (18%)								
NI (Net income)								
Depreciation								
Change in working capital								
Salvage value								
Debt repayments								
FCFE (Free cash flow to equity)								

Table 5

NPV sensitivity to capital cost changes

Cost of capital (R)	NPV in thousands of UAH		NPV investment decision
	Project A	Project B	
0%			
5%			
10%			
15%			
20%			
…			

Table 6

A summary of NPV profiles for projects A and B

Range of discount rates	Significance of upper bound	NPV vs. IRR investment decision	Ranking of projects

Table 7
Calculation of Free Cash Flows to Firm (FCFF) of project A for the base case, optimistic and pessimistic conditions, in thousands of UAH

	Project A								
	Base case			*Optimistic conditions*			*Pessimistic conditions*		
	Year 1	……	**Year n**	**Year 1**	……	**Year n**	**Year 1**	……	**Year n**
Investment									
Sales									
Variable cost *(dependent from sales)*									
Fixed cost									
EBITDA (Earning before interest, taxis and depreciation)									
Depreciation									
EBIT (Earning before interest and taxis)									
Interest									
EBT (Earning before taxis)									
Taxis (18%)									
NI (Net income)									
Depreciation									
Change in working capital									
Salvage value									
Debt repayments									
FCFF (Free cash flow to firm)									

Table 8
Calculation of Free Cash Flows to Firm (FCFF) of project B for the base case, optimistic and pessimistic conditions, in thousands of UAH

	Project B								
	Base case			*Optimistic conditions*			*Pessimistic conditions*		
	Year 1	……	**Year n**	**Year 1**	……	**Year n**	**Year 1**	……	**Year n**
Investment									
Sales									
Variable cost *(dependent from sales)*									
Fixed cost									
EBITDA (Earning before interest, taxis and depreciation)									
Depreciation									
EBIT (Earning before interest and taxis)									
Interest									
EBT (Earning before taxis)									
Taxis (18%)									
NI (Net income)									
Depreciation									
Change in working capital									
Salvage value									
Debt repayments									
FCFF (Free cash flow to firm)									

Table 9

The summary of sensitivity analysis' results of projects A and B

	Change in%	*NPV*	*IRR*	*SI(NPV)*	*SI(IRR)*	*SV(NPV)*	*SV(IRR)*
Project A							
Base case							
Cases when variable changes (determine what variable is changed)							
....							
Project B							
Base case							
Cases when variable changes (determine what variable is changed)							
....							

Table 10

Time shift in cash flows In case of one year project delay

Demand	*Project A*						*Project B*					
	Probability	*Year 0*	*Year 1*	*Year 2*	*......*	*Year n*	*Probability*	*Year 0*	*Year 1*	*Year 2*	*......*	*Year n*
High												
Average												
Low												

Table 11

Return rate of selected stocks on the results of trades on PFTS Stock Exchange

Date	Trade price				Change (to previous month – 100%),%			
	# 1 *(put ticker)*	*#2* *(put ticker)*	*#3* *(put ticker)*	*PFTS* *Index*	*# 1* *(put ticker)*	*#2* *(put ticker)*	*#3* *(put ticker)*	*PFTS* *index*
31.10.2017								
30.09.2017								
31.08.2017								
31.07.2017								
30.06.2017								
31.05,2017								
30.04.2017								
31.03.2017								
28.02.2017								
31.01.2017								
31.12.2016								
30.11.2016								
31.10.2016								
30.09.2016								
31.08.2016								
31.07.2016								
30.06.2016								
31.05.2016								
30.04.2016								
31.03.2016								
29.02.2016								
31.01.2016								
31.12.2015								
30.11.2015								
31.10.2015								
Return rate,% (SUM of all dates divided by 25)					$r_{s\ \#1}$	$r_{s\ \#2}$	$r_{s\ \#3}$	r_m

Table 12

Variants of portfolio structure

Variant	Share of security in the portfolio,%		
	#1 (put ticker)	#2 (put ticker)	#3 (put ticker)
1			
2			
3			

Table 13

Return and risk of individual stocks within portfolio

	Securities		
	#1 (put ticker)	#2 (put ticker)	#3 (put ticker)
r_s			
σ^2			
σ			
CV			
β			

Table 14

Return, risk and effectiveness of portfolio types

	Variants of investment portfolio		
	1	2	3
r_p			
σ			
CV			
β			
Jensen's Alpha			
Treynor ratio			
Sharpe ratio			

Future Value Interest Factor (FVIF)

t\r	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130	1.140	1.150
2	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277	1.300	1.323
3	1.030	1.061	1.093	1.125	1.158	1.191	1.225	1.260	1.295	1.331	1.368	1.405	1.443	1.482	1.521
4	1.041	1.082	1.126	1.170	1.216	1.262	1.311	1.360	1.412	1.464	1.518	1.574	1.630	1.689	1.749
5	1.051	1.104	1.159	1.217	1.276	1.338	1.403	1.469	1.539	1.611	1.685	1.762	1.842	1.925	2.011
6	1.062	1.126	1.194	1.265	1.340	1.419	1.501	1.587	1.677	1.772	1.870	1.974	2.082	2.195	2.313
7	1.072	1.149	1.230	1.316	1.407	1.504	1.606	1.714	1.828	1.949	2.076	2.211	2.353	2.502	2.660
8	1.083	1.172	1.267	1.369	1.477	1.594	1.718	1.851	1.993	2.144	2.305	2.476	2.658	2.853	3.059
9	1.094	1.195	1.305	1.423	1.551	1.689	1.838	1.999	2.172	2.358	2.558	2.773	3.004	3.252	3.518
10	1.105	1.219	1.344	1.480	1.629	1.791	1.967	2.159	2.367	2.594	2.839	3.106	3.395	3.707	4.046
11	1.116	1.243	1.384	1.539	1.710	1.898	2.105	2.332	2.580	2.853	3.152	3.479	3.836	4.226	4.652
12	1.127	1.268	1.426	1.601	1.796	2.012	2.252	2.518	2.813	3.138	3.498	3.896	4.335	4.818	5.350
13	1.138	1.294	1.469	1.665	1.886	2.133	2.410	2.720	3.066	3.452	3.883	4.363	4.898	5.492	6.153
14	1.149	1.319	1.513	1.732	1.980	2.261	2.579	2.937	3.342	3.797	4.310	4.887	5.535	6.261	7.076
15	1.161	1.346	1.558	1.801	2.079	2.397	2.759	3.172	3.642	4.177	4.785	5.474	6.254	7.138	8.137
16	1.173	1.373	1.605	1.873	2.183	2.540	2.952	3.426	3.970	4.595	5.311	6.130	7.067	8.137	9.358
17	1.184	1.400	1.653	1.948	2.292	2.693	3.159	3.700	4.328	5.054	5.895	6.866	7.986	9.276	10.761
18	1.196	1.428	1.702	2.026	2.407	2.854	3.380	3.996	4.717	5.560	6.544	7.690	9.024	10.575	12.375
19	1.208	1.457	1.754	2.107	2.527	3.026	3.617	4.316	5.142	6.116	7.263	8.613	10.197	12.056	14.232
20	1.220	1.486	1.806	2.191	2.653	3.207	3.870	4.661	5.604	6.727	8.062	9.646	11.523	13.743	16.367

t\r	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.160	1.170	1.180	1.190	1.200	1.210	1.220	1.230	1.240	1.250	1.260	1.270	1.280	1.290	1.300
2	1.346	1.369	1.392	1.416	1.440	1.464	1.488	1.513	1.538	1.563	1.588	1.613	1.638	1.664	1.690
3	1.561	1.602	1.643	1.685	1.728	1.772	1.816	1.861	1.907	1.953	2.000	2.048	2.097	2.147	2.197
4	1.811	1.874	1.939	2.005	2.074	2.144	2.215	2.289	2.364	2.441	2.520	2.601	2.684	2.769	2.856
5	2.100	2.192	2.288	2.386	2.488	2.594	2.703	2.815	2.932	3.052	3.176	3.304	3.436	3.572	3.713
6	2.436	2.565	2.700	2.840	2.986	3.138	3.297	3.463	3.635	3.815	4.002	4.196	4.398	4.608	4.827
7	2.826	3.001	3.185	3.379	3.583	3.797	4.023	4.259	4.508	4.768	5.042	5.329	5.629	5.945	6.275
8	3.278	3.511	3.759	4.021	4.300	4.595	4.908	5.239	5.590	5.960	6.353	6.768	7.206	7.669	8.157
9	3.803	4.108	4.435	4.785	5.160	5.560	5.987	6.444	6.931	7.451	8.005	8.595	9.223	9.893	10.604
10	4.411	4.807	5.234	5.695	6.192	6.727	7.305	7.926	8.594	9.313	10.086	10.915	11.806	12.761	13.786
11	5.117	5.624	6.176	6.777	7.430	8.140	8.912	9.749	10.657	11.642	12.708	13.862	15.112	16.462	17.922
12	5.936	6.580	7.288	8.064	8.916	9.850	10.872	11.991	13.215	14.552	16.012	17.605	19.343	21.236	23.298
13	6.886	7.699	8.599	9.596	10.699	11.918	13.264	14.749	16.386	18.190	20.175	22.359	24.759	27.395	30.288
14	7.988	9.007	10.147	11.420	12.839	14.421	16.182	18.141	20.319	22.737	25.421	28.396	31.691	35.339	39.374
15	9.266	10.539	11.974	13.590	15.407	17.449	19.742	22.314	25.196	28.422	32.030	36.062	40.565	45.587	51.186
16	10.748	12.330	14.129	16.172	18.488	21.114	24.086	27.446	31.243	35.527	40.358	45.799	51.923	58.808	66.542
17	12.468	14.426	16.672	19.244	22.186	25.548	29.384	33.759	38.741	44.409	50.851	58.165	66.461	75.862	86.504
18	14.463	16.879	19.673	22.901	26.623	30.913	35.849	41.523	48.039	55.511	64.072	73.870	85.071	97.862	112.455
19	16.777	19.748	23.214	27.252	31.948	37.404	43.736	51.074	59.568	69.389	80.731	93.815	108.890	126.242	146.192
20	19.461	23.106	27.393	32.429	38.338	45.259	53.358	62.821	73.864	86.736	101.721	119.145	139.380	162.852	190.050

Present Value Interest Factor (PVIF)

N\r	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826	0.812	0.797	0.783	0.769	0.756
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683	0.659	0.636	0.613	0.592	0.572
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.593	0.567	0.543	0.519	0.497
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.425	0.400	0.376
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.391	0.361	0.333	0.308	0.284
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247
11	0.896	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	0.237	0.215
12	0.887	0.788	0.701	0.625	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	0.208	0.187
13	0.879	0.773	0.681	0.601	0.530	0.469	0.415	0.368	0.326	0.290	0.258	0.229	0.204	0.182	0.163
14	0.870	0.758	0.661	0.577	0.505	0.442	0.388	0.340	0.299	0.263	0.232	0.205	0.181	0.160	0.141
15	0.861	0.743	0.642	0.555	0.481	0.417	0.362	0.315	0.275	0.239	0.209	0.183	0.160	0.140	0.123
16	0.853	0.728	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	0.123	0.107
17	0.844	0.714	0.605	0.513	0.436	0.371	0.317	0.270	0.231	0.198	0.170	0.146	0.125	0.108	0.093
18	0.836	0.700	0.587	0.494	0.416	0.350	0.296	0.250	0.212	0.180	0.153	0.130	0.111	0.095	0.081
19	0.828	0.686	0.570	0.475	0.396	0.331	0.277	0.232	0.194	0.164	0.138	0.116	0.098	0.083	0.070
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	0.073	0.061

t\r	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	0.862	0.855	0.847	0.840	0.833	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	0.743	0.731	0.718	0.706	0.694	0.683	0.672	0.661	0.650	0.640	0.630	0.620	0.610	0.601	0.592
3	0.641	0.624	0.609	0.593	0.579	0.564	0.551	0.537	0.524	0.512	0.500	0.488	0.477	0.466	0.455
4	0.552	0.534	0.516	0.499	0.482	0.467	0.451	0.437	0.423	0.410	0.397	0.384	0.373	0.361	0.350
5	0.476	0.456	0.437	0.419	0.402	0.386	0.370	0.355	0.341	0.328	0.315	0.303	0.291	0.280	0.269
6	0.410	0.390	0.370	0.352	0.335	0.319	0.303	0.289	0.275	0.262	0.250	0.238	0.227	0.217	0.207
7	0.354	0.333	0.314	0.296	0.279	0.263	0.249	0.235	0.222	0.210	0.198	0.188	0.178	0.168	0.159
8	0.305	0.285	0.266	0.249	0.233	0.218	0.204	0.191	0.179	0.168	0.157	0.148	0.139	0.130	0.123
9	0.263	0.243	0.225	0.209	0.194	0.180	0.167	0.155	0.144	0.134	0.125	0.116	0.108	0.101	0.094
10	0.227	0.208	0.191	0.176	0.162	0.149	0.137	0.126	0.116	0.107	0.099	0.092	0.085	0.078	0.073
11	0.195	0.178	0.162	0.148	0.135	0.123	0.112	0.103	0.094	0.086	0.079	0.072	0.066	0.061	0.056
12	0.168	0.152	0.137	0.124	0.112	0.102	0.092	0.083	0.076	0.069	0.062	0.057	0.052	0.047	0.043
13	0.145	0.130	0.116	0.104	0.093	0.084	0.075	0.068	0.061	0.055	0.050	0.045	0.040	0.037	0.033
14	0.125	0.111	0.099	0.088	0.078	0.069	0.062	0.055	0.049	0.044	0.039	0.035	0.032	0.028	0.025
15	0.108	0.095	0.084	0.074	0.065	0.057	0.051	0.045	0.040	0.035	0.031	0.028	0.025	0.022	0.020
16	0.093	0.081	0.071	0.062	0.054	0.047	0.042	0.036	0.032	0.028	0.025	0.022	0.019	0.017	0.015
17	0.080	0.069	0.060	0.052	0.045	0.039	0.034	0.030	0.026	0.023	0.020	0.017	0.015	0.013	0.012
18	0.069	0.059	0.051	0.044	0.038	0.032	0.028	0.024	0.021	0.018	0.016	0.014	0.012	0.010	0.009
19	0.060	0.051	0.043	0.037	0.031	0.027	0.023	0.020	0.017	0.014	0.012	0.011	0.009	0.008	0.007
20	0.051	0.043	0.037	0.031	0.026	0.022	0.019	0.016	0.014	0.012	0.010	0.008	0.007	0.006	0.005

Future Value Interest Factor of Annuity (FVIFA)

t\r	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130	1.140	1.150
2	2.030	2.060	2.091	2.122	2.153	2.184	2.215	2.246	2.278	2.310	2.342	2.374	2.407	2.440	2.473
3	3.060	3.122	3.184	3.246	3.310	3.375	3.440	3.506	3.573	3.641	3.710	3.779	3.850	3.921	3.993
4	4.101	4.204	4.309	4.416	4.526	4.637	4.751	4.867	4.985	5.105	5.228	5.353	5.480	5.610	5.742
5	5.152	5.308	5.468	5.633	5.802	5.975	6.153	6.336	6.523	6.716	6.913	7.115	7.323	7.536	7.754
6	6.214	6.434	6.662	6.898	7.142	7.394	7.654	7.923	8.200	8.487	8.783	9.089	9.405	9.730	10.067
7	7.286	7.583	7.892	8.214	8.549	8.897	9.260	9.637	10.028	10.436	10.859	11.300	11.757	12.233	12.727
8	8.369	8.755	9.159	9.583	10.027	10.491	10.978	11.488	12.021	12.579	13.164	13.776	14.416	15.085	15.786
9	9.462	9.950	10.464	11.006	11.578	12.181	12.816	13.487	14.193	14.937	15.722	16.549	17.420	18.337	19.304
10	10.567	11.169	11.808	12.486	13.207	13.972	14.784	15.645	16.560	17.531	18.561	19.655	20.814	22.045	23.349
11	11.683	12.412	13.192	14.026	14.917	15.870	16.888	17.977	19.141	20.384	21.713	23.133	24.650	26.271	28.002
12	12.809	13.680	14.618	15.627	16.713	17.882	19.141	20.495	21.953	23.523	25.212	27.029	28.985	31.089	33.352
13	13.947	14.974	16.086	17.292	18.599	20.015	21.550	23.215	25.019	26.975	29.095	31.393	33.883	36.581	39.505
14	15.097	16.293	17.599	19.024	20.579	22.276	24.129	26.152	28.361	30.772	33.405	36.280	39.417	42.842	46.580
15	16.258	17.639	19.157	20.825	22.657	24.673	26.888	29.324	32.003	34.950	38.190	41.753	45.672	49.980	54.717
16	17.430	19.012	20.762	22.698	24.840	27.213	29.840	32.750	35.974	39.545	43.501	47.884	52.739	58.118	64.075
17	18.615	20.412	22.414	24.645	27.132	29.906	32.999	36.450	40.301	44.599	49.396	54.750	60.725	67.394	74.836
18	19.811	21.841	24.117	26.671	29.539	32.760	36.379	40.446	45.018	50.159	55.939	62.440	69.749	77.969	87.212
19	21.019	23.297	25.870	28.778	32.066	35.786	39.995	44.762	50.160	56.275	63.203	71.052	79.947	90.025	101.444
20	22.239	24.783	27.676	30.969	34.719	38.993	43.865	49.423	55.765	63.002	71.265	80.699	91.470	103.768	117.810

t\r	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	1.160	1.170	1.180	1.190	1.200	1.210	1.220	1.230	1.240	1.250	1.260	1.270	1.280	1.290	1.300
2	2.506	2.539	2.572	2.606	2.640	2.674	2.708	2.743	2.778	2.813	2.848	2.883	2.918	2.954	2.990
3	4.066	4.141	4.215	4.291	4.368	4.446	4.524	4.604	4.684	4.766	4.848	4.931	5.016	5.101	5.187
4	5.877	6.014	6.154	6.297	6.442	6.589	6.740	6.893	7.048	7.207	7.368	7.533	7.700	7.870	8.043
5	7.977	8.207	8.442	8.683	8.930	9.183	9.442	9.708	9.980	10.259	10.544	10.837	11.136	11.442	11.756
6	10.414	10.772	11.142	11.523	11.916	12.321	12.740	13.171	13.615	14.073	14.546	15.032	15.534	16.051	16.583
7	13.240	13.773	14.327	14.902	15.499	16.119	16.762	17.430	18.123	18.842	19.588	20.361	21.163	21.995	22.858
8	16.519	17.285	18.086	18.923	19.799	20.714	21.670	22.669	23.712	24.802	25.940	27.129	28.369	29.664	31.015
9	20.321	21.393	22.521	23.709	24.959	26.274	27.657	29.113	30.643	32.253	33.945	35.723	37.593	39.556	41.619
10	24.733	26.200	27.755	29.404	31.150	33.001	34.962	37.039	39.238	41.566	44.031	46.639	49.398	52.318	55.405
11	29.850	31.824	33.931	36.180	38.581	41.142	43.874	46.788	49.895	53.208	56.739	60.501	64.510	68.780	73.327
12	35.786	38.404	41.219	44.244	47.497	50.991	54.746	58.779	63.110	67.760	72.751	78.107	83.853	90.016	96.625
13	42.672	46.103	49.818	53.841	58.196	62.909	68.010	73.528	79.496	85.949	92.926	100.465	108.612	117.411	126.913
14	50.660	55.110	59.965	65.261	71.035	77.330	84.192	91.669	99.815	108.687	118.347	128.861	140.303	152.750	166.286
15	59.925	65.649	71.939	78.850	86.442	94.780	103.935	113.983	125.011	137.109	150.377	164.924	180.868	198.337	217.472
16	70.673	77.979	86.068	95.022	104.931	115.894	128.020	141.430	156.253	172.636	190.735	210.723	232.791	257.145	284.014
17	83.141	92.406	102.740	114.266	127.117	141.441	157.405	175.188	194.994	217.045	241.585	268.888	299.252	333.007	370.518
18	97.603	109.285	122.414	137.166	153.740	172.354	193.254	216.712	243.033	272.556	305.658	342.758	384.323	430.870	482.973
19	114.380	129.033	145.628	164.418	185.688	209.758	236.989	267.785	302.601	341.945	386.389	436.573	493.213	557.112	629.165
20	133.841	152.139	173.021	196.847	224.026	255.018	290.347	330.606	376.465	428.681	488.110	555.717	632.593	719.964	819.215

Present Value Interest Factor of Annuity (PVIFA)

t\r	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626
3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283
4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772
10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019
11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234
12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421
13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583
14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724
15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847
16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954
17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047
18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128
19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198
20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259

t\r	16%	17%	18%	19%	20%	21%	22%	23%	24%	25%	26%	27%	28%	29%	30%
1	0.862	0.855	0.847	0.840	0.833	0.826	0.820	0.813	0.806	0.800	0.794	0.787	0.781	0.775	0.769
2	1.605	1.585	1.566	1.547	1.528	1.509	1.492	1.474	1.457	1.440	1.424	1.407	1.392	1.376	1.361
3	2.246	2.210	2.174	2.140	2.106	2.074	2.042	2.011	1.981	1.952	1.923	1.896	1.868	1.842	1.816
4	2.798	2.743	2.690	2.639	2.589	2.540	2.494	2.448	2.404	2.362	2.320	2.280	2.241	2.203	2.166
5	3.274	3.199	3.127	3.058	2.991	2.926	2.864	2.803	2.745	2.689	2.635	2.583	2.532	2.483	2.436
6	3.685	3.589	3.498	3.410	3.326	3.245	3.167	3.092	3.020	2.951	2.885	2.821	2.759	2.700	2.643
7	4.039	3.922	3.812	3.706	3.605	3.508	3.416	3.327	3.242	3.161	3.083	3.009	2.937	2.868	2.802
8	4.344	4.207	4.078	3.954	3.837	3.726	3.619	3.518	3.421	3.329	3.241	3.156	3.076	2.999	2.925
9	4.607	4.451	4.303	4.163	4.031	3.905	3.786	3.673	3.566	3.463	3.366	3.273	3.184	3.100	3.019
10	4.833	4.659	4.494	4.339	4.192	4.054	3.923	3.799	3.682	3.571	3.465	3.364	3.269	3.178	3.092
11	5.029	4.836	4.656	4.486	4.327	4.177	4.035	3.902	3.776	3.656	3.543	3.437	3.335	3.239	3.147
12	5.197	4.988	4.793	4.611	4.439	4.278	4.127	3.985	3.851	3.725	3.606	3.493	3.387	3.286	3.190
13	5.342	5.118	4.910	4.715	4.533	4.362	4.203	4.053	3.912	3.780	3.656	3.538	3.427	3.322	3.223
14	5.468	5.229	5.008	4.802	4.611	4.432	4.265	4.108	3.962	3.824	3.695	3.573	3.459	3.351	3.249
15	5.575	5.324	5.092	4.876	4.675	4.489	4.315	4.153	4.001	3.859	3.726	3.601	3.483	3.373	3.268
16	5.668	5.405	5.162	4.938	4.730	4.536	4.357	4.189	4.033	3.887	3.751	3.623	3.503	3.390	3.283
17	5.749	5.475	5.222	4.990	4.775	4.576	4.391	4.219	4.059	3.910	3.771	3.640	3.518	3.403	3.295
18	5.818	5.534	5.273	5.033	4.812	4.608	4.419	4.243	4.080	3.928	3.786	3.654	3.529	3.413	3.304
19	5.877	5.584	5.316	5.070	4.843	4.635	4.442	4.263	4.097	3.942	3.799	3.664	3.539	3.421	3.311
20	5.929	5.628	5.353	5.101	4.870	4.657	4.460	4.279	4.110	3.954	3.808	3.673	3.546	3.427	3.316